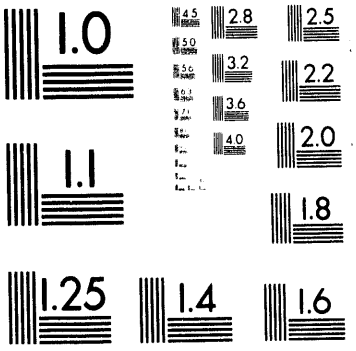
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UC-350

PATRICK AIR FORCE BASE INTEGRATED RESOURCE ASSESSMENT

VOLUME 3: RESOURCE ASSESSMENT

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MASTER

ABSTRACT

The U.S. Air Force has tasked the Pacific Northwest Laboratory (PNL)[a] in support of the U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP) to identify, evaluate, and assist in acquiring all cost-effective energy projects at Patrick Air Force Base (AFB). This is part of a model program that PNL is designing to support energy-use decisions in the federal sector.

This report provides the results of the fossil fuel and electric energy resource opportunity (ERO) assessments performed by PNL at Patrick AFB which is located south of Cocoa Beach, Florida. It is a companion report to Volume 1, Executive Summary, and Volume 2, Baseline Detail.

The results of the analyses of EROs are presented in 11 common energy end-use categories (e.g., boilers, building lighting, air conditioning, and generating plant). A narrative description of each ERO is provided, including information on the installed cost, energy and dollar savings, impacts on operations and maintenance (O&M), and, when applicable, a discussion of energy supply and demand, energy security, and environmental issues. A description of the evaluation methodologies and technical and cost assumptions is also provided for each ERO. Summary tables present the cost-effectiveness of energy end-use equipment before and after the implementation of each ERO and present the results of the life-cycle cost (LCC) analysis indicating the net present value (NPV) and value index (VI) of each ERO.

(a) Pacific Northwest Laboratory is operated by Battelle Memorial Institute for the U.S. Department of Energy under Contract DE-AC06-76RLO 1830.

SUMMARY

The U.S. Air Force (USAF) has tasked the Pacific Northwest Laboratory (PNL) in support of the U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP) to identify, evaluate, and assist in acquiring all cost-effective energy projects at Patrick Air Force Base (AFB). This task is part of a model program that PNL is designing to support energy-use decisions in the federal sector.

This report describes the methodology used to identify and evaluate the energy resource opportunities (EROs) at Patrick AFB, provides a life-cycle cost (LCC) analysis for each ERO, and prioritizes the EROs based first upon whether or not they have a positive net present value (NPV) and second upon their savings-to-investment ratio (SIR). The SIR (the ratio of present value of the total savings to the present value of the installed cost) is used to prioritize EROs and is only applied to projects deemed cost-effective by nature of their positive NPV. EROs with negative NPVs, therefore, will not have an associated SIR measurement. Analysis results are presented in 11 common energy end-use categories (e.g., boilers and furnaces, service hot water, and building lighting).

As illustrated in Table S.1, the present value (PV) of the installed cost of all EROs constituting the minimum LCC efficiency resource (i.e., cost-effective) at Patrick AFB is approximately $16.7 million in 1993 dollars (1993$). The PV of the savings associated with this investment is approximately $43.2 million, for an overall NPV of $17.5 million.

TABLE S.1. Total Savings, Cost, and NPV (1993$)

Total Present Value of Installed Cost	Total Present Value of Energy Savings	Total Present Value of Demand Savings	Total Present Value of O&M Savings	Total Present Value of Replacement Savings	Total Present Value of All Savings	Total Net Present Value
16,693,883	14,934,335	8,429,275	5,293,533	5,498,735	34,155,879	17,461,995

Table S.2 provides a breakdown and summary of the cost-effective resource at Patrick AFB. Cost-sharing and rebate incentives from the utility

are normally factored into the analysis. Because the potential demand-side management (DSM) relationship with the electric utility, Florida Power and Light (FPL), is uncertain, Patrick AFB project managers decided that this document should present an economic analysis from the government-funding-only perspective. Thus, if no cost-sharing with the utility can be arranged, the document will still be useful to the USAF when planning for implementation of various EROs. Once details of a cost-sharing agreement with the utility have been reached, the economic analysis can be redone at any time.

The operations and maintenance (O&M) savings are a reflection of the incremental cost difference between the cost of maintaining the existing equipment and that of maintaining new or retrofitted equipment. Because maintenance costs of new or retrofitted equipment are often the same as the costs to maintain the existing equipment, this incremental maintenance cost is often zero.

Table S.3 accompanies Table S.2, which presents a breakdown and summary of both the energy and demand savings for the first year and full implementation of the cost-effective resource at Patrick AFB.

TABLE S.2. Summary of Cost-Effective Electric Resource at Patrick AFB (1993$)

ERO Category	Present Value of Installed Cost	Present Value of Energy Savings	Present Value of Demand Savings	Present Value of O&M Savings	Present Value of Replac. Savings	Present Value of Total Savings	Net Present Value
Air Conditioning	6,210,400	-1,561,723	6,067,747	824,808	2,594,756	7,925,589	1,715,189
Boilers	17,500	49,675	0	-7,811	-4,631	37,233	19,734
Envelope	1,386,934	5,122,174	0	0	0	5,122,174	3,735,240
Controls	68,200	384,139	0	0	-10,196	373,944	305,744
HVAC	1,629,326	143,938	0	0	2,782,086	2,926,025	1,296,699
Lighting	3,551,476	7,008,373	2,193,583	2,634,927	0	11,836,883	8,285,407
Motors	528,155	624,774	142,949	0	207,203	974,926	446,771
Transport	1,287,000	1,113,696	0	1,841,609	-413,570	2,541,734	1,254,734
Trans&Dist.	1,124,103	99,861	24,995	0	1,023,932	1,148,788	24,685
Wtr. Heating	890,790	1,949,428	0	0	-680,846	1,268,582	377,792
Totals	16,693,883	14,934,335	8,429,275	5,293,533	5,498,735	34,155,878	17,461,995

TABLE S.3. Summary of Electric Energy and Demand Savings at Patrick AFB

ERO Category	First-Year Energy Savings (MBtu)	Full Implement. Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Demand Savings (kW-mo)
Air Conditioning	-2,625	-2,625	72,387	72,387
Boilers	623	623	0	0
Envelope	30,267	30,267	0	0
Controls	2,505	2,505	0	0
HVAC	0	1,833	0	0
Transportation	1,268	1,268	0	0
Trans&Dist.	0	3,025	0	1,214
Lighting	44,266	44,266	22,032	22,032
Motors	3,148	4,318	1,436	1,436
Wtr. Heating	12,283	12,283	0	0
Totals	91,735	97,763	95,855	97,069

Table S.4 presents a breakdown and summary of the total fuel balance at Patrick AFB. Total existing fuel use is based on information developed for the Volume 2: Baseline Detail companion report to this document (Wahlstrom et al. 1993). Total fuel use after ERO implementation was determined, where possible, by subtracting the total fuel savings from the total existing fuel use.

TABLE S.4. Fuel Balance at Patrick AFB

Fuel Type	1991 Existing Energy Use (MBtu)	Existing Demand (kW-mo)	Energy Use Reduction (MBtu)	Demand Reduction (kW-mo)	Increased Energy Use (MBtu)	Increased Demand (kW-mo)	Resulting Energy Use (MBtu)	Resulting Demand (kW-mo)
Diesel	19,161	na	2,923	na	0	na	16,238	na
Electricity	370,803	247,196	95,782	97,069	0	0	275,021	150,127
Gasoline	78,150	na	15,195	na	0	na	62,955	na
Natural Gas	23,819	na	5,174	na	21,457	na	40,102	
Fuel Oil	9,671	na	145	na	0	na	9,525	na
Totals	501,604	247,196	119,220	97,069	21,457	0	97,763	120,110

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ABBREVIATIONS AND ACRONYMS

AC	air conditioning
ADMIN	administration (building type)
AEC	annual energy and demand cost
AFB	Air Force Base
AFUE	annual fuel utilization efficiency
BLST	ballast
BRK/ADM	barracks/administration (building type)
Btu	British thermal unit
CFC	chlorofluorocarbon
CFL	compact fluorescent
CILC-1	Commercial/Industrial Load Control Program Schedule
CNG	compressed natural gas
CO	carbon monoxide
CO_2	carbon dioxide
COMCATN	communication (building type)
COP	coefficient of performance
CVR	conservation voltage reduction
d	discount rate
DET-RR	detached restroom (building type)
DGR	dry good retail
DOE	U.S. Department of Energy
EER	energy efficiency ratio
EEM	energy-efficient motors
ELC	electronic ballast
EMCS	energy management and control system
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
ERO	energy resource opportunity
EUI	energy-use intensity
FEDS	Facility Energy Decision Screening software
FEMP	Federal Energy Management Program
FPL	Florida Power & Light
FSEC	Florida Solar Energy Center
GSA	General Services Administration
HFC	hydrofluorocarbon
HCFC	hydrochlorofluorocarbon
HOSPITL	hospital (building type)
hp	horsepower
HPS	high-pressure sodium
HSG-FAM	family housing (building type)
HUT	miscellaneous small buildings (building type)
HVAC	heating, ventilating, and air conditioning
IC	installed cost

INC	incandescent
INT	integral unit
kVA	kilovoltampere
kW	kilowatt
kWh	kilowatt-hour
kW-mo	kilowatt-month
LCC	life-cycle cost
LPS	low-pressure sodium
MBtu	million British thermal units
MTRPOOL	motorpool (building type)
MW	megawatt
MWh	megawatt-hour
MWR	morale, welfare, & recreation (building type)
NIST	National Institute of Standards and Technology
NO_x	oxides of nitrogen
NPV	net present value
O	oxygen
O_2	electronic oxygen
O&M	operations and maintenance
ODP	open drip-proof
OM	annual O&M expenditures
PLT-BLD	plant building (building type)
PM	preventive maintenance
PNL	Pacific Northwest Laboratory
PV	present value
PV(IC)	present value of installed cost
PV(EC)	present value of annual energy cost
PV(OM)	present value of annual O&M cost
PV(OMS)	present value of O&M savings
PV(REP)	present value of future replacement cost
PV(REPS)	present value of replacement savings
R&D	research and development (building type)
REC	recreation (building type)
REF	reflector
REP	replacement cost
RESTRNT	restaurant (building type)
RI	replace immediately
ROF	replace on failure
rpm	revolutions per minute
SEER	seasonal energy efficiency ratio
SERC	Southeastern Electric Reliability Council
SHOP-AIR	aircraft shop (building type)
SHOP-ELEC	electrical shop (building type)
SHOP-WPN	weapons shop (building type)
SIR	savings to investment ratio
SPW	single present worth factor

STD	standard
STOR-UH	unheated storage (building type)
TEFC	total enclosed fan-cooled
TERMINL	passenger terminal (building type)
TES	thermal energy storage
TLF	temporary lodging facility
TRAING	training (building type)
UPW	uniform present worth factor
USAF	United States Air Force
USFW	U.S. Fish and Wildlife Service
VAV	variable air volume
VFD	variable-frequency drive
VI	value index
VOQ	visiting officers' quarters
VSD	variable-speed drive
W	watt
WHS	warehouse (building type)
WHS-CLD	cold storage warehouse (building type)

1.0 SELECTION OF ENERGY RESOURCE OPPORTUNITIES

The number of conceivable energy conservation measures, fuel-switching opportunities, and renewable energy projects at a federal site is very large. A three-step process has been developed by Pacific Northwest Laboratory (PNL) to make energy resource opportunity (ERO) selection, evaluation, and prioritization manageable. The steps are:

- Preliminary Screening. Select promising EROs from the master list, considering the site's mission, building stock, end-use equipment characteristics, utility characteristics, climate, energy cost, and other local conditions that affect ERO viability.
- Cost and Performance Analysis. Establish, with a reasonable degree of accuracy, the technical and economic feasibility of each ERO that passed the preliminary screening. Perform an analysis comparing the operating and economic performance of the existing equipment and the ERO. Where applicable, include impacts on energy security and the environment in the analysis.
- Life-Cycle Cost Analysis and Prioritization. Perform a life-cycle cost (LCC) analysis and rank EROs by net present value (NPV) so that a package with the optimal return on site and utility investment can be defined. Utility- and technology-specific incentives are accounted for in this evaluation step.

The remainder of Section 1.0 describes the process used for preliminary selection of EROs and presents the ERO master list of screened and selected EROs. Section 2.0 covers the technical characteristics of each conservation and fuel-switching measure considered and analyzes its cost and performance. Section 3.0 provides the results of the LCC analysis and ERO prioritization process. Section 4.0 lists references cited in this document.

1.1 ERO PRELIMINARY SELECTION CRITERIA

The ERO selection process tests the applicability of a long list of EROs (see Table 1.1) using a set of rational criteria that can be applied with relatively little "hard data." This step filters out EROs that are unlikely to be economically feasible, are unlikely to have significant and persistent energy impact at the site, or that will be unduly expensive or difficult to analyze. The ten basic criteria used to characterize and select possible EROs are listed below.

- Low Incidence. EROs that apply to end-use equipment representing a very small fraction of site energy use may be eliminated. However, such EROs may be retained in cases where the end-use is concentrated, rather than diffused, or where it has been previously identified in a detailed audit and passes the other criteria without difficulty.

- Economic Feasibility. A preliminary assessment of economic feasibility can often be made if the utility will commit to an incentive or cost-sharing level in advance. EROs whose costs and performance are well established and fairly uniform across applications can then be screened with respect to the utility's marginal cost of energy supply.

- Technical Feasibility. Sometimes conditions at the site preclude implementation of an ERO. Conditions that make retrofit difficult, or use patterns that complicate operation or maintenance of the end-use equipment in question, may result in elimination of an ERO prior to formal analysis.

- Primarily Operations and Maintenance. A measure that is a no- or low-cost change in operations and maintenance (O&M) activities is generally rejected as inappropriate to the integrated resource acquisition program. Capital-intensive measures that are of interest to the program are difficult, programmatically, for site personnel to implement on their own. Measures may be considered where there is a significant cost to develop new O&M procedures or procure special instruments and tools.

- Mission Critical. End-use equipment that serves mission-critical functions may not be accessible for retrofit or replacement, or its operation may be so important to critical mission objectives that any reduction or change in the service provided is not tolerable.

- Site Preference. The site may have particular objections to certain EROs based on O&M or other infrastructure support requirements, or on unfavorable past experiences with similar measures. EROs that appear to be very attractive in other respects may be analyzed because the savings may incite a reevaluation of the measure.

- Insufficient Data. Sometimes the performance or operational characteristics of existing end-use equipment are unknown, and the cost for an outside consultant to determine these characteristics cannot be justified. This situation is not a technical or implementation cost reason for rejection and should not deter the site-resident energy and O&M staff or local energy service company personnel from further analysis and, if appropriate, implementation of the ERO concerned.

- Complexity. Sometimes the complexity of the analysis precludes the analysis of an ERO as part of a high-level, comprehensive site assessment program.

- Immature Technology. Some retrofits require equipment that has not achieved sufficient market acceptance or enough penetration in the federal sector to be considered reliable and effective in the field.

The persistence for savings and sensitivity of savings to O&M, and the propensity for equipment to degrade in energy performance while continuing to provide service, are factors that may disqualify a technology. Such EROs will usually not be considered.

- Other ERO-Dependent. An ERO may be rejected because it depends on one or more other EROs that have been rejected or whose feasibility is too uncertain. The ERO may also be rejected because it has already been implemented in all, or a majority of, the existing end-use opportunities.

One criterion that will generally not be applied is the willingness of the utility to support a particular ERO with incentives. The rationale for this approach is that if the utility's rate structure reasonably reflects its overall cost of supply, a uniform incentive structure should exist that will properly account for its marginal cost of supply. The rates and incentives, together with an unbiased ERO analysis, should result in a near optimal mix of efficiency, fuel-switching, and renewable energy measures. The application of utility preference based on other criteria, such as applicability to the majority of customers, will only move the mix of recommended measures away from the optimal solution.

1.1.1 Master List of Screened and Selected EROs

A master list of generic conservation measures (see Table 1.1) was used as an origination point in the identification of EROs at Patrick Air Force Base (AFB). For each ERO listed, there is an indication of whether or not it passed the preliminary selection process. If the ERO did not pass, a brief explanation is provided.

TABLE 1.1. Master List of Energy Resource Opportunities at Patrick AFB

ERO Name	ERO Description	Eval? (Y/N)	Comment
FANS AND FAN MOTORS			
Align sheaves	Align sheaves and shafts; replace belt with high-efficiency belts(s)	N	Primarily an O&M measure
Reduce hours	Install clock, EMCS switch or other control means to reduce operating hours	N	See alternate ERO: CO2 Sensor
Reduce speed	Reduce fan speed by adjusting sheave diameter and reduce motor size accordingly	N	Insufficient data
Variable inlet vane	Install variable inlet vanes and control to provide reduced air flow when appropriate	N	Most fans are single-zone
Variable-speed drive	Install variable-frequency motor drive and control to modulate airflow; also reduce motor size if appropriate	N	Most fans are single-zone
Efficient motor	Replace existing motor with high-efficiency model and reduce size if appropriate	Y	
Two-speed motor	Replace existing motor with two-speed motor and controller	Y	
CO_2 sensor	Install CO_2 sensors for ventilation control to reduce heating of outside air and average air volume moved by fans	Y	
Rewind existing motors	Rewind existing motors to improve operational efficiency	Y	
PUMPS AND PUMP MOTORS			
Align shafts	Align shafts and replace coupling with high-efficiency coupling	N	Primarily an O&M measure
Reduce hours	Install clock, EMCS switch, or other control means to reduce operating hours	N	Most pumps operate on demand
Efficient motor	Replace motor with high-efficiency model	Y	
Two-speed motor	Replace existing motor with two-speed motor and controller	Y	

TABLE 1.1. (contd)

ERO Name	ERO Description	Eval? (Y/N)	Comment
Variable-speed drive	Install variable frequency motor drive and control to modulate fluid flow; also reduce motor size if appropriate	Y	
Trim impeller	Replace (or trim) impeller and reduce motor size to match actual load	N	Insufficient data
Two-speed motor	Replace existing motor with two-speed motor and controller	N	Insufficient data
Variable-speed drive	Install variable-frequency motor drive and control to modulate fluid flow; also reduce motor size if appropriate	N	Most large pumps already have VSD
Adjust VSD setpoint	Adjust VSD control setpoint for lower-speed operation	N	Insufficient data
REFRIGERATION (residential/dorms)			
Efficient refrigerator	Replace existing refrigerator with high- efficiency model meeting DOE 1993 Appliance Efficiency Standard	Y	
DISTRIBUTION AND TRANSMISSION			
Replace transformers	Replace existing transformers with high- efficiency amorphous transformers	Y	
Conservation voltage reduction (CVR)	Reduce line voltage to various end-use devices	N	Current voltage levels must be maintained
AIR CONDITIONING			
Efficient chillers	Replace existing chillers with more efficient model	Y	
Efficient air-conditioner	Replace window air conditioner with high- efficiency model	Y	
Thermal storage systems	Install thermal energy storage systems	Y	Test case evaluation for hospital
Replace Existing Chillers	Install gas-engine-driven chillers and utilize waste heat for cogeneration	Y	

TABLE 1.1. (contd)

ERO Name	ERO Description	Eval? (Y/N)	Comment
Reduce A/C hours	Install clock, EMCS switch, or other control means to reduce operating hours and peak coincident load of air conditioner	Y	See ERO for EMCS system
RESIDENTIAL LIGHTING (interior and exterior)			
Upgrade incandescent to PCF fixture	Upgrade incandescent fixture to permanent compact fluorescent fixture	Y	
Replace incandescent with PCF fixture	Replace incandescent with new compact fluorescent fixture	Y	
Upgrade fluorescent to T8	Upgrade fluorescent to high-efficiency T8 or similar system	Y	
COMMERCIAL LIGHTING			
Upgrade fluorescent to T8	Upgrade fluorescent fixture to high-efficiency T8 or similar system	Y	
Replace fluorescent with new fixture	Replace fluorescent fixture with new high- efficiency T8 or compatible fixture	Y	
De-lamp	Replace, modify, or move/remove fixtures to reduce lighting density to level that provides correct illumination.	N	
Upgrade incandescent to PCF fixture	Upgrade incandescent fixture with new compact fluorescent fixture	Y	
Replace incandescent with PCF fixture	Replace mercury vapor lamps and ballasts with high-pressure sodium lamp and ballast (or replace entire fixture)	Y	
Upgrade incandescent exit signs	Upgrade incandescent exit signs with LED or fluorescent exit signs	N	More economical to replace whole unit
Replace incandescent exit signs	Replace incandescent exit signs with LED fluorescent	Y	
Occupancy sensors	Install occupancy sensors to control lights	Y	See occupancy-based controls ERO
Time clocks or photocells	Install time clocks for photocells to control lights	N	Occupant sensors preferred

TABLE 1.1. (contd)

ERO Name	ERO Description	Eval? (Y/N)	Comment
EMCS control	Install EMCS or add field panel and necessary relays to control lights via EMCS	N	Occupant sensors preferred
OCCUPANCY BASED CONTROLS			
Occupancy sensors, restrooms	Install occupancy sensor to control lights and exhaust fan in restrooms	Y	
Occupancy sensors, other	Install occupancy sensor to control lights in hallway, lunchroom, office, conference room, or other intermittently occupied area	Y	
Daylight sensor	Install daylight sensor to control lights in hallways, foyer, or other area that has windows and low ambient light requirement	N	Areas too small
Daylight sensor, security	Install daylight sensor to control security light(s) in area that has windows	N	Resource too small
Night setback	Install timeclock to schedule fan, thermostat setpoint, and air-conditioner operation	Y	See ERO for EMCS
CO_2 sensor control	Install CO_2 sensor to control air-handler and ventilation fans	N	Unproven technology
Countdown timer	Install countdown timer to control air-handler and ventilation fans during normally unoccupied hours; typical scheme allows up to 2 hours of operation, then has to be set again if occupant is still present	Y	
Occupied mode via EMCS	Implement unoccupied schedules for fans and air-conditioning via EMCS; override during normally unoccupied hours	Y	
DOMESTIC WATER HEATING			
Solar heater	Install solar panels and system to assist in water heating	Y	
Fuel switch to gas	Replace electric water heaters with gas units	N	Evaluated in fuel-switching options
Efficient heater	Replace water heater with high-efficiency (well-insulated) model	Y	

TABLE 1.1. (contd)

ERO Name	ERO Description	Eval? (Y/N)	Comment
Insulate service hot water pipes	Insulate service hot water pipes to reduce losses (ASHRAE Standard 90A)	Y	Unheated spaces only
Tankless heater	Replace tank-type electric resistance heater with instant/tankless unit	N	Inappropriate for site
Low-flow shower heads	Install low-flow shower heads to restrict the volume of water used in showers	N	Measured savings are much less than estimated.
Lower hot water temperature	Reduce water temperature to reduce energy lost in various hot water consuming processing including showers, dishwashers, laundries	N	No application identified. Potential increasing energy use if thermostats aren't matched properly
A/C desuperheater	Recover heat from heat pumps by installing water-cooled desuperheater and controls	Y	
Refrigeration desuperheater	Recover heat from refrigerators by installing water-cooled desuperheater and controls	N	Small resource
RESIDENTIAL HVAC			
Whole-house fan	Install whole-house fans to reduce or eliminate the use of air conditioning	N	Little value because of high humidity
Efficient furnace motor	Replace furnace fan motor with high-efficiency motor	N	Insufficient data
Two speed furnace motor	Replace furnace fan motor with two speed motor	N	Insufficient data
Ventilation heat recovery	Install air-to-air heat exchanger to reduce infiltration and recover heat from ventilation air	N	No value as cooling is primary load
Efficient air cond tioner	Replace existing air conditioner with high- efficiency unit	N	Existing cooling units are heat pumps
Efficient heat pump	Replace heat pumps with high-efficiency units	N	Now being done for Capehart housing. Already in other housing areas
Fuel-switch to gas	Fuel switch from electric heat to natural gas by installing fuel-burning furnace or internal-combustion-engine-driven heat pump	Y	See fuel switch ERO
RESIDENTIAL APPLIANCES			
Efficient washer	Replace clothes washer with high efficiency unit	N	Tenant owned

TABLE 1.1. (contd)

ERO Name	ERO Description	Eval? (Y/N)	Comment
Efficient dryer	Replace clothes dryer with high efficiency unit	N	Tenant owned
Fuel-switch to gas dryer	Replace clothes dryer to gas unit	Y	Part of overall fuel-switch option
Efficient dishwasher	Replace dishwasher with high-efficiency (water miser) dishwasher	Y	
Microwave oven	Provide microwave oven to reduce use of convection oven	N	Insufficient data on cooking end use; large portion of tenants have them
BOILERS			
New efficient boiler	When the refurbishment cost of an existing boiler is uneconomical, boiler replacement may be considered	Y	
Pulse or condensing boiler	Pulse or condensing boiler have high efficiency. Seasonal efficiency is typically 8% higher than conventional units.	Y	
Gas chiller/ cogeneration	Chillers can be CNG engine-driven and the waste heat utilized to cut peak demand and overall energy cost.	Y	
Preheat combustion air	Use heat exchanger or heat pipe to transfer heat to exhaust gases to primary combustion air	N	Not applicable
Tune existing boilers	Boiler efficiency can be improve substantially by adjusting mechanical controls, repairing refractory lining, and cleaning or replacing tips and orifices	Y	
Solar water heater	Replace or augment existing hot water boiler with solar collectors	Y	
Fire-tube turbulators	Install turbulators to improve overall combustion efficiency in fire-tube boilers	N	Not applicable
BUILDING ENVELOPE			
Insulate ceilings	Ceilings can be insulated with batt type fiberglass insulation and blown-in fiberglass or cellulose	Y	
Insulate walls	Walls can be insulated with rigid, non-rigid, poured-in or blown-in insulation	N	Most walls are concrete structure
Storm windows/doors and multiglazed windows	Storm windows create a "dead air" space for insulation and also reduce infiltration. Multiglazed windows replace existing windows	Y	Evaluate multiglazed windows only

TABLE 1.1. (contd)

ERO Name	ERO Description	Eval? (Y/N)	Comment
Tinted/reflective window trim	Window tinting can be applied to an existing window to reduce solar heat gain	Y	
Weatherization package	Install weatherstripping, caulking, and sealing as necessary to close any opening in buildings to reduce infiltration	Y	
Radiant Barriers	Install radiant barrier in the attic (or above suspended ceiling) of building to reduce solar heat gain	Y	
SPACE HEATING			
Install new energy efficient replacement furnace	Replacement is cost-effective if existing furnaces are old and inefficient	N	Heat pumps installed
Install programmable thermostat with setback controls	Electronic thermostats provide the means to set back temperature when the space is unoccupied or a greater deviation from normal set-point temperature can be tolerated	N	Tenant controlled, part of overall energy management program
Infrared heaters	Provide spot or space heating by overhead infrared heating system	N	Small heating load and heat pumps installed
VEHICLES			
Conversion to compressed natural gas (CNG)	Converting the engines to CNG can cut emissions, maintenance, and fuel costs	Y	
ENERGY MANAGEMENT AND CONTROL SYSTEM			
Expand existing EMCS	Expanding the control of the EMCS can cut energy consumption by units such as air-handlers, chillers, and boilers. Maintenance can also be simplified	Y	
FUEL SWITCHING			
Utilize natural gas	Install natural gas for the cooking, water heating, and clothes drying end uses	Y	
LOAD CONTROL			
Control A/C and water heater energy consumption in housing	Use the EMCS to turn off A/C compressor and water heater during on-peak period to reduce energy consumption	Y	
GENERATION			

TABLE 1.1. (contd)

ERO Name	ERO Description	Eval? (Y/N)	Comment
Examine opportunities for adding turbine to existing boilers	Using natural gas boilers with a turbine in conjunction with evaporative coolers can help meet electricity, steam, and cooling needs	N	High capital cost; steam plant used only 3 to 4 months of year
Build separate generating plant	Build plant so base can go on interruptible rate schedule	Y	

2.0 ENERGY RESOURCE OPPORTUNITY EVALUATIONS

The results of the ERO analyses are presented within 17 common energy end-use categories. A narrative description of each ERO is provided, including information on the initial cost; energy and dollar savings; impacts on O&M; and, when applicable, a discussion of energy supply and demand; energy security; and environmental issues. Also provided is a brief description of the evaluation methodologies and technical and cost assumptions used in each analysis.

At the end of each section, a summary table presents the operational performance of energy end-use equipment before and after the implementation of each ERO. The summary tables also provide the results of the LCC analysis, including the NPV and savings to investment ratio (SIR) of each ERO.

Individual EROs were evaluated as mutually exclusive measures. This evaluation approach allows individual EROs to be ranked or rated based on parameters such as initial cost, NPV, energy savings, and change in O&M requirements; and permits direct economic comparison of competing EROs.

2.1 FAN AND PUMP MOTOR EROs

Motor EROs at Patrick AFB fall into two main categories. The first involves replacement of a single-speed standard efficiency motor with a high efficiency model. The second category involves adding a variable-speed drive and controls, installing two-speed models, properly sizing motors, and rewinding existing motors. The efficient motor ERO is applicable to all fan, pump, and air compressor motors associated with HVAC and compressed air systems. Application of the second category is limited to certain fan and pump motors or requires specific characteristics regarding motor loading, age, and total system characteristics. For this reason, the ERO analysis was limited to basic information, and a range of potential energy savings is provided without being application-specific.

The inventory of the existing motors was obtained from the information contained in the Recurring Work Program database. Information was provided on the number and size of the various motors but not the actual loads.

2.1.1 Replace Motors With High-Efficiency Models

Description

Energy-efficient three-phase motors are manufactured with predominantly open drip-proof (ODP) and total enclosed fan-cooled (TEFC) enclosures. Motors up to 200 hp can be obtained in either 1200, 1800, or 3600 rpm. They are particularly attractive in duty cycling applications because they suffer less thermal stress than standard efficient motors because of lower losses overall. In some applications, however, energy-efficient motors (EEMs) would not be a good alternative (e.g., where high-starting torque is needed) because EEMs are optimized for low-slip operation, which generally results in a lower starting torque than that required for standard efficiency motors. For most heating, ventilation, and air-conditioning (HVAC) fan and pump applications, the starting torque is not an issue. However, the starting characteristics should be considered when preparing retrofit specifications.

Assumptions

Technical assumptions are as follows:

- For the fan motors, the hours of operation are slightly longer than the chiller schedule; therefore, 7,500 h/yr are used (3,000 hr during on-peak rates and 4,500 hr during off-peak rates).
- For the chilled water pump motors and the condenser water pump motors on the cooling towers, the annual operating hours are 7,057 (above 65°F) (USAF 1985).
- The average efficiency improvement of high-efficiency versus standard efficiency is 4.76% (average efficiency improvement of 2-hp to 50-hp motors). See Table 2.1 for details (Washington State Energy Office 1992).

TABLE 2.1. Motor Efficiency Reference Table

Motor Size, hp	Premium Eff.	Std. Eff.	Savings	Premium Cost	Std. Cost	Cost Diff.	Cost Diff/hp	Prem. Cost/hp	Labor Cost	Labor Cost/hp
50	95.0%	92.4%	2.96%	$3,200	$2,487	$713	$14.26	$64.00	$363	$7.26
40	94.5%	91.7%	3.23%	$2,574	$1,932	$642	$16.05	$64.35	$363	$9.08
30	94.1%	91.0%	3.62%	$1,969	$1,494	$475	$15.83	$65.63	$221	$7.37
25	94.1%	91.0%	3.62%	$1,658	$1,346	$312	$12.48	$66.32	$221	$8.84
20	93.4%	90.2%	3.80%	$1,268	$1,121	$147	$7.35	$63.40	$221	$11.05
15	93.0%	88.5%	5.47%	$1,042	$887	$155	$10.33	$69.47	$221	$14.73
10	91.7%	87.5%	5.23%	$780	$516	$264	$26.40	$78.00	$132	$13.20
7.	91.7%	87.5%	5.23%	$647	$540	$107	$14.27	$86.27	$132	$17.60
5	90.2%	85.5%	6.09%	$478	$376	$102	$20.40	$95.60	$132	$26.40
3	89.5%	84.0%	7.32%	$415	$280	$135	$45.00	$138.33	$132	$44.00
2	86.6%	82.5%	5.74%	$442	$250	$192	$96.00	$221.00	$132	$66.00
Averages:			4.76%				$25.31	$92.03	$206.36	$20.50

- Motor life expectancy is 15 years.
- Maintenance costs for standard and high-efficiency motors are the same.
- For those facilities with air-conditioning (AC) units 5 tons and greater, one hp of fan motor was allocated for every 820 ft^2 of floorspace. The motors were considered to be relatively small in facilities with AC loads of less than 5 tons. This assumption is based on data acquired during site visits.
- Chilled water pump motors were studied for facilities with 25 tons or more of cooling load using 1 hp of motor/10 tons of cooling (based on average data from on-site inspections).
- Condenser water pump motors were studied for facilities with cooling towers using 1 hp of motor/10 tons of cooling (based on average data from on-site inspections).
- Irrigation pump motors are used 6 mo/yr, 30% of the time (estimate from Base personnel).
- Sewage and lift station hours of operation were determined from consultations with Base personnel at the sewage plants.

Cost assumptions are as follows:

- The differential cost (delta) per horsepower of high efficiency versus standard efficiency is $25.31/hp (average price differential of premium efficiency - standard efficiency for the 2-hp to 50-hp motor size range) (Washington State Energy Office 1992).

- The labor costs were not included in the replace on failure (ROF) analysis.
- Labor costs of $20.50/hp (average labor per motor divided by motor size) were included in the replace immediately (RI) analysis (Nadel et al. 1991).
- The average price for electricity is $0.053/kWh (including demand).
- The prices for various motor sizes are shown in Table 2.1, as well as the efficiency improvements by going to the premium efficient units.

Results

The quantitative results of this ERO appear in Tables 2.2, 2.3, 2.4, and 2.5 for fan motor, chilled water pump, and condenser motor analysis, and irrigation, sewage, and lift station pump motor analysis, respectively.

Budget Implications. The total initial cost for immediately changing out all existing fan motors to high (premium) efficiency units is $310,116 plus $69,084 for labor for a total of $379,200. If the chilled water pump motors are replaced immediately, the cost is $77,962 plus $17,367 for labor for a total cost of $95,329. If the condenser water pumps are RI, the cost is $33,592 plus $7,483 for labor for a total of $41,075. The irrigation, sewage, and lift station pump motors cost $84,579 plus $18,842 for labor for a total of $103,421. These calculations are assuming that the labor is contracted out. If Base personnel perform the labor, significant savings will result. The ROF option was considered for the fans, chilled water pumps, and condenser pump motors, as well as the irrigation, sewage, and lift station pumps. The fan motors cost $85,273, the chilled water pumps cost $21,437, the condenser pumps cost $9,237, and the irrigation, sewage, and lift station pumps cost $23,257. These ROF costs are the differential between the premium and standard efficiency units.

Energy and Cost Savings. This ERO is estimated to save 897,398 kWh/yr for the premium efficiency fan motors. At an average electricity cost of $0.053/kWh, the savings will be $47,562/yr. The chilled water pump premium efficiency motors result in an annual savings of approximately 212,276 kWh at a value of $11,251. The condenser pump motors (premium efficiency) will save

91,466 kWh annually for a total of $4,848. The irrigation, sewage and lift station pumps will save 82,348 kWh annually for a total of $4,364.

Energy Security. This ERO has relatively little impact on energy security. If anything, it should help energy security because fewer kilowatt-hours are used when the motors are retrofitted.

Operations and Maintenance. The maintenance costs for premium efficiency motors is assumed to be the same as for standard motors; thus, they were not factored into this analysis.

Environmental Issues. This ERO has no adverse impact on the environment. Because some energy is saved, the net effect on the environment is positive; i.e., less electrical consumption, thus less generation.

TABLE 2.2. Fan Motor Analysis - Standard to Premium Efficiency

Existing Fan Motor Operating Parameters

Existing Motor Characteristics			Operating Schedule		Energy Consumption		Energy Demand	
Facility Type	Area (sq ft)	Existing Total Hp	Hours On-Peak	Hours Off-Peak	On-Peak (kWh)	Off-Peak (kWh)	No. Months On-Peak	Demand (kW-mo)
ADMIN	889,134	1,084	3,000	4,500	2,426,685	3,640,028	12	9,707
BRK/ADM	231,501	282	3,000	4,500	631,828	947,743	12	2,527
CHAPEL	11,896	15	3,000	4,500	32,467	48,701	12	130
CLINIC	6,880	8	3,000	4,500	18,777	28,166	12	75
CLUB	14,986	18	3,000	4,500	40,901	61,351	12	164
COMCATN	83,568	102	3,000	4,500	228,079	342,119	12	912
DGR	150,542	184	3,000	4,500	410,870	616,304	12	1,643
DINING	82,537	101	3,000	4,500	225,266	337,898	12	901
GROCERY	84,797	103	3,000	4,500	231,434	347,151	12	926
HANGER	116,379	142	3,000	4,500	317,630	476,444	12	1,271
HOSPITL	74,071	90	3,000	4,500	202,160	303,239	12	809
HSG-FAM	12,411	15	3,000	4,500	33,873	50,809	12	135
MISC	4,234	5	3,000	4,500	11,556	17,334	12	46
MTRPOOL	51,624	63	3,000	4,500	140,896	211,344	12	564
MWR	115,629	141	3,000	4,500	315,583	473,374	12	1,262
PLT-BLD	4,655	6	3,000	4,500	12,705	19,057	12	51
R&D	55,318	67	3,000	4,500	150,978	226,466	12	604
REC	43,284	53	3,000	4,500	118,134	177,200	12	473
RESTRNT	3,283	4	3,000	4,500	8,960	13,440	12	36
SECURITY	38,736	47	3,000	4,500	105,721	158,581	12	423
SHOP	33,988	41	3,000	4,500	92,762	139,144	12	371
SHOP-ELEC	168,243	205	3,000	4,500	459,180	688,770	12	1,837
STOR-UH	42,530	52	3,000	4,500	116,076	174,114	12	464
TERMINL	87,168	106	3,000	4,500	237,905	356,857	12	952
TRAING	39,402	48	3,000	4,500	107,539	161,308	12	430
WHS	316,275	386	3,000	4,500	863,199	1,294,799	12	3,453

TABLE 2.2. (contd)

Energy Efficient Fan Motor Operating Parameters

Energy Efficient Motor Characteristics			Operating Schedule		Energy Consumption		Energy Demand	
Facility Type	Area (sq ft)	Energy Eff Total Hp	Hours On-Peak	Hours Off-Peak	On-Peak (kWh)	Off-Peak (kWh)	No. Months On-Peak	Demand (kW-mo)
ADMIN	889,134	1,084	3,000	4,500	2,311,175	3,466,763	12	9,245
BRK/ADM	231,501	282	3,000	4,500	601,753	902,630	12	2,407
CHAPEL	11,896	15	3,000	4,500	30,922	46,383	12	124
CLINIC	6,880	8	3,000	4,500	17,884	26,825	12	72
CLUB	14,986	18	3,000	4,500	38,954	58,431	12	156
COMCATN	83,568	102	3,000	4,500	217,223	325,834	12	869
DGR	150,542	184	3,000	4,500	391,312	586,968	12	1,565
DINING	82,537	101	3,000	4,500	214,543	321,814	12	858
GROCERY	84,797	103	3,000	4,500	220,418	330,626	12	882
HANGER	116,379	142	3,000	4,500	302,510	453,766	12	1,210
HOSPITL	74,071	90	3,000	4,500	192,537	288,805	12	770
HSG-FAM	12,411	15	3,000	4,500	32,261	48,391	12	129
MISC	4,234	5	3,000	4,500	11,006	16,509	12	44
MTRPOOL	51,624	63	3,000	4,500	134,189	201,284	12	537
MWR	115,629	141	3,000	4,500	300,561	450,841	12	1,202
PLT-BLD	4,655	6	3,000	4,500	12,100	18,150	12	48
R&D	55,318	67	3,000	4,500	143,791	215,687	12	575
REC	43,284	53	3,000	4,500	112,510	168,766	12	450
RESTRNT	3,283	4	3,000	4,500	8,534	12,801	12	34
SECURITY	38,736	47	3,000	4,500	100,689	151,033	12	403
SHOP	33,988	41	3,000	4,500	88,347	132,520	12	353
SHOP-ELEC	168,243	205	3,000	4,500	437,323	655,985	12	1,749
STOR-UH	42,530	52	3,000	4,500	110,551	165,826	12	442
TERMINL	87,168	106	3,000	4,500	226,581	339,871	12	906
TRAING	39,402	48	3,000	4,500	102,420	153,630	12	410
WHS	316,275	386	3,000	4,500	822,111	1,233,167	12	3,288

TABLE 2.2. (contd)

Energy Efficient Fan Motor Economic Parameters

Economic Parameters					First Year Savings (RI)					Life Cycle Cost			
										RI		ROF	
Facility Type	First Cost RI ($)	First Cost ROF ($)	Life (years)	Time to Failure (years)	Energy (MBtu)	Demand (kW-mo)	Energy ($)	Demand ($)	Total ($)	NPV ($)	SIR	NPV ($)	SIR
ADMIN	122,024	92,728	15	7	986	462	9,915	2,888	12,803	114,321	1.94	103,765	2.12
BRK/ADM	31,771	24,143	15	7	257	120	2,582	752	3,333	29,765	1.94	27,017	2.12
CHAPEL	1,633	1,241	15	7	13	6	133	39	171	1,530	1.94	1,388	2.12
CLINIC	944	718	15	7	8	4	77	22	99	885	1.94	803	2.12
CLUB	2,057	1,563	15	7	17	8	167	49	216	1,938	1.95	1,749	2.13
COMCATN	11,469	8,715	15	7	93	43	932	271	1,203	10,745	1.94	9,753	2.12
DGR	20,660	15,700	15	7	167	78	1,679	489	2,168	19,357	1.94	17,569	2.12
DINING	11,327	8,608	15	7	91	43	920	268	1,188	10,612	1.94	9,633	2.12
GROCERY	11,637	8,844	15	7	94	44	946	275	1,221	10,903	1.94	9,896	2.12
HANGER	15,972	12,137	15	7	129	60	1,298	378	1,676	14,963	1.94	13,582	2.12
HOSPITL	10,165	7,725	15	7	82	38	826	241	1,067	9,524	1.94	8,644	2.12
HSG-FAM	1,703	1,294	15	7	14	6	138	40	179	1,595	1.94	1,448	2.12
MISC	581	442	15	7	5	2	47	14	61	544	1.94	494	2.12
MTRPOOL	7,085	5,384	15	7	57	27	576	168	743	6,638	1.94	6,025	2.12
MWR	15,869	12,059	15	7	128	60	1,289	376	1,665	14,867	1.94	13,494	2.12
PLT-BLD	639	485	15	7	5	2	52	15	67	599	1.94	543	2.12
R&D	7,592	5,769	15	7	61	29	617	180	797	7,112	1.94	6,456	2.12
REC	5,940	4,514	15	7	48	22	483	141	623	5,565	1.94	5,051	2.12
RESTRNT	451	342	15	7	4	2	37	11	47	422	1.94	383	2.12
SECURITY	5,316	4,040	15	7	43	20	432	126	558	4,980	1.94	4,521	2.12
SHOP	4,664	3,545	15	7	38	18	379	110	489	4,370	1.94	3,967	2.12
SHOP-ELEC	23,089	17,546	15	7	186	87	1,876	546	2,423	21,632	1.94	19,635	2.12
STOR-UH	5,837	4,435	15	7	47	22	474	138	612	5,468	1.94	4,963	2.12
TERMINL	11,963	9,091	15	7	97	45	972	283	1,255	11,208	1.94	10,173	2.12
TRAING	5,407	4,109	15	7	44	20	439	128	567	5,066	1.94	4,598	2.12
WHS	43,405	32,984	15	7	351	164	3,527	1,027	4,554	40,665	1.94	36,910	2.12

TABLE 2.3. Chilled-Water Pump Motor Analysis - Standard to Premium Efficiency

Existing Chilled Water Pump Motor Operating Parameters

Existing Motor Characteristics			Operating Schedul		Energy Consumption		Energy Demand	
Facility Type	Area (sq ft)	Existing Total Hp	Hours On-Peak	Hours Off-Peak	On-Peak (kWh)	Off-Peak (kWh)	No. Months On-Peak	Demand (kW-mo)
ADMIN	806,235	329	4,940	2,117	1,210,945	518,977	12	2,942
BRK/ADM	213,799	76	4,940	2,117	280,441	120,189	12	681
CHAPEL	11,896	10	4,940	2,117	36,852	15,794	12	90
CLINIC	6,880	4	4,940	2,117	14,741	6,317	12	36
CLUB	8,811	3	4,940	2,117	11,055	4,738	12	27
COMCATN	15,180	7	4,940	2,117	25,796	11,055	12	63
DGR	140,007	43	4,940	2,117	156,988	67,281	12	381
DINING	82,537	31	4,940	2,117	115,346	49,434	12	280
GROCERY	84,797	16	4,940	2,117	58,963	25,270	12	143
HANGER	116,379	19	4,940	2,117	70,018	30,008	12	170
HOSPITL	74,071	32	4,940	2,117	117,925	50,539	12	286
MISC	4,234	4	4,940	2,117	14,741	6,317	12	36
MWR	91,826	42	4,940	2,117	154,777	66,333	12	376
PLT-BLD	4,655	79	4,940	2,117	291,128	124,769	12	707
R&D	54,346	23	4,940	2,117	85,496	36,641	12	208
REC	17,508	5	4,940	2,117	18,057	7,739	12	44
SECURITY	23,120	8	4,940	2,117	27,639	11,845	12	67
SHOP-ELEC	157,250	20	4,940	2,117	75,177	32,219	12	183
STOR-UH	42,530	4	4,940	2,117	12,898	5,528	12	31
TERMINL	87,168	18	4,940	2,117	66,333	28,428	12	161
TRAING	39,402	18	4,940	2,117	66,333	28,428	12	161
WHS	197,405	57	4,940	2,117	210,054	90,023	12	510

TABLE 2.3. (contd)

Energy Efficient Chilled Water Pump Motor Operating Parameters

Energy Efficient Motor Characteristics			Operating Schedul		Energy Consumption		Energy Demand	
Facility Type	Area (sq ft)	Energy Eff Total Hp	Hours On-Peak	Hours Off-Peak	On-Peak (kWh)	Off-Peak (kWh)	No. Months On-Peak	Demand (kW-mo)
ADMIN	806,235	329	4,940	2,117	1,153,304	494,273	12	2,942
BRK/ADM	213,799	76	4,940	2,117	267,092	114,468	12	681
CHAPEL	11,896	10	4,940	2,117	35,098	15,042	12	90
CLINIC	6,880	4	4,940	2,117	14,039	6,017	12	36
CLUB	8,811	3	4,940	2,117	10,529	4,513	12	27
COMCATN	15,180	7	4,940	2,117	24,568	10,529	12	63
DGR	140,007	43	4,940	2,117	149,515	64,078	12	381
DINING	82,537	31	4,940	2,117	109,855	47,081	12	280
GROCERY	84,797	16	4,940	2,117	56,156	24,067	12	143
HANGER	116,379	19	4,940	2,117	66,385	28,579	12	170
HOSPITL	74,071	32	4,940	2,117	112,312	48,134	12	286
MISC	4,234	4	4,940	2,117	14,039	6,017	12	36
MWR	91,826	42	4,940	2,117	147,410	63,176	12	376
PLT-BLD	4,655	79	4,940	2,117	277,270	118,830	12	707
R&D	54,346	23	4,940	2,117	81,426	34,897	12	208
REC	17,508	5	4,940	2,117	17,198	7,370	12	44
SECURITY	23,120	8	4,940	2,117	26,323	11,281	12	67
SHOP-ELEC	157,250	20	4,940	2,117	71,599	30,685	12	183
STOR-UH	42,530	4	4,940	2,117	12,284	5,265	12	31
TERMINL	87,168	18	4,940	2,117	63,176	27,075	12	161
TRAING	39,402	18	4,940	2,117	63,176	27,075	12	161
WHS	197,405	57	4,940	2,117	200,056	85,738	12	510

TABLE 2.3. (contd)

Energy Efficient Chilled Water Pump Motor Economic Parameters

Economic Parameters					First Year Savings (RI)					Life Cycle Cost			
										RI		ROF	
Facility Type	First Cost RI ($)	First Cost ROF ($)	Life (years)	Time to Failure (years)	*Energy (MBtu)	Demand (kW-mo)	Energy ($)	Demand ($)	Total ($)	NPV ($)	SIR	NPV ($)	SIR
ADMIN	36,979	28,101	15	7	281	NA	2,907	NA	2,907	19,141	1.52	21,752	1.77
BRK/ADM	8,564	6,508	15	7	65	NA	673	NA	673	4,433	1.52	5,037	1.77
CHAPEL	1,125	855	15	7	9	NA	88	NA	88	583	1.52	662	1.77
CLINIC	450	342	15	7	3	NA	35	NA	35	233	1.52	265	1.77
CLUB	338	257	15	7	3	NA	27	NA	27	174	1.51	198	1.77
COMCATN	788	599	15	7	6	NA	62	NA	62	408	1.52	463	1.77
DGR	4,794	3,643	15	7	36	NA	377	NA	377	2,482	1.52	2,820	1.77
DINING	3,522	2,677	15	7	27	NA	277	NA	277	1,823	1.52	2,072	1.77
GROCERY	1,801	1,368	15	7	14	NA	142	NA	142	932	1.52	1,059	1.77
HANGER	2,138	1,625	15	7	16	NA	168	NA	168	1,107	1.52	1,258	1.77
HOSPITL	3,601	2,737	15	7	27	NA	283	NA	283	1,863	1.52	2,118	1.77
MISC	450	342	15	7	3	NA	35	NA	35	233	1.52	265	1.77
MWR	4,727	3,592	15	7	36	NA	371	NA	371	2,446	1.52	2,780	1.77
PLT-BLD	8,890	6,756	15	7	68	NA	699	NA	699	4,602	1.52	5,230	1.77
R&D	2,611	1,984	15	7	20	NA	205	NA	205	1,352	1.52	1,536	1.77
REC	551	419	15	7	4	NA	43	NA	43	286	1.52	324	1.77
SECURITY	844	641	15	7	6	NA	66	NA	66	437	1.52	497	1.77
SHOP-ELEC	2,296	1,745	15	7	17	NA	180	NA	180	1,189	1.52	1,351	1.77
STOR-UH	394	299	15	7	3	NA	31	NA	31	203	1.52	231	1.77
TERMINL	2,026	1,539	15	7	15	NA	159	NA	159	1,048	1.52	1,191	1.77
TRAING	2,026	1,539	15	7	15	NA	159	NA	159	1,048	1.52	1,191	1.77
WHS	6,415	4,875	15	7	49	NA	504	NA	504	3,320	1.52	3,773	1.77

TABLE 2.4. Condenser (Cooling Tower) Pump Motor Analysis - Standard to Premium Efficiency

Existing Condenser Pump Motor Operating Parameters

Existing Motor Characteristics			Operating Schedule		Energy Consumption		Energy Demand	
Facility Type	Facility Number	Existing Total Hp	Hours On-Peak	Hours Off-Peak	On-Peak (kWh)	Off-Peak (kWh)	No. Months On-Peak	Demand (kW-mo)
ADMIN	423	61	4,940	2,117	224,795	96,341	12	546
ADMIN	425	48	4,940	2,117	176,888	75,809	12	430
ADMIN	537	7	4,940	2,117	25,796	11,055	12	63
ADMIN	559	6	4,940	2,117	22,111	9,476	12	54
ADMIN	989	107.5	4,940	2,117	396,155	169,781	12	962
BRK/ADM	501-506	45.5	4,940	2,117	167,675	71,861	12	407
BRK/ADM	501	6	4,940	2,117	22,111	9,476	12	54
BRK/ADM	502	6	4,940	2,117	22,111	9,476	12	54
BRK/ADM	503	6	4,940	2,117	22,111	9,476	12	54
DGR	415	11	4,940	2,117	40,537	17,373	12	98
DINING	558	8	4,940	2,117	29,481	12,635	12	72
HOSPITL	1380	32	4,940	2,117	117,925	50,539	12	286
MWR	546	10	4,940	2,117	36,852	15,794	12	90
TRAING	440	5	4,940	2,117	18,426	7,897	12	45
WHS	984	6	4,940	2,117	22,111	9,476	12	54

Energy Efficient Condenser Pump Motor Operating Parameters

Energy Efficient Motor Characteristics			Operating Schedule		Energy Consumption		Energy Demand	
Facility Type	Facility Number	Energy Eff Total Hp	Hours On-Peak	Hours Off-Peak	On-Peak (kWh)	Off-Peak (kWh)	No. Months On-Peak	Demand (kW-mo)
ADMIN	423	61	4,940	2,117	214,095	91,755	12	546
ADMIN	425	48	4,940	2,117	168,468	72,201	12	430
ADMIN	537	7	4,940	2,117	24,568	10,529	12	63
ADMIN	559	6	4,940	2,117	21,059	9,025	12	54
ADMIN	989	107.5	4,940	2,117	377,298	161,699	12	962
BRK/ADM	501-506	45.5	4,940	2,117	159,694	68,440	12	407
BRK/ADM	501	6	4,940	2,117	21,059	9,025	12	54
BRK/ADM	502	6	4,940	2,117	21,059	9,025	12	54
BRK/ADM	503	6	4,940	2,117	21,059	9,025	12	54
DGR	415	11	4,940	2,117	38,607	16,546	12	98
DINING	558	8	4,940	2,117	28,078	12,033	12	72
HOSPITL	1380	32	4,940	2,117	112,312	48,134	12	286
MWR	546	10	4,940	2,117	35,098	15,042	12	90
TRAING	440	5	4,940	2,117	17,549	7,521	12	45
WHS	984	6	4,940	2,117	21,059	9,025	12	54

TABLE 2.4. (contd)

Energy Efficient Condenser Pump Motor Economic Parameters

Economic Parameters					First Year Savings (RI)					Life Cycle Cost			
										RI		ROF	
Facility Number	First Cost RI ($)	First Cost ROF ($)	Life (years)	Time to Failure (years)	Energy (MBtu)	Demand (kW-mo)	Energy ($)	Demand ($)	Total ($)	NPV ($)	SIR	NPV ($)	SIR
423	6,865	5,217	15	7	52	NA	540	NA	540	3,553	1.52	4,038	1.77
425	5,402	4,105	15	7	41	NA	425	NA	425	2,796	1.52	3,177	1.77
537	788	599	15	7	6	NA	62	NA	62	408	1.52	463	1.77
559	675	513	15	7	5	NA	53	NA	53	349	1.52	397	1.77
989	12,098	9,193	15	7	92	NA	951	NA	951	6,262	1.52	7,116	1.77
501-506	5,120	3,891	15	7	39	NA	402	NA	402	2,650	1.52	3,012	1.77
501	675	513	15	7	5	NA	53	NA	53	349	1.52	397	1.77
502	675	513	15	7	5	NA	53	NA	53	349	1.52	397	1.77
503	675	513	15	7	5	NA	53	NA	53	349	1.52	397	1.77
415	1,238	941	15	7	9	NA	97	NA	97	641	1.52	728	1.77
558	900	684	15	7	7	NA	71	NA	71	466	1.52	530	1.77
1380	3,601	2,737	15	7	27	NA	283	NA	283	1,864	1.52	2,118	1.77
546	1,125	855	15	7	9	NA	88	NA	88	582	1.52	662	1.77
440	563	428	15	7	4	NA	44	NA	44	291	1.52	331	1.77
984	675	513	15	7	5	NA	53	NA	53	349	1.52	397	1.77

TABLE 2.5. Irrigation, Sewage, Lift Station Pump Motor Analysis - Standard to Premium Efficiency

Existing Pump Motor Operating Parameters

Existing Motor Characteristics			Operating Schedule		Energy Consumption		Energy Demand	
Facility Type	Type of Motor	Existing Total Hp	Hours On-Peak	Hours Off-Peak	On-Peak (kWh)	Off-Peak (kWh)	No. Months On-Peak	Demand (kW-mo)
Irrigation	Pump	1	604	710	451	529	12	9
Irrigation	Pump	3	604	710	1,353	1,588	12	27
Irrigation	Pump	8	604	710	3,607	4,235	12	72
Irrigation	Pump	15	604	710	6,764	7,940	12	134
Irrigation	Pump	180	604	710	81,164	95,280	12	1,611
Irrigation	Pump	112.5	604	710	50,728	59,550	12	1,007
Irrigation	Pump	40	604	710	18,036	21,173	12	358
South Plant	Sewage Pump	1	4,030	4,730	3,006	3,529	12	9
South Plant	Sewage Pump	2	4,030	4,730	6,012	7,058	12	18
South Plant	Sewage Pump	2	336	394	501	588	12	18
South Plant	Sewage Pump	3	336	394	752	882	12	27
South Plant	Sewage Pump	5	336	394	1,253	1,470	12	45
South Plant	Sewage Pump	7.5	4,030	4,730	22,546	26,467	12	67
South Plant	Sewage Pump	10	4,030	4,730	30,061	35,289	12	90
South Plant	Sewage Pump	35	336	394	8,768	10,293	12	313
South Plant	Sewage Pump	35	4,030	4,730	105,213	123,511	12	313
North Plant	Sewage Pump	20	1,007	1,183	15,030	17,644	12	179
North Plant	Sewage Pump	15	1,763	2,069	19,725	23,155	12	134
North Plant	Sewage Pump	20	4,030	4,730	60,122	70,578	12	179
North Plant	Sewage Pump	5	4,030	4,730	15,030	17,644	12	45
North Plant	Sewage Pump	10	420	493	3,133	3,678	12	90
North Plant	Sewage Pump	10	1,175	1,380	8,768	10,293	12	90
North Plant	Sewage Pump	40	1,343	1,577	40,081	47,052	12	358
North Plant	Sewage Pump	80	1,007	1,183	60,122	70,578	12	716
Lift Station	Pump	54	1,209	1,419	48,699	57,168	12	483
Lift Station	Pump	70	1,209	1,419	63,128	74,106	12	627
Lift Station	Pump	30	1,209	1,419	27,055	31,760	12	269
Lift Station	Pump	105	1,209	1,419	94,692	111,160	12	940

TABLE 2.5. (contd)

Energy Efficient Pump Motor Operating Parameters

Energy Efficient Motor Characteristics			Operating Schedule		Energy Consumption		Energy Demand	
Facility Type	Type of Motor	Energy Eff Total Hp	Hours On-Peak	Hours Off-Peak	On-Peak (kWh)	Off-Peak (kWh)	No. Months On-Peak	Demand (kW-mo)
Irrigation	Pump	1	604	710	429	504	12	9
Irrigation	Pump	3	604	710	1,288	1,512	12	27
Irrigation	Pump	8	604	710	3,436	4,033	12	72
Irrigation	Pump	15	604	710	6,442	7,562	12	134
Irrigation	Pump	180	604	710	77,301	90,744	12	1,611
Irrigation	Pump	112.5	604	710	48,313	56,715	12	1,007
Irrigation	Pump	40	604	710	17,178	20,165	12	358
South Plant	Sewage Pump	1	4,030	4,730	2,863	3,361	12	9
South Plant	Sewage Pump	2	4,030	4,730	5,726	6,722	12	18
South Plant	Sewage Pump	2	336	394	477	560	12	18
South Plant	Sewage Pump	3	336	394	716	840	12	27
South Plant	Sewage Pump	5	336	394	1,193	1,400	12	45
South Plant	Sewage Pump	7.5	4,030	4,730	21,472	25,207	12	67
South Plant	Sewage Pump	10	4,030	4,730	28,630	33,609	12	90
South Plant	Sewage Pump	35	336	394	8,350	9,803	12	313
South Plant	Sewage Pump	35	4,030	4,730	100,205	117,632	12	313
North Plant	Sewage Pump	20	1,007	1,183	14,315	16,805	12	179
North Plant	Sewage Pump	15	1,763	2,069	18,786	22,053	12	134
North Plant	Sewage Pump	20	4,030	4,730	57,260	67,218	12	179
North Plant	Sewage Pump	5	4,030	4,730	14,315	16,805	12	45
North Plant	Sewage Pump	10	420	493	2,984	3,503	12	90
North Plant	Sewage Pump	10	1,175	1,380	8,350	9,803	12	90
North Plant	Sewage Pump	40	1,343	1,577	38,173	44,812	12	358
North Plant	Sewage Pump	80	1,007	1,183	57,260	67,218	12	716
Lift Station	Pump	54	1,209	1,419	46,380	54,447	12	483
Lift Station	Pump	70	1,209	1,419	60,123	70,579	12	627
Lift Station	Pump	30	1,209	1,419	25,767	30,248	12	269
Lift Station	Pump	105	1,209	1,419	90,184	105,868	12	940

TABLE 2.5. (contd)

Energy Efficient Pump Motor Economic Parameters

Economic Parameters					First Year Savings (RI)					Life Cycle Cost			
										RI		ROF	
Facility Type	First Cost RI ($)	First Cost ROF ($)	Life (years)	Time to Failure (years)	Energy (MBtu)	Demand (kW-mo)	Energy ($)	Demand ($)	Total ($)	NPV ($)	SIR	NPV ($)	SIR
Irrigation	113	86	15	7	0	NA	2	NA	2	-57	0.49	-6	0.93
Irrigation	338	257	15	7	0	NA	5	NA	5	-171	0.49	-18	0.93
Irrigation	900	684	15	7	1	NA	13	NA	13	-456	0.49	-47	0.93
Irrigation	1,688	1,283	15	7	2	NA	24	NA	24	-855	0.49	-88	0.93
Irrigation	20,256	15,393	15	7	29	NA	290	NA	290	-10,257	0.49	-1,053	0.93
Irrigation	12,660	9,621	15	7	18	NA	181	NA	181	-6,411	0.49	-658	0.93
Irrigation	4,501	3,421	15	7	6	NA	64	NA	64	-2,279	0.49	-234	0.93
South Plant	113	86	15	7	1	NA	11	NA	11	88	1.79	85	1.99
South Plant	225	171	15	7	2	NA	21	NA	21	177	1.79	170	1.99
South Plant	225	171	15	7	0	NA	2	NA	2	-137	0.39	-26	0.85
South Plant	338	257	15	7	0	NA	3	NA	3	-205	0.39	-39	0.85
South Plant	563	428	15	7	0	NA	4	NA	4	-342	0.39	-65	0.85
South Plant	844	641	15	7	8	NA	81	NA	81	663	1.79	638	1.99
South Plant	1,125	855	15	7	11	NA	107	NA	107	884	1.79	851	1.99
South Plant	3,939	2,993	15	7	3	NA	31	NA	31	-2,394	0.39	-454	0.85
South Plant	3,939	2,993	15	7	37	NA	376	NA	376	3,095	1.79	2,977	1.99
North Plant	2,251	1,710	15	7	5	NA	54	NA	54	-798	0.65	97	1.06
North Plant	1,688	1,283	15	7	7	NA	70	NA	70	-117	0.93	373	1.29
North Plant	2,251	1,710	15	7	21	NA	215	NA	215	1,769	1.79	1,701	1.99
North Plant	563	428	15	7	5	NA	54	NA	54	442	1.79	425	1.99
North Plant	1,125	855	15	7	1	NA	11	NA	11	-648	0.42	-107	0.87
North Plant	1,125	855	15	7	3	NA	31	NA	31	-327	0.71	93	1.11
North Plant	4,501	3,421	15	7	14	NA	143	NA	143	-1,025	0.77	550	1.16
North Plant	9,003	6,841	15	7	21	NA	215	NA	215	-3,190	0.65	388	1.06
Lift Station	6,077	4,618	15	7	17	NA	174	NA	174	-1,691	0.72	550	1.12
Lift Station	7,878	5,986	15	7	22	NA	226	NA	226	-2,193	0.72	714	1.12
Lift Station	3,376	2,566	15	7	10	NA	97	NA	97	-940	0.72	306	1.12
Lift Station	11,816	8,979	15	7	33	NA	338	NA	338	-3,289	0.72	1,070	1.12

2.1.2 Replace Motors with Two-Speed Models

Description

Two-speed, three-phase motors are manufactured with predominantly ODP or TEFC enclosures. Motors up to 500 hp can be obtained for a variety of applications. These motors are particularly attractive in applications where

- variable heating or cooling loads result in flow requirements below two-thirds or one-half of required peak flow a large fraction of the time
- flow requirements vary with day/night or weekday/weekend activity.

Some of the drawbacks to two-speed motors include the design trade-offs that make a two-speed motor somewhat less efficient than its single-speed counterpart. However, in many applications, the percentage of time the motor is running in low speed makes the two-speed motor more attractive than an energy efficient single-speed motor. Therefore, when replacing motors, loading characteristics should be analyzed to determine the exact savings potential by switching to two-speed motors.

2.1.3 Install Variable-Frequency Motor Drive and Controller

Description

Variable-frequency drives (VFDs) are the most efficient way to capacity control many devices, including centrifugal fans and pumps. The speed of the motor is controlled electronically, essentially sizing the motor to match the load. The VFD adjusts the frequency and voltage of the power supplied to the motor, thus changing its speed. The basic components that make up the VFD are a rectifier, inverter, and regulator. Some examples where VFDs are beneficial include variable-air-volume (VAV) systems. VFDs are the best method for controlling these air-handling requirements. In pumping systems, the VFD can control the motor to match the flow of material. Maintenance savings, reduced downtime, and longer life of belts, pulleys, bearings, and motors can be realized when using VFDs in the proper situation. Various information is required to evaluate the potential benefits of switching to VFDs. The motor size, total annual operating hours, incremental cost of electricity, and the type of system (i.e., constant volume, outlet damper, variable inlet vane,

eddy-current drive) are needed for the analysis. Therefore, a VFD analysis must be done on a case-by-case basis to determine the savings potential (Moses et al. 1989). More information on individual systems must be obtained to conduct an effective VFD analysis at Patrick AFB. The amount of energy savings can range from 10% to 50%.

2.1.4 Properly Size Existing Motors

Description

Properly sizing existing motors can result in significant energy savings. It is important to check for fans and pumps that are producing higher flow rates than necessary and pumps that have been throttled with valves or flow regulators. Load information on motors that may be grossly oversized should be obtained. Sometimes, the motor should be retrofitted immediately, or the proper sizing of motors upon failure of the existing unit should at least be analyzed closely.

There was not enough load-related information in this study to analyze this ERO. Typical energy evaluations assume a loading of 75%. However, most designs are based on a 60% load to account for load growth and potential safety problems. Once the loading is less than 50%, the efficiency of the motor drops markedly. The opportunities for properly sizing motors at the base should be considered on a case-by-case basis. The smaller motors are the best candidates for retrofits.

2.1.5 Rewind Existing Motors

Description

A lot of motors fail because the bearings go out or the windings fail, usually because of insulation degradation, overheating, aging, and overvoltage conditions. When bearings or windings are the failing component, the old windings may be stripped and replaced with new wire. Generally, this is done on motors over 10 hp. However, there are various other considerations (Nadel et al. 1991). The greatest concern is that the motor is usually not as efficient after the rewind (1% to 5% less efficient). Often, there are other hidden problems that are not found during the rewind process. Therefore, this option was not analyzed. Properly sizing a new premium efficiency motor or

switching to a premium efficiency motor with a VFD, if applicable, should be considered.

2.2 REFRIGERATION ERO (Residential and Dormitories)

2.2.1 Install Energy-Efficient Refrigerators

Description

New appliance efficiency standards that became effective in 1993 will result in new refrigerators being at least 26% more efficient than 1989 models. For this reason, analysis was undertaken to determine the cost-effectiveness of replacing all the existing refrigerators with new models which meet the 1993 standard. This ERO examines 1,614 standard refrigerators in family housing and the temporary lodging facility (TLF), as well as 719 compact refrigerators in the dormitories and visiting officers' quarters (VOQ).

Assumptions

Technical assumptions that apply to all refrigerators are as follows:

- Existing refrigerators are an average of 5 years old, and the efficiency of the existing units is 5% less than the 1989 standard.
- The distribution of energy use by all refrigerators (standard and compact) is assumed to be midway between constant consumption (36% on-peak and 64% off-peak) and the cumulative load of Patrick AFB for 1991 (29% on-peak and 71% off-peak), resulting in a profile of 33% on-peak and 67% off-peak.
- The number and types of refrigerators considered are shown in Table 2.6.

Technical assumptions that apply to family housing refrigerators are as follows:

- Refrigerators in family housing units consume an average of 1,900 kWh/yr with a peak coincident demand of 0.282 kW.
- Existing units are assumed to be 5% less efficient than the 1990 standard. Energy consumption of the 18 ft^3 model that conforms to the 1993 standard is 30% more efficient than models that conform to the 1990 standard. Average efficiency and peak coincident demand of 1993 standard refrigerators are therefore assumed to be 65% of the consumption and demand of existing units.

TABLE 2.6. Existing Refrigerators at Patrick AFB

	Building Group	Total Residents	Persons or Families per Refrigerator	Refrig. Type	Total Refrigerators
Family Housing	APPR PFY50	3 Families	1	Standard	3
	Capehart	999 Families	1	Standard	999
	Wherry	554 Families	1	Standard	554
	TLF	58 Families	1	Standard	58
	Dormitories	1,102 Persons	2	Compact	551
	VOQ	335 Persons	2	Compact	168

Cost estimate for family housing is as follows:

- The installed cost of a new refrigerator (18 ft^3, bought in quantity) compared to those existing in the housing units, is $587 in 1992 dollars.

Technical assumptions that apply to dormitory and VOQ (compact) refrigerators are as follows:

- Compact refrigerators consume an average of 900 kWh/yr with a peak coincident demand of 0.134 kW.

- Existing units are assumed to be 5% less efficient than the 1990 standard. Energy consumption of the compact model that conforms to the 1993 standard is 26% more efficient than models that conform to the 1990 standard. Average efficiency and peak coincident demand of 1993 standard compact refrigerators are therefore assumed to be 69% of the consumption and demand of existing units.

Cost assumption for the dormitories and VOQ is as follows:

- The installed cost of a refrigerator (bought in quantity) compared to those existing in the dormitories and VOQ is $211 in 1992 dollars.

Results

Quantitative results of this analysis are shown in Table 2.7 and are discussed below.

Budget Implications. The initial cost for immediate installation of refrigerators in all units is $1,099,127.

Energy and Cost Savings. It is estimated that this ERO will result in an annual energy savings of $52,876 in the family housing and TLF facilities and $9,918 in the dormitories and VOQ.

Operations and Maintenance. Because high-efficiency units require no more maintenance than existing units, this recommendation has no effect on O&M.

Energy Security. This recommendation has little impact on energy security.

Environmental Issues. Refrigerants from the existing units must be properly disposed of in accordance with existing regulations.

TABLE 2.7. Energy-Efficient Domestic Refrigerator EROs

Existing Refrigerator Operating Parameters

	Existing Equipment				Operating Schedule			Average	Energy Consumption (kWh)		Sum of 12 Monthly coincident demands (kW-mo)	
ID	Equip Code	Application	Size (cu.ft.)	# of units	Hrs on-peak	Hrs off-peak	Peak Factor	Load (kW/unit)	on-peak	off-peak	on-peak	off-peak
1	RF-1	Family Hsg: APPR PFY50	18	3	2,891	5,869	1.3	0.217	1,882	3,821	10	NA
2	RF-2	Family Hsg: Capehart	18	999	2,891	5,869	1.3	0.217	626,720	1,272,299	3,382	NA
3	RF-3	Family Hsg: Wherry	18	554	2,891	5,869	1.3	0.217	347,550	705,559	1,875	NA
4	RF-4	Temporary Lodging Fac. (TLF	18	58	2,891	5,869	1.3	0.217	36,386	73,867	196	NA
5	RF-5	Dormitories	4.5	551	2,891	5,869	1.3	0.103	164,073	333,083	885	NA
6	RF-6	VOQ	4.5	168	2,891	5,869	1.3	0.103	50,026	101,557	270	NA

Efficient Refrigerator Operating Parameters

	Replacement Equipment				Operating Schedule			Average	Energy Consumption (kWh)		Sum of 12 Monthly coincident demands (kW-mo)	
ID	Equip Code	Application	Size (cu.ft.)	# of units	Hrs on-peak	Hrs off-peak	Peak Factor	Load (kW/unit)	on-peak	off-peak	on-peak	off-peak
1	REF-1	Family Hsg: APPR PFY50	18	3	2,891	5,869	1.3	0.141	1,223	2,483	7	NA
2	REF-2	Family Hsg: Capehart	18	999	2,891	5,869	1.3	0.141	407,223	826,701	2,197	NA
3	REF-3	Family Hsg: Wherry	18	554	2,891	5,869	1.3	0.141	225,828	458,451	1,219	NA
4	REF-4	Temporary Lodging Fac. (TLF	18	58	2,891	5,869	1.3	0.141	23,643	47,997	128	NA
5	REF-5	Dormitories	4.5	551	2,891	5,869	1.3	0.071	113,099	229,601	610	NA
6	REF-6	VOQ	4.5	168	2,891	5,869	1.3	0.071	34,484	70,005	186	NA

Efficient Refrigerator ERO Economics

	Economic Parameters				First Year Energy & Demand Savings					Life Cycle Cost	
ID	First Cost R1$ (1993	Before O&M $	After O&M $	Life (yr)	Energy (kWh)	Demand (kW-mo)	Energy (1992 $)	Demand (1992 $)	Total (1992 $)	NPV ($)	SIR
1	1,761	#N/A	#N/A	10	1,997	4	68	22	90	-566	0.68
2	586,413	#N/A	#N/A	10	665,094	1,184	22,668	7,403	30,071	-188,420	0.68
3	325,198	#N/A	#N/A	10	368,831	657	12,581	4,105	16,686	-104,489	0.68
4	34,046	#N/A	#N/A	10	38,614	69	1,317	430	1,747	-10,939	0.68
5	116,261	#N/A	#N/A	10	154,456	275	5,268	1,719	6,987	-32,822	0.72
6	35,448	#N/A	#N/A	10	47,094	84	1,606	524	2,130	-10,007	0.72

2.3 ELECTRICAL DISTRIBUTION AND TRANSMISSION ERO

2.3.1 Install Improved Transformers

Description

The ERO options of replacing the existing transformers at Patrick AFB, with either amorphous core or improved silicon steel, were explored. When transformers utilize an amorphous metal core, the no-load losses (particularly eddy currents) are reduced significantly. Improved silicon steel cores also provide no-load loss reductions, although not as much as the amorphous core. In silicon steel core transformers, the thickness of the steel laminations in the core affect the volume provided for current flow within the silicon steel (Brooks 1986). Thus, by improving the silicon steel, the no-load losses can be reduced.

Assumptions

Technical assumptions are as follows:

- The no-load losses in the amorphous core transformer are 30% of the no-load losses in the conventional unit.
- The no-load losses in the improved silicon steel transformer are 75% of the no-load losses in the conventional unit.
- Amorphous core transformers are only available for kilovoltampere (kVA) ratings of 1,000 or smaller.

Cost assumptions are as follows:

- Amorphous core transformers cost 1.4 times as much as the conventional transformer (Brooks 1986).
- Improved silicon steel transformers cost 1.2 times as much as the conventional transformer (Brooks 1986).

Results

The quantitative results of this ERO appear in Tables 2.8 through 2.12. There were 492 transformers analyzed using data provided by site personnel. For tables with characteristics information (Tables 2.8 through 2.10), the transformers are grouped by phase, kVA rating, and the relevant substation

(North Substation for the top half of the table and the South substation for the bottom half).

The base is currently replacing existing transformers as they fail with silicon steel transformers with stainless steel covers. This is being done to counteract the life-shortening effect of the harsh salt environment on standard transformers. Presently, not all the transformers have been physically replaced, but an ample numbers transformers to complete the exchange have already been procured and are in storage.

In analyzing this ERO, we first generated characteristics information assuming all the transformers were of standard design. This information is provided in Table 2.8. Characteristics information was developed assuming the transformers were silicon core. This information was provided in table 2.9. Characteristics information is provided in table 2.10, assuming the transformers were amorphous core instead of silicon core. This information is being provided to determine the proper transformer choice if they fail before their rated life (approximately 25 to 30 years).

The ERO economic parameters for both a silicon core and amorphous core transformer replacement are provided in Tables 2.11 and 2.12. Replacing immediately all standard transformers with silicon core transformers is not cost effective as all have a negative NPV. Replacing the existing transformers with silicon core as they fail has mixed results. Some have positive NPVs, while others have negative NPVs. This result is somewhat deceptive since the NPV value according for first cost which was estimated based on the current age of the transformers. Since replace transformers have already been purchased, the true first cost is already a sunk cost and no additional purchase cost is necessary.

Replacing the current transformers with amorphous core is not cost effective as all the NPVs are negative. Generally, replacing the transformers with amorphous core as they fail is cost-effective since most of the NPVs are marginally positive. Since replace silicon transformers exist, there is no real value in pursuing this ERO. In the future, however, some consideration should be given to considering amorphous core for larger transformer sizes.

Budget Implications

The total initial cost for immediately changing all existing transformers to improved silicon steel is $1,829,638 plus $510,959 for labor for a total of $2,340,597. The amorphous core transformers, if replaced immediately, cost $2,134,578 plus $510,959 for labor for a total of $2,645,537. These calculations are based on the assumption that the labor is contracted out (Means 1991). If Base personnel perform the labor, significant savings will result. These figures are also based on the whole cost of a new transformer. If an ROF option were chosen, the incremental increase in cost between either the silicon steel or the amorphous core would only be included; and, there would be no labor cost because the transformer would have to be replaced anyway.

The ROF option results in a cost of $304,940 for the improved silicon steel and $609,879 for the amorphous core, with no labor cost.

Energy and Cost Saving

This ERO is estimated to save 181,533 kWh/yr for the improved silicon steel ROF option. At an average electricity cost of 5.5 cents/kWh, this ERO saves $9,984/yr in energy costs. The ROF option of going to amorphous core transformers results in an annual savings of approximately 967,090 kWh at a value of $53,190. These figures are for the no-load loss savings. There may be additional savings from load losses, but they are difficult to ascertain with any degree of accuracy.

Energy Security

This recommendation has little impact on energy security. Because the recommendation is an ROF option and relatively new transformers are currently installed, this ERO will not be a factor for several years.

Operations and Maintenance

Transformers generally do not require maintenance as long as component failures do not occur, but they may require infrequent repair. For this analysis, the O&M was considered negligible, and therefore ignored.

Environmental Issues

This ERO has no adverse impact on the environment. Because some energy is saved, the net effect on the environment is positive; i.e., less electrical consumption, thus less generation.

TABLE 2.8. Characteristics of Existing Transformers

North and South Substations: Existing Transformers: No Load Loss Analysis

	Existing Transformer Characteristics								Operating Schedule		Energy Consumption		Energy Demand		
ID	Substn	Phase	Primary Voltage (kV)	Secondary Voltage (V)	Capacity (kVA)	No.	Total Capacity (kVA)	No Load Loss (watts)	Hours On-Peak	Hours Off-Peak	Total Annual On-Peak (kWh)	Total Annual Off-Peak (kWh)	No. Months On-Peak	Annual Demand Savings (kW-mo)	Total Demand (kW-mo)
1	N	1	13.2	208	10	1	10	73	3,154	5,606	230	409	12	0.88	0.88
2	N	1	13.2	208	10	1	10	73	3,154	5,606	230	409	12	0.88	0.88
3	N	1	13.2	208	15	2	30	84	3,154	5,606	530	942	12	1.01	2.02
4	N	1	13.2	208	15	1	15	84	3,154	5,606	265	471	12	1.01	1.01
5	N	1	13.2	208	25	3	75	118	3,154	5,606	1,116	1,985	12	1.42	4.25
6	N	1	13.2	208	25	3	75	118	3,154	5,606	1,116	1,985	12	1.42	4.25
7	N	1	13.2	208	37.5	6	225	166	3,154	5,606	3,141	5,584	12	1.99	11.95
8	N	1	13.2	208	37.5	3	113	166	3,154	5,606	1,570	2,792	12	1.99	5.98
9	N	1	13.2	208	50	6	300	185	3,154	5,606	3,500	6,223	12	2.22	13.32
10	N	1	13.2	208	50	3	150	185	3,154	5,606	1,750	3,112	12	2.22	6.66
11	N	1	13.2	208	50	1	50	185	3,154	5,606	583	1,037	12	2.22	2.22
12	N	1	13.2	208	75	2	150	285	3,154	5,606	1,798	3,196	12	3.42	6.84
13	N	1	13.2	208	75	13	975	285	3,154	5,606	11,684	20,772	12	3.42	44.46
14	N	1	13.2	208	75	6	450	285	3,154	5,606	5,393	9,587	12	3.42	20.52
15	N	1	13.2	208	75	6	450	285	3,154	5,606	5,393	9,587	12	3.42	20.52
16	N	1	13.2	208	100	3	300	355	3,154	5,606	3,359	5,971	12	4.26	12.78
17	N	1	13.2	208	100	13	1,300	355	3,154	5,606	14,554	25,874	12	4.26	55.38
18	N	1	13.2	208	100	6	600	355	3,154	5,606	6,717	11,942	12	4.26	25.56
19	N	1	13.2	208	100	9	900	355	3,154	5,606	10,076	17,912	12	4.26	38.34
20	N	1	13.2	208	100	2	200	355	3,154	5,606	2,239	3,981	12	4.26	8.52
21	N	1	13.2	208	333	3	999	840	3,154	5,606	7,947	14,128	12	10.08	30.24
22	N	1	13.2	240	10	8	80	68	3,154	5,606	1,716	3,050	12	0.82	6.53
23	N	1	13.2	240	10	1	10	68	3,154	5,606	214	381	12	0.82	0.82
24	N	1	13.2	240	15	1	15	84	3,154	5,606	265	471	12	1.01	1.01
25	N	1	13.2	240	15	1	15	84	3,154	5,606	265	471	12	1.01	1.01
26	N	1	13.2	240	15	1	15	84	3,154	5,606	265	471	12	1.01	1.01
27	N	1	13.2	240	15	1	15	84	3,154	5,606	265	471	12	1.01	1.01
28	N	1	13.2	240	25	6	150	118	3,154	5,606	2,233	3,969	12	1.42	8.50
29	N	1	13.2	240	25	3	75	118	3,154	5,606	1,116	1,985	12	1.42	4.25
30	N	1	13.2	240	25	1	25	118	3,154	5,606	372	662	12	1.42	1.42
31	N	1	13.2	240	25	1	25	118	3,154	5,606	372	662	12	1.42	1.42
32	N	1	13.2	240	37.5	1	38	166	3,154	5,606	523	931	12	1.99	1.99
33	N	1	13.2	240	37.5	1	38	166	3,154	5,606	523	931	12	1.99	1.99
34	N	1	13.2	240	37.5	12	450	166	3,154	5,606	6,282	11,168	12	1.99	23.90
35	N	1	13.2	240	50	3	150	185	3,154	5,606	1,750	3,112	12	2.22	6.66
36	N	1	13.2	240	50	3	150	185	3,154	5,606	1,750	3,112	12	2.22	6.66
37	N	1	13.2	240	50	16	800	185	3,154	5,606	9,335	16,595	12	2.22	35.52
38	N	1	13.2	240	50	7	350	185	3,154	5,606	4,084	7,260	12	2.22	15.54
39	N	1	13.2	240	75	6	450	285	3,154	5,606	5,393	9,587	12	3.42	20.52
40	N	1	13.2	480	15	3	45	84	3,154	5,606	795	1,413	12	1.01	3.02
41	N	1	13.2	480	50	3	150	185	3,154	5,606	1,750	3,112	12	2.22	6.66
42	N	1	13.2	480	50	3	150	185	3,154	5,606	1,750	3,112	12	2.22	6.66
43	N	1	13.2	480	100	3	300	355	3,154	5,606	3,359	5,971	12	4.26	12.78
44	N	1	13.2	480	100	3	300	355	3,154	5,606	3,359	5,971	12	4.26	12.78
45	N	1	13.2	480	167	3	501	469	3,154	5,606	4,437	7,888	12	5.63	16.88
46	N	1	13.2	480	333	3	999	840	3,154	5,606	7,947	14,128	12	10.08	30.24
47	N	1	13.2	4160	37.5	3	113	166	3,154	5,606	1,570	2,792	12	1.99	5.98
48	N	3	13.2	208	25	1	25	149	3,154	5,606	470	835	12	1.79	1.79
49	N	3	13.2	208	45	1	45	223	3,154	5,606	703	1,250	12	2.68	2.68
50	N	3	13.2	208	45	1	45	223	3,154	5,606	703	1,250	12	2.68	2.68
51	N	3	13.2	208	75	2	150	360	3,154	5,606	2,271	4,037	12	4.32	8.64
52	N	3	13.2	208	75	2	150	360	3,154	5,606	2,271	4,037	12	4.32	8.64
53	N	3	13.2	208	112.5	1	113	530	3,154	5,606	1,671	2,971	12	6.36	6.36
54	N	3	13.2	208	150	2	300	560	3,154	5,606	3,532	6,279	12	6.72	13.44
55	N	3	13.2	208	150	1	150	560	3,154	5,606	1,766	3,140	12	6.72	6.72
56	N	3	13.2	208	150	1	150	560	3,154	5,606	1,766	3,140	12	6.72	6.72
57	N	3	13.2	208	150	1	150	560	3,154	5,606	1,766	3,140	12	6.72	6.72
58	N	3	13.2	208	225	1	225	880	3,154	5,606	2,775	4,934	12	10.56	10.56
59	N	3	13.2	208	225	1	225	880	3,154	5,606	2,775	4,934	12	10.56	10.56
60	N	3	13.2	208	225	1	225	880	3,154	5,606	2,775	4,934	12	10.56	10.56
61	N	3	13.2	208	300	1	300	1,050	3,154	5,606	3,311	5,887	12	12.60	12.60
62	N	3	13.2	208	300	3	900	1,050	3,154	5,606	9,934	17,660	12	12.60	37.80
63	N	3	13.2	208	300	1	300	1,050	3,154	5,606	3,311	5,887	12	12.60	12.60
64	N	3	13.2	208	350	1	350	1,188	3,154	5,606	3,746	6,660	12	14.26	14.26
65	N	3	13.2	240	75	1	75	360	3,154	5,606	1,135	2,018	12	4.32	4.32
66	N	3	13.2	240	300	1	300	1,050	3,154	5,606	3,311	5,887	12	12.60	12.60
67	N	3	13.2	480	112.5	1	113	530	3,154	5,606	1,671	2,971	12	6.36	6.36
68	N	3	13.2	480	150	2	300	560	3,154	5,606	3,532	6,279	12	6.72	13.44
69	N	3	13.2	480	225	1	225	880	3,154	5,606	2,775	4,934	12	10.56	10.56
70	N	3	13.2	480	225	1	225	880	3,154	5,606	2,775	4,934	12	10.56	10.56
71	N	3	13.2	480	300	1	300	1,050	3,154	5,606	3,311	5,887	12	12.60	12.60

TABLE 2.8. (contd)

North and South Substations: Existing Transformers: No Load Loss Analysis

	Existing Transformer Characteristics								Operating Schedule		Energy Consumption		Energy Demand		
ID	Substn	Phase	Primary Voltage (kV)	Secondary Voltage (V)	Capacity (kVA)	No.	Total Capacity (kVA)	No Load Loss (watts)	Hours On-Peak	Hours Off-Peak	Total Annual On-Peak (kWh)	Total Annual Off-Peak (kWh)	No. Months On-Peak	Annual Demand Savings (kW-mo)	Total Demand (kW-mo)
72	N	3	13.2	480	300	1	300	1,050	3,154	5,606	3,311	5,887	12	12.60	12.60
73	N	3	13.2	480	300	1	300	1,050	3,154	5,606	3,311	5,887	12	12.60	12.60
74	N	3	13.2	480	300	1	300	1,050	3,154	5,606	3,311	5,887	12	12.60	12.60
75	N	3	13.2	480	300	1	300	1,050	3,154	5,606	3,311	5,887	12	12.60	12.60
76	N	3	13.2	480	500	2	1,000	1,600	3,154	5,606	10,092	17,940	12	19.20	38.40
77	N	3	13.2	480	750	1	750	1,800	3,154	5,606	5,676	10,092	12	21.60	21.60
78	N	3	13.2	480	750	6	4,500	1,800	3,154	5,606	34,059	60,549	12	21.60	129.60
79	N	3	13.2	480	1,000	1	1,000	2,100	3,154	5,606	6,623	11,773	12	25.20	25.20
80	N	3	13.2	4160	1,500	1	1,500	3,455	3,154	5,606	10,896	19,370	12	41.46	41.46
81	N	3	13.2	4160	2,000	1	2,000	4,205	3,154	5,606	13,261	23,575	12	50.46	50.46
82	S	1	13.2	208	10	1	10	73	3,154	5,606	230	409	12	0.88	0.88
83	S	1	13.2	208	10	2	20	73	3,154	5,606	460	819	12	0.88	1.75
84	S	1	13.2	208	15	1	15	84	3,154	5,606	265	471	12	1.01	1.01
85	S	1	13.2	208	15	1	15	84	3,154	5,606	265	471	12	1.01	1.01
86	S	1	13.2	208	25	3	75	118	3,154	5,606	1,116	1,985	12	1.42	4.25
87	S	1	13.2	208	37.5	3	113	166	3,154	5,606	1,570	2,792	12	1.99	5.98
88	S	1	13.2	208	37.5	6	225	166	3,154	5,606	3,141	5,584	12	1.99	11.95
89	S	1	13.2	208	50	3	150	185	3,154	5,606	1,750	3,112	12	2.22	6.66
90	S	1	13.2	208	50	3	150	185	3,154	5,606	1,750	3,112	12	2.22	6.66
91	S	1	13.2	208	50	3	150	185	3,154	5,606	1,750	3,112	12	2.22	6.66
92	S	1	13.2	208	75	1	75	285	3,154	5,606	899	1,598	12	3.42	3.42
93	S	1	13.2	208	75	3	225	285	3,154	5,606	2,696	4,793	12	3.42	10.26
94	S	1	13.2	208	75	4	300	285	3,154	5,606	3,595	6,391	12	3.42	13.68
95	S	1	13.2	208	100	3	300	355	3,154	5,606	3,359	5,971	12	4.26	12.78
96	S	1	13.2	208	100	5	500	355	3,154	5,606	5,598	9,951	12	4.26	21.30
97	S	1	13.2	208	100	3	300	355	3,154	5,606	3,359	5,971	12	4.26	12.78
98	S	1	13.2	208	333	3	999	840	3,154	5,606	7,947	14,128	12	10.08	30.24
99	S	1	13.2	240	5	1	5	41	3,154	5,606	129	230	12	0.49	0.49
100	S	1	13.2	240	10	3	30	68	3,154	5,606	643	1,144	12	0.82	2.45
101	S	1	13.2	240	10	6	60	68	3,154	5,606	1,287	2,287	12	0.82	4.90
102	S	1	13.2	240	15	4	60	84	3,154	5,606	1,060	1,884	12	1.01	4.03
103	S	1	13.2	240	25	2	50	118	3,154	5,606	744	1,323	12	1.42	2.83
104	S	1	13.2	240	25	12	300	118	3,154	5,606	4,465	7,939	12	1.42	16.99
105	S	1	13.2	240	37.5	23	863	166	3,154	5,606	12,040	21,405	12	1.99	45.82
106	S	1	13.2	240	50	60	3,000	185	3,154	5,606	35,005	62,231	12	2.22	133.20
107	S	1	13.2	240	75	1	75	285	3,154	5,606	899	1,598	12	3.42	3.42
108	S	1	13.2	240	75	48	3,600	285	3,154	5,606	43,141	76,696	12	3.42	164.16
109	S	1	13.2	240	75	1	75	285	3,154	5,606	899	1,598	12	3.42	3.42
110	S	1	13.2	240	100	7	700	355	3,154	5,606	7,837	13,932	12	4.26	29.82
111	S	1	13.2	240	167	1	167	469	3,154	5,606	1,479	2,629	12	5.63	5.63
112	S	1	13.2	480	25	1	25	118	3,154	5,606	372	662	12	1.42	1.42
113	S	1	13.2	480	37.5	3	113	166	3,154	5,606	1,570	2,792	12	1.99	5.98
114	S	1	13.2	480	333	3	999	840	3,154	5,606	7,947	14,128	12	10.08	30.24
115	S	3	13.2	208	45	1	45	223	3,154	5,606	703	1,250	12	2.68	2.68
116	S	3	13.2	208	75	1	75	360	3,154	5,606	1,135	2,018	12	4.32	4.32
117	S	3	13.2	208	75	1	75	360	3,154	5,606	1,135	2,018	12	4.32	4.32
118	S	3	13.2	208	75	1	75	360	3,154	5,606	1,135	2,018	12	4.32	4.32
119	S	3	13.2	208	75	1	75	360	3,154	5,606	1,135	2,018	12	4.32	4.32
120	S	3	13.2	208	75	2	150	360	3,154	5,606	2,271	4,037	12	4.32	8.64
121	S	3	13.2	208	112.5	1	113	530	3,154	5,606	1,671	2,971	12	6.36	6.36
122	S	3	13.2	208	112.5	1	113	530	3,154	5,606	1,671	2,971	12	6.36	6.36
123	S	3	13.2	208	112.5	1	113	530	3,154	5,606	1,671	2,971	12	6.36	6.36
124	S	3	13.2	208	150	2	300	560	3,154	5,606	3,532	6,279	12	6.72	13.44
125	S	3	13.2	208	150	1	150	560	3,154	5,606	1,766	3,140	12	6.72	6.72
126	S	3	13.2	208	150	2	300	560	3,154	5,606	3,532	6,279	12	6.72	13.44
127	S	3	13.2	208	225	1	225	880	3,154	5,606	2,775	4,934	12	10.56	10.56
128	S	3	13.2	208	225	2	450	880	3,154	5,606	5,550	9,867	12	10.56	21.12
129	S	3	13.2	208	225	2	450	880	3,154	5,606	5,550	9,867	12	10.56	21.12
130	S	3	13.2	208	750	1	750	1,800	3,154	5,606	5,676	10,092	12	21.60	21.60
131	S	3	13.2	208	750	1	750	1,800	3,154	5,606	5,676	10,092	12	21.60	21.60
132	S	3	13.2	208	1,000	1	1,000	2,100	3,154	5,606	6,623	11,773	12	25.20	25.20
133	S	3	13.2	208	1,500	2	3,000	2,900	3,154	5,606	18,291	32,517	12	34.80	69.60
134	S	3	13.2	480	45	2	90	223	3,154	5,606	1,407	2,500	12	2.68	5.35
135	S	3	13.2	480	112.5	1	113	530	3,154	5,606	1,671	2,971	12	6.36	6.36
136	S	3	13.2	480	150	1	150	560	3,154	5,606	1,766	3,140	12	6.72	6.72
137	S	3	13.2	480	150	1	150	560	3,154	5,606	1,766	3,140	12	6.72	6.72
138	S	3	13.2	480	225	1	225	880	3,154	5,606	2,775	4,934	12	10.56	10.56
139	S	3	13.2	480	225	1	225	880	3,154	5,606	2,775	4,934	12	10.56	10.56

TABLE 2.9. Characteristics of Improved Silicon Steel Transformers

North and South Substation: Improved Silicon Steel Transformers: No Load Loss Analysis

	Improved Silicon Steel Transformer Characteristics								Operating Schedule		Energy Consumption		Energy Demand		
ID	Substn	Phase	Primary Voltage (kV)	Secondary Voltage (V)	Capacity (kVA)	No.	Total Capacity (kVA)	No Load Loss (watts)	Hours On-Peak	Hours Off-Peak	Total Annual On-Peak (kWh)	Total Annual Off-Peak (kWh)	No. Months On-Peak	Annual Demand Savings (kW-mo)	Total Demand (kW-mo)
1	N	1	13.2	208	10	1	10	55	3,154	5,606	173	307	12	0.66	0.66
2	N	1	13.2	208	10	1	10	55	3,154	5,606	173	307	12	0.66	0.66
3	N	1	13.2	208	15	2	30	63	3,154	5,606	397	706	12	0.76	1.51
4	N	1	13.2	208	15	1	15	63	3,154	5,606	199	353	12	0.76	0.76
5	N	1	13.2	208	25	3	75	89	3,154	5,606	837	1,488	12	1.06	3.19
6	N	1	13.2	208	25	3	75	89	3,154	5,606	837	1,488	12	1.06	3.19
7	N	1	13.2	208	37.5	6	225	125	3,154	5,606	2,356	4,188	12	1.49	8.96
8	N	1	13.2	208	37.5	3	113	125	3,154	5,606	1,178	2,094	12	1.49	4.48
9	N	1	13.2	208	50	6	300	139	3,154	5,606	2,625	4,667	12	1.67	9.99
10	N	1	13.2	208	50	3	150	139	3,154	5,606	1,313	2,334	12	1.67	5.00
11	N	1	13.2	208	50	1	50	139	3,154	5,606	438	778	12	1.67	1.67
12	N	1	13.2	208	75	2	150	214	3,154	5,606	1,348	2,397	12	2.57	5.13
13	N	1	13.2	208	75	13	975	214	3,154	5,606	8,763	15,579	12	2.57	33.35
14	N	1	13.2	208	75	6	450	214	3,154	5,606	4,044	7,190	12	2.57	15.39
15	N	1	13.2	208	75	6	450	214	3,154	5,606	4,044	7,190	12	2.57	15.39
16	N	1	13.2	208	100	3	300	266	3,154	5,606	2,519	4,478	12	3.20	9.59
17	N	1	13.2	208	100	13	1,300	266	3,154	5,606	10,915	19,405	12	3.20	41.54
18	N	1	13.2	208	100	6	600	266	3,154	5,606	5,038	8,956	12	3.20	19.17
19	N	1	13.2	208	100	9	900	266	3,154	5,606	7,557	13,434	12	3.20	28.76
20	N	1	13.2	208	100	2	200	266	3,154	5,606	1,679	2,985	12	3.20	6.39
21	N	1	13.2	208	333	3	999	630	3,154	5,606	5,960	10,596	12	7.56	22.68
22	N	1	13.2	240	10	8	80	51	3,154	5,606	1,287	2,287	12	0.61	4.90
23	N	1	13.2	240	10	1	10	51	3,154	5,606	161	286	12	0.61	0.61
24	N	1	13.2	240	15	1	15	63	3,154	5,606	199	353	12	0.76	0.76
25	N	1	13.2	240	15	1	15	63	3,154	5,606	199	353	12	0.76	0.76
26	N	1	13.2	240	15	1	15	63	3,154	5,606	199	353	12	0.76	0.76
27	N	1	13.2	240	15	1	15	63	3,154	5,606	199	353	12	0.76	0.76
28	N	1	13.2	240	25	6	150	89	3,154	5,606	1,675	2,977	12	1.06	6.37
29	N	1	13.2	240	25	3	75	89	3,154	5,606	837	1,488	12	1.06	3.19
30	N	1	13.2	240	25	1	25	89	3,154	5,606	279	496	12	1.06	1.06
31	N	1	13.2	240	25	1	25	89	3,154	5,606	279	496	12	1.06	1.06
32	N	1	13.2	240	37.5	1	38	125	3,154	5,606	393	698	12	1.49	1.49
33	N	1	13.2	240	37.5	1	38	125	3,154	5,606	393	698	12	1.49	1.49
34	N	1	13.2	240	37.5	12	450	125	3,154	5,606	4,711	8,376	12	1.49	17.93
35	N	1	13.2	240	50	3	150	139	3,154	5,606	1,313	2,334	12	1.67	5.00
36	N	1	13.2	240	50	3	150	139	3,154	5,606	1,313	2,334	12	1.67	5.00
37	N	1	13.2	240	50	16	800	139	3,154	5,606	7,001	12,446	12	1.67	26.64
38	N	1	13.2	240	50	7	350	139	3,154	5,606	3,063	5,445	12	1.67	11.66
39	N	1	13.2	240	75	6	450	214	3,154	5,606	4,044	7,190	12	2.57	15.39
40	N	1	13.2	480	15	3	45	63	3,154	5,606	596	1,060	12	0.76	2.27
41	N	1	13.2	480	50	3	150	139	3,154	5,606	1,313	2,334	12	1.67	5.00
42	N	1	13.2	480	50	3	150	139	3,154	5,606	1,313	2,334	12	1.67	5.00
43	N	1	13.2	480	100	3	300	266	3,154	5,606	2,519	4,478	12	3.20	9.59
44	N	1	13.2	480	100	3	300	266	3,154	5,606	2,519	4,478	12	3.20	9.59
45	N	1	13.2	480	167	3	501	352	3,154	5,606	3,328	5,916	12	4.22	12.66
46	N	1	13.2	480	333	3	999	630	3,154	5,606	5,960	10,596	12	7.56	22.68
47	N	1	13.2	4160	37.5	3	113	125	3,154	5,606	1,178	2,094	12	1.49	4.48
48	N	3	13.2	208	25	1	25	112	3,154	5,606	352	627	12	1.34	1.34
49	N	3	13.2	208	45	1	45	167	3,154	5,606	527	938	12	2.01	2.01
50	N	3	13.2	208	45	1	45	167	3,154	5,606	527	938	12	2.01	2.01
51	N	3	13.2	208	75	2	150	270	3,154	5,606	1,703	3,027	12	3.24	6.48
52	N	3	13.2	208	75	2	150	270	3,154	5,606	1,703	3,027	12	3.24	6.48
53	N	3	13.2	208	112.5	1	113	398	3,154	5,606	1,254	2,229	12	4.77	4.77
54	N	3	13.2	208	150	2	300	420	3,154	5,606	2,649	4,709	12	5.04	10.08
55	N	3	13.2	208	150	1	150	420	3,154	5,606	1,325	2,355	12	5.04	5.04
56	N	3	13.2	208	150	1	150	420	3,154	5,606	1,325	2,355	12	5.04	5.04
57	N	3	13.2	208	150	1	150	420	3,154	5,606	1,325	2,355	12	5.04	5.04
58	N	3	13.2	208	225	1	225	660	3,154	5,606	2,081	3,700	12	7.92	7.92
59	N	3	13.2	208	225	1	225	660	3,154	5,606	2,081	3,700	12	7.92	7.92
60	N	3	13.2	208	225	1	225	660	3,154	5,606	2,081	3,700	12	7.92	7.92
61	N	3	13.2	208	300	1	300	788	3,154	5,606	2,483	4,415	12	9.45	9.45
62	N	3	13.2	208	300	3	900	788	3,154	5,606	7,450	13,245	12	9.45	28.35
63	N	3	13.2	208	300	1	300	788	3,154	5,606	2,483	4,415	12	9.45	9.45
64	N	3	13.2	208	350	1	350	891	3,154	5,606	2,810	4,995	12	10.69	10.69
65	N	3	13.2	240	75	1	75	270	3,154	5,606	851	1,514	12	3.24	3.24
66	N	3	13.2	240	300	1	300	788	3,154	5,606	2,483	4,415	12	9.45	9.45
67	N	3	13.2	480	112.5	1	113	398	3,154	5,606	1,254	2,229	12	4.77	4.77
68	N	3	13.2	480	150	2	300	420	3,154	5,606	2,649	4,709	12	5.04	10.08
69	N	3	13.2	480	225	1	225	660	3,154	5,606	2,081	3,700	12	7.92	7.92
70	N	3	13.2	480	225	1	225	660	3,154	5,606	2,081	3,700	12	7.92	7.92
71	N	3	13.2	480	300	1	300	788	3,154	5,606	2,483	4,415	12	9.45	9.45

TABLE 2.9. (contd)

North and South Substation: Improved Silicon Steel Transformers: No Load Loss Analysis

	Improved Silicon Steel Transformer Characteristics								Operating Schedule		Energy Consumption		Energy Demand		
ID	Substn	Phase	Primary Voltage (kV)	Secondary Voltage (V)	Capacity (kVA)	No.	Total Capacity (kVA)	No Load Loss (watts)	Hours On-Peak	Hours Off-Peak	Total Annual On-Peak (kWh)	Total Annual Off-Peak (kWh)	No. Months On-Peak	Annual Demand Savings (kW-mo)	Total Demand (kW-mo)
72	N	3	13.2	480	300	1	300	788	3,154	5,606	2,483	4,415	12	9.45	9.45
73	N	3	13.2	480	300	1	300	788	3,154	5,606	2,483	4,415	12	9.45	9.45
74	N	3	13.2	480	300	1	300	788	3,154	5,606	2,483	4,415	12	9.45	9.45
75	N	3	13.2	480	300	1	300	788	3,154	5,606	2,483	4,415	12	9.45	9.45
76	N	3	13.2	480	500	2	1,000	1,200	3,154	5,606	7,569	13,455	12	14.40	28.80
77	N	3	13.2	480	750	1	750	1,350	3,154	5,606	4,257	7,569	12	16.20	16.20
78	N	3	13.2	480	750	6	4,500	1,350	3,154	5,606	25,544	45,412	12	16.20	97.20
79	N	3	13.2	480	1,000	1	1,000	1,575	3,154	5,606	4,967	8,830	12	18.90	18.90
80	N	3	13.2	4160	1,500	1	1,500	2,591	3,154	5,606	8,172	14,528	12	31.10	31.10
81	N	3	13.2	4160	2,000	1	2,000	3,154	3,154	5,606	9,946	17,681	12	37.85	37.85
82	S	1	13.2	208	10	1	10	55	3,154	5,606	0	307	12	0.66	0.66
83	S	1	13.2	208	10	2	20	55	3,154	5,606	0	614	12	0.66	1.31
84	S	1	13.2	208	15	1	15	63	3,154	5,606	0	353	12	0.76	0.76
85	S	1	13.2	208	15	1	15	63	3,154	5,606	0	353	12	0.76	0.76
86	S	1	13.2	208	25	3	75	89	3,154	5,606	0	1,488	12	1.06	3.19
87	S	1	13.2	208	37.5	3	113	125	3,154	5,606	0	2,094	12	1.49	4.48
88	S	1	13.2	208	37.5	6	225	125	3,154	5,606	0	4,188	12	1.49	8.96
89	S	1	13.2	208	50	3	150	139	3,154	5,606	0	2,334	12	1.67	5.00
90	S	1	13.2	208	50	3	150	139	3,154	5,606	0	2,334	12	1.67	5.00
91	S	1	13.2	208	50	3	150	139	3,154	5,606	0	2,334	12	1.67	5.00
92	S	1	13.2	208	75	1	75	214	3,154	5,606	0	1,198	12	2.57	2.57
93	S	1	13.2	208	75	3	225	214	3,154	5,606	0	3,595	12	2.57	7.70
94	S	1	13.2	208	75	4	300	214	3,154	5,606	0	4,793	12	2.57	10.26
95	S	1	13.2	208	100	3	300	266	3,154	5,606	0	4,478	12	3.20	9.59
96	S	1	13.2	208	100	5	500	266	3,154	5,606	0	7,464	12	3.20	15.98
97	S	1	13.2	208	100	3	300	266	3,154	5,606	0	4,478	12	3.20	9.59
98	S	1	13.2	208	333	3	999	630	3,154	5,606	0	10,596	12	7.56	22.68
99	S	1	13.2	240	5	1	5	31	3,154	5,606	0	172	12	0.37	0.37
100	S	1	13.2	240	10	3	30	51	3,154	5,606	0	858	12	0.61	1.84
101	S	1	13.2	240	10	6	60	51	3,154	5,606	0	1,716	12	0.61	3.67
102	S	1	13.2	240	15	4	60	63	3,154	5,606	0	1,413	12	0.76	3.02
103	S	1	13.2	240	25	2	50	89	3,154	5,606	0	992	12	1.06	2.12
104	S	1	13.2	240	25	12	300	89	3,154	5,606	0	5,954	12	1.06	12.74
105	S	1	13.2	240	37.5	23	863	125	3,154	5,606	0	16,054	12	1.49	34.36
106	S	1	13.2	240	50	60	3,000	139	3,154	5,606	0	46,673	12	1.67	99.90
107	S	1	13.2	240	75	1	75	214	3,154	5,606	0	1,198	12	2.57	2.57
108	S	1	13.2	240	75	48	3,600	214	3,154	5,606	0	57,522	12	2.57	123.12
109	S	1	13.2	240	75	1	75	214	3,154	5,606	0	1,198	12	2.57	2.57
110	S	1	13.2	240	100	7	700	266	3,154	5,606	0	10,449	12	3.20	22.37
111	S	1	13.2	240	167	1	167	352	3,154	5,606	0	1,972	12	4.22	4.22
112	S	1	13.2	480	25	1	25	89	3,154	5,606	0	496	12	1.06	1.06
113	S	1	13.2	480	37.5	3	113	125	3,154	5,606	0	2,094	12	1.49	4.48
114	S	1	13.2	480	333	3	999	630	3,154	5,606	0	10,596	12	7.56	22.68
115	S	3	13.2	208	45	1	45	167	3,154	5,606	0	938	12	2.01	2.01
116	S	3	13.2	208	75	1	75	270	3,154	5,606	0	1,514	12	3.24	3.24
117	S	3	13.2	208	75	1	75	270	3,154	5,606	0	1,514	12	3.24	3.24
118	S	3	13.2	208	75	1	75	270	3,154	5,606	0	1,514	12	3.24	3.24
119	S	3	13.2	208	75	1	75	270	3,154	5,606	0	1,514	12	3.24	3.24
120	S	3	13.2	208	75	2	150	270	3,154	5,606	0	3,027	12	3.24	6.48
121	S	3	13.2	208	112.5	1	113	398	3,154	5,606	0	2,229	12	4.77	4.77
122	S	3	13.2	208	112.5	1	113	398	3,154	5,606	0	2,229	12	4.77	4.77
123	S	3	13.2	208	112.5	1	113	398	3,154	5,606	0	2,229	12	4.77	4.77
124	S	3	13.2	208	150	2	300	420	3,154	5,606	0	4,709	12	5.04	10.08
125	S	3	13.2	208	150	1	150	420	3,154	5,606	0	2,355	12	5.04	5.04
126	S	3	13.2	208	150	2	300	420	3,154	5,606	0	4,709	12	5.04	10.08
127	S	3	13.2	208	225	1	225	660	3,154	5,606	0	3,700	12	7.92	7.92
128	S	3	13.2	208	225	2	450	660	3,154	5,606	0	7,400	12	7.92	15.84
129	S	3	13.2	208	225	2	450	660	3,154	5,606	0	7,400	12	7.92	15.84
130	S	3	13.2	208	750	1	750	1,350	3,154	5,606	0	7,569	12	16.20	16.20
131	S	3	13.2	208	750	1	750	1,350	3,154	5,606	0	7,569	12	16.20	16.20
132	S	3	13.2	208	1,000	1	1,000	1,575	3,154	5,606	0	8,830	12	18.90	18.90
133	S	3	13.2	208	1,500	2	3,000	2,175	3,154	5,606	0	24,388	12	26.10	52.20
134	S	3	13.2	480	45	2	90	167	3,154	5,606	0	1,875	12	2.01	4.01
135	S	3	13.2	480	112.5	1	113	398	3,154	5,606	0	2,229	12	4.77	4.77
136	S	3	13.2	480	150	1	150	420	3,154	5,606	0	2,355	12	5.04	5.04
137	S	3	13.2	480	150	1	150	420	3,154	5,606	0	2,355	12	5.04	5.04
138	S	3	13.2	480	225	1	225	660	3,154	5,606	0	3,700	12	7.92	7.92
139	S	3	13.2	480	225	1	225	660	3,154	5,606	0	3,700	12	7.92	7.92

TABLE 2.10. Characteristics of Amorphous Core Transformers

North and South Substations: Amphorous Core Transformers: No Load Loss Analysis

	Improved Silicon Steel Transformer Characteristics								Operating Schedule		Energy Consumption		Energy Demand		
ID	Substn.	Phase	Primary Voltage (kV)	Secondary Voltage (V)	Capacity (kVA)	No.	Total Capacity (kVA)	No Load Loss (watts)	Hours On-Peak	Hours Off-Peak	Total Annual On-Peak (kWh)	Total Annual Off-Peak (kWh)	No. Months On-Peak	Annual Demand Savings (kW-mo)	Total Demand (kW-mo)
1	N	1	13.2	208	10	1	10	22	3,154	5,606	69	123	12	0.26	0.26
2	N	1	13.2	208	10	1	10	22	3,154	5,606	69	123	12	0.26	0.26
3	N	1	13.2	208	15	2	30	25	3,154	5,606	159	283	12	0.30	0.60
4	N	1	13.2	208	15	1	15	25	3,154	5,606	79	141	12	0.30	0.30
5	N	1	13.2	208	25	3	75	35	3,154	5,606	335	595	12	0.42	1.27
6	N	1	13.2	208	25	3	75	35	3,154	5,606	335	595	12	0.42	1.27
7	N	1	13.2	208	37.5	6	225	50	3,154	5,606	942	1,675	12	0.60	3.59
8	N	1	13.2	208	37.5	3	113	50	3,154	5,606	471	838	12	0.60	1.79
9	N	1	13.2	208	50	6	300	56	3,154	5,606	1,050	1,867	12	0.67	4.00
10	N	1	13.2	208	50	3	150	56	3,154	5,606	525	933	12	0.67	2.00
11	N	1	13.2	208	50	1	50	56	3,154	5,606	175	311	12	0.67	0.67
12	N	1	13.2	208	75	2	150	86	3,154	5,606	539	959	12	1.03	2.05
13	N	1	13.2	208	75	13	975	86	3,154	5,606	3,505	6,232	12	1.03	13.34
14	N	1	13.2	208	75	6	450	86	3,154	5,606	1,618	2,876	12	1.03	6.16
15	N	1	13.2	208	75	6	450	86	3,154	5,606	1,618	2,876	12	1.03	6.16
16	N	1	13.2	208	100	3	300	107	3,154	5,606	1,008	1,791	12	1.28	3.83
17	N	1	13.2	208	100	13	1,300	107	3,154	5,606	4,366	7,762	12	1.28	16.61
18	N	1	13.2	208	100	6	600	107	3,154	5,606	2,015	3,582	12	1.28	7.67
19	N	1	13.2	208	100	9	900	107	3,154	5,606	3,023	5,374	12	1.28	11.50
20	N	1	13.2	208	100	2	200	107	3,154	5,606	672	1,194	12	1.28	2.56
21	N	1	13.2	208	333	3	999	252	3,154	5,606	2,384	4,238	12	3.02	9.07
22	N	1	13.2	240	10	8	80	20	3,154	5,606	515	915	12	0.24	1.96
23	N	1	13.2	240	10	1	10	20	3,154	5,606	64	114	12	0.24	0.24
24	N	1	13.2	240	15	1	15	25	3,154	5,606	79	141	12	0.30	0.30
25	N	1	13.2	240	15	1	15	25	3,154	5,606	79	141	12	0.30	0.30
26	N	1	13.2	240	15	1	15	25	3,154	5,606	79	141	12	0.30	0.30
27	N	1	13.2	240	15	1	15	25	3,154	5,606	79	141	12	0.30	0.30
28	N	1	13.2	240	25	6	150	35	3,154	5,606	670	1,191	12	0.42	2.55
29	N	1	13.2	240	25	3	75	35	3,154	5,606	335	595	12	0.42	1.27
30	N	1	13.2	240	25	1	25	35	3,154	5,606	112	198	12	0.42	0.42
31	N	1	13.2	240	25	1	25	35	3,154	5,606	112	198	12	0.42	0.42
32	N	1	13.2	240	37.5	1	38	50	3,154	5,606	157	279	12	0.60	0.60
33	N	1	13.2	240	37.5	1	38	50	3,154	5,606	157	279	12	0.60	0.60
34	N	1	13.2	240	37.5	12	450	50	3,154	5,606	1,885	3,350	12	0.60	7.17
35	N	1	13.2	240	50	3	150	56	3,154	5,606	525	933	12	0.67	2.00
36	N	1	13.2	240	50	3	150	56	3,154	5,606	525	933	12	0.67	2.00
37	N	1	13.2	240	50	16	800	56	3,154	5,606	2,800	4,978	12	0.67	10.66
38	N	1	13.2	240	50	7	350	56	3,154	5,606	1,225	2,178	12	0.67	4.66
39	N	1	13.2	240	75	6	450	86	3,154	5,606	1,618	2,876	12	1.03	6.16
40	N	1	13.2	480	15	3	45	25	3,154	5,606	238	424	12	0.30	0.91
41	N	1	13.2	480	50	3	150	56	3,154	5,606	525	933	12	0.67	2.00
42	N	1	13.2	480	50	3	150	56	3,154	5,606	525	933	12	0.67	2.00
43	N	1	13.2	480	100	3	300	107	3,154	5,606	1,008	1,791	12	1.28	3.83
44	N	1	13.2	480	100	3	300	107	3,154	5,606	1,008	1,791	12	1.28	3.83
45	N	1	13.2	480	167	3	501	141	3,154	5,606	1,331	2,366	12	1.69	5.07
46	N	1	13.2	480	333	3	999	252	3,154	5,606	2,384	4,238	12	3.02	9.07
47	N	1	13.2	4160	37.5	3	113	50	3,154	5,606	471	838	12	0.60	1.79
48	N	3	13.2	208	25	1	25	45	3,154	5,606	141	251	12	0.54	0.54
49	N	3	13.2	208	45	1	45	67	3,154	5,606	211	375	12	0.80	0.80
50	N	3	13.2	208	45	1	45	67	3,154	5,606	211	375	12	0.80	0.80
51	N	3	13.2	208	75	2	150	108	3,154	5,606	681	1,211	12	1.30	2.59
52	N	3	13.2	208	75	2	150	108	3,154	5,606	681	1,211	12	1.30	2.59
53	N	3	13.2	208	112.5	1	113	159	3,154	5,606	501	891	12	1.91	1.91
54	N	3	13.2	208	150	2	300	168	3,154	5,606	1,060	1,884	12	2.02	4.03
55	N	3	13.2	208	150	1	150	168	3,154	5,606	530	942	12	2.02	2.02
56	N	3	13.2	208	150	1	150	168	3,154	5,606	530	942	12	2.02	2.02
57	N	3	13.2	208	150	1	150	168	3,154	5,606	530	942	12	2.02	2.02
58	N	3	13.2	208	225	1	225	264	3,154	5,606	833	1,480	12	3.17	3.17
59	N	3	13.2	208	225	1	225	264	3,154	5,606	833	1,480	12	3.17	3.17
60	N	3	13.2	208	225	1	225	264	3,154	5,606	833	1,480	12	3.17	3.17
61	N	3	13.2	208	300	1	300	315	3,154	5,606	993	1,766	12	3.78	3.78
62	N	3	13.2	208	300	3	900	315	3,154	5,606	2,980	5,298	12	3.78	11.34
63	N	3	13.2	208	300	1	300	315	3,154	5,606	993	1,766	12	3.78	3.78
64	N	3	13.2	208	350	1	350	356	3,154	5,606	1,124	1,998	12	4.28	4.28
65	N	3	13.2	240	75	1	75	108	3,154	5,606	341	605	12	1.30	1.30
66	N	3	13.2	240	300	1	300	315	3,154	5,606	993	1,766	12	3.78	3.78
67	N	3	13.2	480	112.5	1	113	159	3,154	5,606	501	891	12	1.91	1.91
68	N	3	13.2	480	150	2	300	168	3,154	5,606	1,060	1,884	12	2.02	4.03
69	N	3	13.2	480	225	1	225	264	3,154	5,606	833	1,480	12	3.17	3.17
70	N	3	13.2	480	225	1	225	264	3,154	5,606	833	1,480	12	3.17	3.17

TABLE 2.10. (contd)

North and South Substations: Amphorous Core Transformers: No Load Loss Analysis

	Improved Silicon Steel Transformer Characteristics								Operating Schedule		Energy Consumption		Energy Demand		
ID	Substn.	Phase	Primary Voltage (kV)	Secondary Voltage (V)	Capacity (kVA)	No.	Total Capacity (kVA)	No Load Loss (watts)	Hours On-Peak	Hours Off-Peak	Total Annual On-Peak (kWh)	Total Annual Off-Peak (kWh)	No. Months On-Peak	Annual Demand Savings (kW-mo)	Total Demand (kW-mo)
71	N	3	13.2	480	300	1	300	315	3,154	5,606	993	1,766	12	3.78	3.78
72	N	3	13.2	480	300	1	300	315	3,154	5,606	993	1,766	12	3.78	3.78
73	N	3	13.2	480	300	1	300	315	3,154	5,606	993	1,766	12	3.78	3.78
74	N	3	13.2	480	300	1	300	315	3,154	5,606	993	1,766	12	3.78	3.78
75	N	3	13.2	480	300	1	300	315	3,154	5,606	993	1,766	12	3.78	3.78
76	N	3	13.2	480	500	2	1,000	480	3,154	5,606	3,027	5,382	12	5.76	11.52
77	N	3	13.2	480	750	1	750	540	3,154	5,606	1,703	3,027	12	6.48	6.48
78	N	3	13.2	480	750	6	4,500	540	3,154	5,606	10,218	18,165	12	6.48	38.88
79	N	3	13.2	480	1,000	1	1,000	630	3,154	5,606	1,987	3,532	12	7.56	7.56
80	N	3	13.2	4160	1,500	1	1,500	1,037	3,154	5,606	3,269	5,811	12	12.44	12.44
81	N	3	13.2	4160	2,000	1	2,000	1,262	3,154	5,606	3,978	7,072	12	15.14	15.14
82	S	1	13.2	208	10	1	10	22	3,154	5,606	69	123	12	0.26	0.26
83	S	1	13.2	208	10	2	20	22	3,154	5,606	138	246	12	0.26	0.53
84	S	1	13.2	208	15	1	15	25	3,154	5,606	79	141	12	0.30	0.30
85	S	1	13.2	208	15	1	15	25	3,154	5,606	79	141	12	0.30	0.30
86	S	1	13.2	208	25	3	75	35	3,154	5,606	335	595	12	0.42	1.27
87	S	1	13.2	208	37.5	3	113	50	3,154	5,606	471	838	12	0.60	1.79
88	S	1	13.2	208	37.5	6	225	50	3,154	5,606	942	1,675	12	0.60	3.59
89	S	1	13.2	208	50	3	150	56	3,154	5,606	525	933	12	0.67	2.00
90	S	1	13.2	208	50	3	150	56	3,154	5,606	525	933	12	0.67	2.00
91	S	1	13.2	208	50	3	150	56	3,154	5,606	525	933	12	0.67	2.00
92	S	1	13.2	208	75	1	75	86	3,154	5,606	270	479	12	1.03	1.03
93	S	1	13.2	208	75	3	225	86	3,154	5,606	809	1,438	12	1.03	3.08
94	S	1	13.2	208	75	4	300	86	3,154	5,606	1,079	1,917	12	1.03	4.10
95	S	1	13.2	208	100	3	300	107	3,154	5,606	1,008	1,791	12	1.28	3.83
96	S	1	13.2	208	100	5	500	107	3,154	5,606	1,679	2,985	12	1.28	6.39
97	S	1	13.2	208	100	3	300	107	3,154	5,606	1,008	1,791	12	1.28	3.83
98	S	1	13.2	208	333	3	999	252	3,154	5,606	2,384	4,238	12	3.02	9.07
99	S	1	13.2	240	5	1	5	12	3,154	5,606	39	69	12	0.15	0.15
100	S	1	13.2	240	10	3	30	20	3,154	5,606	193	343	12	0.24	0.73
101	S	1	13.2	240	10	6	60	20	3,154	5,606	386	686	12	0.24	1.47
102	S	1	13.2	240	15	4	60	25	3,154	5,606	318	565	12	0.30	1.21
103	S	1	13.2	240	25	2	50	35	3,154	5,606	223	397	12	0.42	0.85
104	S	1	13.2	240	25	12	300	35	3,154	5,606	1,340	2,382	12	0.42	5.10
105	S	1	13.2	240	37.5	23	863	50	3,154	5,606	3,612	6,422	12	0.60	13.74
106	S	1	13.2	240	50	60	3,000	56	3,154	5,606	10,501	18,669	12	0.67	39.96
107	S	1	13.2	240	75	1	75	86	3,154	5,606	270	479	12	1.03	1.03
108	S	1	13.2	240	75	48	3,600	86	3,154	5,606	12,942	23,009	12	1.03	49.25
109	S	1	13.2	240	75	1	75	86	3,154	5,606	270	479	12	1.03	1.03
110	S	1	13.2	240	100	7	700	107	3,154	5,606	2,351	4,180	12	1.28	8.95
111	S	1	13.2	240	167	1	167	141	3,154	5,606	444	789	12	1.69	1.69
112	S	1	13.2	480	25	1	25	35	3,154	5,606	112	198	12	0.42	0.42
113	S	1	13.2	480	37.5	3	113	50	3,154	5,606	471	838	12	0.60	1.79
114	S	1	13.2	480	333	3	999	252	3,154	5,606	2,384	4,238	12	3.02	9.07
115	S	3	13.2	208	45	1	45	67	3,154	5,606	211	375	12	0.80	0.80
116	S	3	13.2	208	75	1	75	108	3,154	5,606	341	605	12	1.30	1.30
117	S	3	13.2	208	75	1	75	108	3,154	5,606	341	605	12	1.30	1.30
118	S	3	13.2	208	75	1	75	108	3,154	5,606	341	605	12	1.30	1.30
119	S	3	13.2	208	75	1	75	108	3,154	5,606	341	605	12	1.30	1.30
120	S	3	13.2	208	75	2	150	108	3,154	5,606	681	1,211	12	1.30	2.59
121	S	3	13.2	208	112.5	1	113	159	3,154	5,606	501	891	12	1.91	1.91
122	S	3	13.2	208	112.5	1	113	159	3,154	5,606	501	891	12	1.91	1.91
123	S	3	13.2	208	112.5	1	113	159	3,154	5,606	501	891	12	1.91	1.91
124	S	3	13.2	208	150	2	300	168	3,154	5,606	1,060	1,884	12	2.02	4.03
125	S	3	13.2	208	150	1	150	168	3,154	5,606	530	942	12	2.02	2.02
126	S	3	13.2	208	150	2	300	168	3,154	5,606	1,060	1,884	12	2.02	4.03
127	S	3	13.2	208	225	1	225	264	3,154	5,606	833	1,480	12	3.17	3.17
128	S	3	13.2	208	225	2	450	264	3,154	5,606	1,665	2,960	12	3.17	6.34
129	S	3	13.2	208	225	2	450	264	3,154	5,606	1,665	2,960	12	3.17	6.34
130	S	3	13.2	208	750	1	750	540	3,154	5,606	1,703	3,027	12	6.48	6.48
131	S	3	13.2	208	750	1	750	540	3,154	5,606	1,703	3,027	12	6.48	6.48
132	S	3	13.2	208	1,000	1	1,000	630	3,154	5,606	1,987	3,532	12	7.56	7.56
133	S	3	13.2	208	1,500	2	3,000	870	3,154	5,606	5,487	9,755	12	10.44	20.88
134	S	3	13.2	480	45	2	90	67	3,154	5,606	422	750	12	0.80	1.61
135	S	3	13.2	480	112.5	1	113	159	3,154	5,606	501	891	12	1.91	1.91
136	S	3	13.2	480	150	1	150	168	3,154	5,606	530	942	12	2.02	2.02
137	S	3	13.2	480	150	1	150	168	3,154	5,606	530	942	12	2.02	2.02
138	S	3	13.2	480	225	1	225	264	3,154	5,606	833	1,480	12	3.17	3.17
139	S	3	13.2	480	225	1	225	264	3,154	5,606	833	1,480	12	3.17	3.17

TABLE 2.11. Silicon Steel Transformer ERO Economic Parameters

Improved Silicon Steel Economic Parameters

	Economic Parameters				First Year Savings (RI)					Life Cycle Cost			
										RI		ROF	
ID	First Cost RI ($)	First Cost ROF ($)	Life (Years)	Time to Failure (Years)	Energy (MBtu)	Demand kW-mo	Energy $	Demand $	Total $	NPV ($)	SIR	NPV ($)	SIR
1	1,203	469	25	24	1	0	5	1	7	-1,069	0.11	0	1.00
2	1,203	1,070	25	3	1	0	5	1	7	-214	0.82	-19	0.98
3	3,017	2,682	25	3	1	1	13	3	16	-565	0.81	-72	0.97
4	1,509	589	25	24	1	0	6	2	8	-1,351	0.10	-1	1.00
5	6,025	5,356	25	3	3	1	27	7	33	-1,114	0.82	-136	0.97
6	6,025	3,763	25	12	3	1	27	7	33	-3,369	0.44	-61	0.98
7	15,137	13,457	25	3	7	3	75	19	93	-2,666	0.82	-236	0.98
8	7,569	3,071	25	23	4	1	37	9	47	-6,499	0.14	-5	1.00
9	17,805	15,828	25	3	8	3	83	21	104	-3,250	0.82	-376	0.98
10	8,902	5,560	25	12	4	2	42	10	52	-4,943	0.44	-83	0.99
11	2,967	1,158	25	24	1	1	14	3	17	-2,629	0.11	-1	1.00
12	7,465	6,636	25	3	4	2	43	11	53	-1,219	0.84	-41	0.99
13	48,523	30,307	25	12	28	11	278	69	347	-25,969	0.46	-75	1.00
14	22,395	12,933	25	14	13	5	128	32	160	-13,470	0.40	-24	1.00
15	22,395	8,737	25	24	13	5	128	32	160	-19,371	0.14	0	1.00
16	13,183	11,719	25	3	8	3	80	20	100	-2,081	0.84	-16	1.00
17	57,125	35,680	25	12	34	14	346	87	432	-30,227	0.47	34	1.00
18	26,365	11,570	25	21	16	6	160	40	199	-20,828	0.21	14	1.00
19	39,548	15,428	25	24	24	10	239	60	299	-33,948	0.14	6	1.00
20	8,788	3,566	25	23	5	2	53	13	66	-7,351	0.16	2	1.00
21	40,375	23,316	25	14	19	8	189	47	236	-25,394	0.37	-593	0.97
22	9,625	3,905	25	23	4	2	41	10	51	-8,394	0.13	-10	1.00
23	1,203	752	25	12	1	0	5	1	6	-674	0.44	-11	0.98
24	1,509	662	25	21	1	0	6	2	8	-1,247	0.17	-4	0.99
25	1,509	774	25	17	1	0	6	2	8	-1,087	0.28	-9	0.99
26	1,509	589	25	24	1	0	6	2	8	-1,351	0.10	-1	1.00
27	1,509	1,451	25	1	1	0	6	2	8	-127	0.92	-42	0.97
28	12,051	4,889	25	23	5	2	53	13	66	-10,472	0.13	-13	1.00
29	6,025	5,794	25	1	3	1	27	7	33	-495	0.92	-156	0.97
30	2,008	1,931	25	1	1	0	9	2	11	-165	0.92	-52	0.97
31	2,008	991	25	18	1	0	9	2	11	-1,495	0.26	-9	0.99
32	2,523	2,426	25	1	1	0	12	3	16	-186	0.93	-46	0.98
33	2,523	2,243	25	3	1	0	12	3	16	-444	0.82	-39	0.98
34	30,275	12,283	25	23	15	6	149	37	187	-25,994	0.14	-19	1.00
35	8,902	8,560	25	1	4	2	42	10	52	-715	0.92	-217	0.97
36	8,902	3,907	25	21	4	2	42	10	52	-7,275	0.18	-19	1.00
37	47,479	19,263	25	23	22	9	222	56	277	-41,014	0.14	-47	1.00
38	20,772	12,974	25	12	10	4	97	24	121	-11,534	0.44	-194	0.99
39	22,395	9,086	25	23	13	5	128	32	160	-18,880	0.16	0	1.00
40	4,526	4,023	25	3	2	1	19	5	24	-847	0.81	-109	0.97
41	8,902	3,612	25	23	4	2	42	10	52	-7,690	0.14	-9	1.00
42	8,902	3,473	25	24	4	2	42	10	52	-7,886	0.11	-4	1.00
43	13,183	7,917	25	13	8	3	80	20	100	-7,420	0.44	9	1.00
44	13,183	5,349	25	23	8	3	80	20	100	-11,027	0.16	4	1.00
45	29,112	18,183	25	12	11	4	105	26	132	-17,034	0.41	-781	0.96
46	40,375	23,316	25	14	19	8	189	47	236	-25,394	0.37	-593	0.97
47	7,569	6,729	25	3	4	1	37	9	47	-1,333	0.82	-118	0.98
48	2,008	1,931	25	1	1	0	11	3	14	-119	0.94	-9	1.00
49	2,796	1,746	25	12	2	1	17	4	21	-1,479	0.47	4	1.00
50	2,796	1,134	25	23	2	1	17	4	21	-2,343	0.16	1	1.00
51	7,465	4,663	25	12	5	2	54	14	67	-3,771	0.49	80	1.02
52	7,465	2,912	25	24	5	2	54	14	67	-6,233	0.17	6	1.00
53	8,047	4,296	25	16	4	2	40	10	50	-5,500	0.32	-80	0.98
54	18,445	11,521	25	12	8	3	84	21	105	-10,451	0.43	-355	0.97
55	9,223	5,539	25	13	4	2	42	11	52	-5,530	0.40	-159	0.97
56	9,223	3,742	25	23	4	2	42	11	52	-7,999	0.13	-20	0.99
57	9,223	3,598	25	24	4	2	42	11	52	-8,197	0.11	-10	1.00
58	11,176	6,981	25	12	7	3	66	17	82	-6,033	0.46	-92	0.99
59	11,176	6,454	25	14	7	3	66	17	82	-6,757	0.40	-72	0.99
60	11,176	4,360	25	24	7	3	66	17	82	-9,633	0.14	-4	1.00
61	12,809	11,387	25	3	8	3	79	20	98	-2,201	0.83	-199	0.98
62	38,427	24,001	25	12	24	9	236	59	295	-20,559	0.46	-243	0.99
63	12,809	4,997	25	24	8	3	79	20	98	-10,978	0.14	-3	1.00
64	13,780	8,607	25	12	9	4	89	22	111	-7,286	0.47	-52	0.99
65	3,733	2,331	25	12	3	1	27	7	34	-1,886	0.49	40	1.02
66	12,809	5,197	25	23	8	3	79	20	98	-10,704	0.16	-7	1.00
67	8,047	5,026	25	12	4	2	40	10	50	-4,497	0.44	-129	0.97
68	18,445	11,521	25	12	8	3	84	21	105	-10,451	0.43	-355	0.97
69	11,176	6,981	25	12	7	3	66	17	82	-6,033	0.46	-92	0.99
70	11,176	4,360	25	24	7	3	66	17	82	-9,633	0.14	-4	1.00

TABLE 2.11. (contd)

Improved Silicon Steel Economic Parameters

	Economic Parameters				First Year Savings (RI)					Life Cycle Cost			
										RI		ROF	
ID	First Cost RI ($)	First Cost ROF ($)	Life (Years)	Time to Failure (Years)	Energy (MBtu)	Demand kW-mo	Energy $	Demand $	Total $	NPV ($)	SIR	NPV ($)	SIR
71	12,809	11,387	25	3	8	3	79	20	98	-2,201	0.83	-199	0.98
72	12,809	8,000	25	12	8	3	79	20	98	-6,853	0.46	-81	0.99
73	12,809	7,397	25	14	8	3	79	20	98	-7,682	0.40	-63	0.99
74	12,809	5,621	25	21	8	3	79	20	98	-10,121	0.21	-16	1.00
75	12,809	5,197	25	23	8	3	79	20	98	-10,704	0.16	-7	1.00
76	32,635	14,322	25	21	24	10	240	60	300	-25,006	0.23	43	1.00
77	22,610	11,607	25	17	13	5	135	34	169	-15,648	0.31	-106	0.99
78	135,659	52,923	25	24	81	32	809	203	1,012	-116,761	0.14	-59	1.00
79	24,366	10,693	25	21	16	6	157	39	197	-19,106	0.22	-19	1.00
80	28,713	11,202	25	24	26	10	259	65	324	-22,968	0.20	33	1.00
81	32,945	12,853	25	24	31	13	315	79	394	-25,994	0.21	47	1.00
82	1,203	1,157	25	1	1	0	5	1	7	-90	0.93	-22	0.98
83	2,406	976	25	23	1	0	11	3	14	-2,084	0.13	-2	1.00
84	1,509	1,451	25	1	1	0	6	2	8	-127	0.92	-42	0.97
85	1,509	942	25	12	1	0	6	2	8	-849	0.44	-16	0.98
86	6,025	2,445	25	23	3	1	27	7	33	-5,236	0.13	-7	1.00
87	7,569	6,470	25	4	4	1	37	9	47	-1,699	0.78	-109	0.98
88	15,137	6,142	25	23	7	3	75	19	93	-12,997	0.14	-10	1.00
89	8,902	7,914	25	3	4	2	42	10	52	-1,625	0.82	-188	0.98
90	8,902	7,317	25	5	4	2	42	10	52	-2,467	0.72	-160	0.98
91	8,902	4,943	25	15	4	2	42	10	52	-5,813	0.35	-58	0.99
92	3,733	3,318	25	3	2	1	21	5	27	-610	0.84	-21	0.99
93	11,198	9,572	25	4	6	3	64	16	80	-2,367	0.79	-55	0.99
94	14,930	6,058	25	23	9	3	85	21	107	-12,586	0.16	0	1.00
95	13,183	11,269	25	4	8	3	80	20	100	-2,714	0.79	-12	1.00
96	21,971	13,723	25	12	13	5	133	33	166	-11,626	0.47	13	1.00
97	13,183	7,320	25	15	8	3	80	20	100	-8,259	0.37	10	1.00
98	40,375	17,718	25	21	19	8	189	47	236	-33,082	0.18	-177	0.99
99	819	332	25	23	0	0	3	1	4	-722	0.12	-1	1.00
100	3,610	2,255	25	12	2	1	15	4	19	-2,023	0.44	-34	0.98
101	7,219	2,929	25	23	3	1	31	8	38	-6,296	0.13	-7	1.00
102	6,034	2,448	25	23	3	1	25	6	31	-5,271	0.13	-7	1.00
103	4,017	3,862	25	1	2	1	18	4	22	-330	0.92	-104	0.97
104	24,101	9,779	25	23	11	4	106	27	133	-20,944	0.13	-26	1.00
105	58,027	23,543	25	23	29	11	286	72	358	-49,822	0.14	-37	1.00
106	178,046	72,238	25	23	83	33	832	208	1,040	-153,802	0.14	-175	1.00
107	3,733	1,638	25	21	2	1	21	5	27	-2,973	0.20	0	1.00
108	179,160	72,690	25	23	102	41	1,025	257	1,281	-151,038	0.16	1	1.00
109	3,733	1,456	25	24	2	1	21	5	27	-3,229	0.14	0	1.00
110	30,759	12,480	25	23	19	7	186	47	233	-25,730	0.16	9	1.00
111	9,704	3,937	25	23	4	1	35	9	44	-8,596	0.11	-31	0.99
112	2,008	1,931	25	1	1	0	9	2	11	-165	0.92	-52	0.97
113	7,569	6,470	25	4	4	1	37	9	47	-1,699	0.78	-109	0.98
114	40,375	17,718	25	21	19	8	189	47	236	-33,082	0.18	-177	0.99
115	2,796	1,227	25	21	2	1	17	4	21	-2,212	0.21	2	1.00
116	3,733	2,331	25	12	3	1	27	7	34	-1,886	0.49	40	1.02
117	3,733	1,993	25	16	3	1	27	7	34	-2,362	0.37	27	1.01
118	3,733	1,916	25	17	3	1	27	7	34	-2,470	0.34	24	1.01
119	3,733	1,514	25	23	3	1	27	7	34	-3,035	0.19	6	1.00
120	7,465	2,912	25	24	5	2	54	14	67	-6,233	0.17	6	1.00
121	8,047	3,972	25	18	4	2	40	10	50	-5,946	0.26	-58	0.99
122	8,047	3,531	25	21	4	2	40	10	50	-6,552	0.19	-31	0.99
123	8,047	3,139	25	24	4	2	40	10	50	-7,091	0.12	-7	1.00
124	18,445	10,242	25	15	8	3	84	21	105	-12,208	0.34	-252	0.98
125	9,223	4,553	25	18	4	2	42	11	52	-6,885	0.25	-81	0.98
126	18,445	7,484	25	23	8	3	84	21	105	-15,998	0.13	-41	0.99
127	11,176	6,454	25	14	7	3	66	17	82	-6,757	0.40	-72	0.99
128	22,353	9,809	25	21	13	5	132	33	165	-17,770	0.21	-39	1.00
129	22,353	8,720	25	24	13	5	132	33	165	-19,266	0.14	-9	1.00
130	23,594	14,737	25	12	13	5	135	34	169	-12,864	0.45	-272	0.98
131	23,594	13,101	25	15	13	5	135	34	169	-15,100	0.36	-190	0.99
132	26,049	10,162	25	24	16	6	157	39	197	-22,381	0.14	-11	1.00
133	61,634	24,045	25	24	43	17	434	109	543	-51,716	0.16	8	1.00
134	5,592	2,269	25	23	3	1	33	8	42	-4,685	0.16	2	1.00
135	8,047	3,139	25	24	4	2	40	10	50	-7,091	0.12	-7	1.00
136	9,223	4,209	25	20	4	2	42	11	52	-7,357	0.20	-55	0.99
137	9,223	4,047	25	21	4	2	42	11	52	-7,580	0.18	-43	0.99
138	11,176	6,206	25	15	7	3	66	17	82	-7,098	0.36	-63	0.99
139	11,176	5,101	25	20	7	3	66	17	82	-8,616	0.23	-26	0.99

TABLE 2.12. Amorphous Core Transformer ERO Economic Parameters

Amorphous Core Economic Parameters

	Economic Parameters				First Year Savings (RI)					Life Cycle Cost			
										RI		ROF	
ID	First Cost RI ($)	First Cost ROF ($)	Life (Years)	Time to Failure (Years)	Energy (MBtu)	Demand kW-mo	Energy $	Demand $	Total $	NPV ($)	SIR	NPV ($)	SIR
1	1,203	469	25	24	1	0	5	1	7	-1,069	0.11	1	1.00
2	1,203	1,070	25	3	1	0	5	1	7	-214	0.82	33	1.03
3	3,017	2,682	25	3	1	1	13	3	16	-565	0.81	21	1.01
4	1,509	589	25	24	1	0	6	2	8	-1,351	0.10	1	1.00
5	6,025	5,356	25	3	3	1	27	7	33	-1,114	0.82	78	1.01
6	6,025	3,763	25	12	3	1	27	7	33	-3,369	0.44	52	1.01
7	15,137	13,457	25	3	7	3	75	19	93	-2,666	0.82	509	1.03
8	7,569	3,071	25	23	4	1	37	9	47	-6,499	0.14	21	1.01
9	17,805	15,628	25	3	8	3	83	21	104	-3,250	0.82	343	1.02
10	8,902	5,560	25	12	4	2	42	10	52	-4,943	0.44	106	1.02
11	2,967	1,158	25	24	1	1	14	3	17	-2,629	0.11	3	1.00
12	7,465	6,636	25	3	4	2	43	11	53	-1,219	0.84	479	1.06
13	48,523	30,307	25	12	28	11	278	69	347	-25,969	0.46	1,666	1.05
14	22,395	12,933	25	14	13	5	128	32	160	-13,470	0.40	636	1.04
15	22,395	8,737	25	24	13	5	128	32	160	-19,371	0.14	53	1.01
16	13,183	11,719	25	3	8	3	80	20	100	-2,081	0.84	1,017	1.06
17	57,125	35,680	25	12	34	14	346	87	432	-30,227	0.47	2,330	1.06
18	26,365	11,570	25	21	16	6	160	40	199	-20,828	0.21	302	1.02
19	39,548	15,428	25	24	24	10	239	60	299	-33,948	0.14	110	1.01
20	8,788	3,566	25	23	5	2	53	13	66	-7,351	0.16	49	1.01
21	40,375	23,316	25	14	19	8	189	47	236	-25,394	0.37	-179	0.99
22	9,625	3,905	25	23	4	2	41	10	51	-8,394	0.13	14	1.00
23	1,203	752	25	12	1	0	5	1	6	-674	0.44	11	1.01
24	1,509	662	25	21	1	0	6	2	8	-1,247	0.17	3	1.00
25	1,509	774	25	17	1	0	6	2	8	-1,087	0.28	6	1.01
26	1,509	589	25	24	1	0	6	2	8	-1,351	0.10	1	1.00
27	1,509	1,451	25	1	1	0	6	2	8	-127	0.92	11	1.01
28	12,051	4,889	25	23	5	2	53	13	66	-10,472	0.13	18	1.00
29	6,025	5,794	25	1	3	1	27	7	33	-495	0.92	84	1.01
30	2,008	1,931	25	1	1	0	9	2	11	-165	0.92	28	1.01
31	2,008	991	25	18	1	0	9	2	11	-1,495	0.26	10	1.01
32	2,523	2,426	25	1	1	0	12	3	16	-186	0.93	95	1.04
33	2,523	2,243	25	3	1	0	12	3	16	-444	0.82	85	1.03
34	30,275	12,283	25	23	15	6	149	37	187	-25,994	0.14	85	1.01
35	8,902	8,560	25	1	4	2	42	10	52	-715	0.92	189	1.02
36	8,902	3,907	25	21	4	2	42	10	52	-7,275	0.18	34	1.01
37	47,479	19,263	25	23	22	9	222	56	277	-41,014	0.14	91	1.00
38	20,772	12,974	25	12	10	4	97	24	121	-11,534	0.44	248	1.02
39	22,395	9,086	25	23	13	5	128	32	160	-18,880	0.16	107	1.01
40	4,526	4,023	25	3	2	1	19	5	24	-847	0.81	31	1.01
41	8,902	3,612	25	23	4	2	42	10	52	-7,690	0.14	17	1.00
42	8,902	3,473	25	24	4	2	42	10	52	-7,886	0.11	9	1.00
43	13,183	7,917	25	13	8	3	80	20	100	-7,420	0.44	491	1.06
44	13,183	5,349	25	23	8	3	80	20	100	-11,027	0.16	74	1.01
45	29,112	18,183	25	12	11	4	105	26	132	-17,034	0.41	-873	0.96
46	40,375	23,316	25	14	19	8	189	47	236	-25,394	0.37	-179	0.99
47	7,569	6,729	25	3	4	1	37	9	47	-1,333	0.82	255	1.03
48	2,008	1,931	25	1	1	0	11	3	14	-119	0.94	150	1.07
49	2,796	1,746	25	12	2	1	17	4	21	-1,479	0.47	118	1.06
50	2,796	1,134	25	23	2	1	17	4	21	-2,343	0.16	16	1.01
51	7,465	4,663	25	12	5	2	54	14	67	-3,771	0.49	514	1.10
52	7,465	2,912	25	24	5	2	54	14	67	-6,233	0.17	34	1.01
53	6,047	4,296	25	16	4	2	40	10	50	-5,500	0.32	8	1.00
54	18,445	11,521	25	12	8	3	84	21	105	-10,451	0.43	-160	0.99
55	9,223	5,539	25	13	4	2	42	11	52	-5,530	0.40	-70	0.99
56	9,223	3,742	25	23	4	2	42	11	52	-7,999	0.13	-6	1.00
57	9,223	3,598	25	24	4	2	42	11	52	-8,197	0.11	-3	1.00
58	11,176	6,961	25	12	7	3	66	17	82	-6,033	0.46	247	1.03
59	11,176	6,454	25	14	7	3	66	17	82	-6,757	0.40	207	1.03
60	11,176	4,360	25	24	7	3	66	17	82	-9,633	0.14	18	1.00
61	12,809	11,387	25	3	8	3	79	20	98	-2,201	0.83	638	1.05
62	38,427	24,001	25	12	24	9	236	59	295	-20,559	0.46	1,059	1.04
63	12,809	4,997	25	24	8	3	79	20	98	-10,978	0.14	25	1.00
64	13,780	8,607	25	12	9	4	89	22	111	-7,286	0.47	479	1.05
65	3,733	2,331	25	12	3	1	27	7	34	-1,886	0.49	257	1.10
66	12,809	5,197	25	23	8	3	79	20	98	-10,704	0.16	51	1.01
67	8,047	5,026	25	12	4	2	40	10	50	-4,497	0.44	2	1.00
68	18,445	11,521	25	12	8	3	84	21	105	-10,451	0.43	-160	0.99
69	11,176	6,981	25	12	7	3	66	17	82	-6,033	0.46	247	1.03
70	11,176	4,360	25	24	7	3	66	17	82	-9,633	0.14	18	1.00
71	12,809	11,387	25	3	8	3	79	20	98	-2,201	0.83	638	1.05
72	12,809	8,000	25	12	8	3	79	20	98	-6,853	0.46	353	1.04
73	12,809	7,397	25	14	8	3	79	20	98	-7,682	0.40	294	1.03
74	12,809	5,621	25	21	8	3	79	20	98	-10,121	0.21	104	1.02
75	12,809	5,197	25	23	8	3	79	20	98	-10,704	0.16	51	1.01
76	32,635	14,322	25	21	24	10	240	60	300	-25,006	0.23	499	1.03
77	22,610	11,607	25	17	13	5	135	34	169	-15,648	0.31	285	1.02

TABLE 2.12. (contd)

Amorphous Core Economic Parameters

	Economic Parameters				First Year Savings (RI)					Life Cycle Cost			
										RI		ROF	
ID	First Cost RI ($)	First Cost ROF ($)	Life (Years)	Time to Failure (Years)	Energy (MBtu)	Demand kW-mo	Energy $	Demand $	Total $	NPV ($)	SIR	NPV ($)	SIR
78	135,659	52,923	25	24	81	32	809	203	1,012	-116,761	0.14	212	1.00
79	24,366	10,693	25	21	16	6	157	39	197	-19,106	0.22	232	1.02
80	28,713	11,202	25	24	26	10	259	65	324	-22,968	0.20	-196	0.98
81	32,945	12,853	25	24	31	13	315	79	394	-25,994	0.21	-227	0.98
82	1,336	1,285	25	1	2	1	15	4	19	-26	0.98	37	1.03
83	2,672	1,084	25	23	3	1	31	8	38	-1,957	0.27	6	1.01
84	1,678	1,614	25	1	2	1	18	4	22	-71	0.96	11	1.01
85	1,678	1,048	25	12	2	1	18	4	22	-793	0.53	8	1.01
86	6,721	2,727	25	23	7	3	74	19	93	-4,961	0.26	9	1.00
87	8,458	7,230	25	4	10	4	104	26	131	-1,251	0.85	241	1.03
88	16,917	6,864	25	23	21	8	209	52	261	-12,102	0.28	43	1.01
89	9,962	8,856	25	3	12	5	116	29	146	-1,194	0.88	171	1.02
90	9,962	8,188	25	5	12	5	116	29	146	-2,036	0.80	157	1.02
91	9,962	5,532	25	15	12	5	116	29	146	-5,383	0.46	82	1.01
92	4,185	3,720	25	3	6	2	60	15	75	-296	0.93	240	1.06
93	12,554	10,731	25	4	18	7	179	45	224	-1,427	0.89	678	1.06
94	16,738	6,791	25	23	24	10	239	60	299	-11,333	0.32	71	1.01
95	14,796	12,649	25	4	22	9	223	56	279	-1,469	0.90	957	1.06
96	24,663	15,405	25	12	37	15	372	93	465	-9,551	0.61	896	1.06
97	14,798	8,217	25	15	22	9	223	56	279	-7,014	0.53	399	1.05
98	46,097	20,229	25	21	53	21	529	132	661	-32,036	0.31	-30	1.00
99	906	368	25	23	1	0	9	2	11	-699	0.23	0	1.00
100	4,008	2,503	25	12	4	2	43	11	53	-1,874	0.53	32	1.01
101	8,016	3,252	25	23	9	3	86	21	107	-5,997	0.25	11	1.00
102	6,714	2,724	25	23	7	3	70	18	88	-5,048	0.25	7	1.00
103	4,480	4,306	25	1	5	2	50	12	62	-160	0.96	56	1.01
104	26,883	10,907	25	23	30	12	297	74	371	-19,923	0.26	36	1.00
105	64,848	26,311	25	23	80	32	801	200	1,001	-46,391	0.28	163	1.01
106	199,243	80,838	25	23	232	93	2,328	583	2,911	-145,190	0.27	340	1.00
107	4,185	1,836	25	21	6	2	60	15	75	-2,659	0.36	36	1.02
108	200,859	81,494	25	23	286	115	2,869	718	3,588	-135,996	0.32	853	1.01
109	4,185	1,632	25	24	6	2	60	15	75	-2,915	0.30	9	1.01
110	34,529	14,009	25	23	52	21	521	130	652	-22,826	0.34	172	1.01
111	11,076	4,494	25	23	10	4	98	25	123	-8,709	0.21	-32	0.99
112	2,240	2,154	25	1	2	1	25	6	31	-80	0.96	28	1.01
113	8,458	7,230	25	4	10	4	104	26	131	-1,251	0.85	241	1.03
114	46,097	20,229	25	21	53	21	529	132	661	-32,036	0.31	-30	1.00
115	3,127	1,372	25	21	5	2	47	12	58	-1,945	0.36	33	1.02
116	4,185	2,614	25	12	6	3	76	19	94	-1,371	0.67	257	1.10
117	4,185	2,234	25	16	6	3	76	19	94	-1,847	0.56	166	1.06
118	4,185	2,148	25	17	6	3	76	19	94	-1,955	0.53	147	1.07
119	4,185	1,698	25	23	6	3	76	19	94	-2,520	0.40	34	1.02
120	8,369	3,265	25	24	15	6	151	38	189	-5,204	0.36	34	1.01
121	9,184	4,533	25	18	11	4	111	28	139	-5,659	0.38	9	1.00
122	9,184	4,030	25	21	11	4	111	28	139	-6,265	0.32	7	1.00
123	9,184	3,583	25	24	11	4	111	28	139	-6,804	0.26	2	1.00
124	21,053	11,690	25	15	23	9	235	59	294	-11,806	0.44	-104	0.99
125	10,526	5,196	25	18	12	5	117	29	147	-6,685	0.36	-29	0.99
126	21,053	8,542	25	23	23	9	235	59	294	-15,596	0.26	-12	1.00
127	12,758	7,368	25	14	18	7	185	46	231	-5,975	0.53	207	1.03
128	25,517	11,196	25	21	37	15	369	92	462	-16,206	0.36	149	1.01
129	25,517	9,955	25	24	37	15	369	92	462	-17,704	0.31	37	1.00
130	27,039	16,889	25	12	38	15	378	95	472	-11,476	0.58	338	1.02
131	27,039	15,014	25	15	38	15	378	95	472	-13,712	0.49	262	1.02
132	29,836	11,640	25	24	44	18	440	110	551	-20,529	0.31	43	1.00
133	70,571	27,531	25	24	0	0	0	0	0	-69,306	0.02	-429	0.98
134	6,255	2,538	25	23	9	4	94	23	117	-4,150	0.34	32	1.01
135	9,184	3,583	25	24	11	4	111	28	139	-6,804	0.26	2	1.00
136	10,526	4,804	25	20	12	5	117	29	147	-7,157	0.32	-18	1.00
137	10,526	4,619	25	21	12	5	117	29	147	-7,360	0.30	-13	1.00
138	12,758	7,084	25	15	18	7	185	46	231	-6,316	0.50	187	1.03
139	12,758	5,823	25	20	18	7	185	46	231	-7,634	0.39	93	1.02

2.4 AIR-CONDITIONING EROs

A large portion of the overall energy consumption at Patrick AFB goes to operate air conditioning systems. The method of air conditioning at the base is either by chilled water systems or individual window units. Both types were evaluated in terms of replacement with more efficient units. Thermal storage systems were evaluated as potential retrofit options because there is a large potential to reduce demand charges and FPL provides attractive rebates for installation of those systems in existing and new buildings. All EROs were evaluated on a replace immediately option.

2.4.1 Replace Existing Chillers with More Efficient Models

Description

There are many air-conditioning and chiller systems at Patrick AFB. These systems are electric-driven and, in most cases, standard efficiency systems. Currently, there are alternatives available to reduce the cost of cooling. This ERO examines replacing the existing systems with higher-efficiency refrigeration equipment.

Assumptions

Table 2.13 identifies the major refrigeration systems at Patrick AFB involving systems greater than 5-ton capacity. The systems have been analyzed using bin-type weather data collected at the base (USAF 1978).

Assumptions are as follows:

- The facilities have a balance temperature of 65°F. This is the temperature above which cooling becomes necessary.
- The load profile of the existing chiller/refrigeration system is proportional to the distribution of the dry-bulb temperatures from the weather data.
- Peak cooling load on the chiller/refrigeration system is 90% of the system's nominal capacity.
- Time-of-day profiles for the utility rate schedule billing analysis are prorated from the bin weather data, based on hours in the temperature bin.

- Equipment sizes (tonnage) are from the Real Property Database. Several facilities were visited to verify the accuracy of this information. Some corrections have been made.
- Equipment efficiencies are from manufacturers' performance information for equipment inspected during site visits. The efficiency of other chillers have been estimated based on the best available information.

Results

The results of the analysis for this ERO are provided in Table 2.13. Actual replacements should be based on the highest available efficiency using actual design and installation conditions. Condensing using cooling tower water instead of air-cooled condensers can increase efficiencies by as much as 20% because of the lower temperatures available to reduce the refrigerant head pressures.

Budget Implications. Table 2.13 identifies 9,912 total tons of refrigeration capacity for a total implementation cost of $4,485,400.

Energy and Cost Savings. Total energy savings are estimated to be 3,985,780 kWh/yr. The energy cost reduction is estimated to be $255,300/yr.

Energy Security. This ERO should have minimal impact on energy security.

Operations and Maintenance. During the site visit, several existing chillers showed signs of pending failure, specifically in the hospital and technical laboratory. Other facilities showed signs of poor performance, such as corroded valves and actuators. To achieve proper performance from the air-conditioning systems, it is recommended that a thorough preventive maintenance (PM) program be initiated with the new chillers. A good PM program can actually reduce future costs, maintain high efficiencies, reduce downtime, reduce trouble calls, and extend equipment life.

Environmental Issues. The new chillers should be specified with alternative refrigerants rather than with chlorofluorocarbons (CFCs). Hydrofluorocarbons (HFCs) are the long-term preference, although hydro-chlorofluorocarbons (HCFCs) are still allowable. HCFCs will be removed from service around 2020 to 2030.

TABLE 2.13. High-Efficiency Chiller Replacement Analysis

Existing A/C Characteristics and Operating Parameters

Facility Number	Existing Equipment: Efficiency kW/ton	Existing Equipment: Rating Ton	Existing Equipment: # of Units	Operating Schedule: Total FLE Hours	Operating Schedule: Hours on-peak	Operating Schedule: Hours off-peak	Equiv months on-peak	Energy Consumption (kWh): on-peak	Energy Consumption (kWh): off-peak	Sum of 12 Monthly Coincident Demand (kW-mo): on-peak	Sum of 12 Monthly Coincident Demand (kW-mo): off-peak
100	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
102	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
104	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
106	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
204	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
205	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
206	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
250	1.32	5	1	1,397	568	829	9.7	3,750	5,472	51.8	NA
250	1.00	145	1	1,397	568	829	9.7	82,382	120,211	1,137.8	NA
251	1.32	17	1	2,233	888	1,345	9.7	19,916	30,185	176.1	NA
263	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
265	1.00	75	1	2,233	888	1,345	9.7	66,564	100,887	588.5	NA
310	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
312	1.20	31	1	1,397	568	829	9.7	21,135	30,840	291.9	NA
313	1.00	204	1	1,397	568	829	9.7	115,903	169,125	1,600.8	NA
317	1.32	5	1	1,397	568	829	9.7	3,750	5,472	51.8	NA
318	1.00	50	1	1,397	568	829	9.7	28,408	41,452	392.3	NA
321	1.32	15	1	2,233	888	1,345	9.7	17,573	26,634	155.4	NA
329	1.20	20	1	1,397	568	829	9.7	13,636	19,897	188.3	NA
330	1.00	50	1	1,397	568	829	9.7	28,408	41,452	392.3	NA
330	1.20	60	1	1,397	568	829	9.7	40,907	59,691	565.0	NA
330	0.85	300	1	1,397	568	829	9.7	144,878	211,406	2,001.0	NA
335	1.32	9	1	2,233	888	1,345	9.7	10,544	15,980	93.2	NA
345	1.32	7	1	2,233	888	1,345	9.7	8,201	12,429	72.5	NA
400	1.32	7	1	2,233	888	1,345	9.7	8,201	12,429	72.5	NA
400	1.00	80	1	2,233	888	1,345	9.7	71,001	107,613	627.8	NA
401	1.32	15	1	2,233	888	1,345	9.7	17,573	26,634	155.4	NA
402	1.20	20	1	2,233	888	1,345	9.7	21,300	32,284	188.3	NA
404	0.89	60	1	2,233	888	1,345	9.7	47,393	71,831	419.0	NA
408	1.00	40	1	1,397	568	829	9.7	22,726	33,162	313.9	NA
415	0.85	110	1	1,397	568	829	9.7	53,122	77,516	733.7	NA
423	0.98	610	1	1,397	568	829	9.7	339,640	495,602	4,690.9	NA
424	1.20	20	1	2,233	888	1,345	9.7	21,300	32,284	188.3	NA
425	1.20	25	1	1,397	568	829	9.7	17,045	24,871	235.4	NA
425	1.00	55	1	1,397	568	829	9.7	31,248	45,597	431.6	NA
425	0.85	480	1	1,397	568	829	9.7	231,805	338,250	3,201.5	NA
430	1.00	40	1	1,397	568	829	9.7	22,726	33,162	313.9	NA
431	1.32	100	1	1,397	568	829	9.7	74,996	109,434	1,035.8	NA
440	0.90	50	1	1,397	568	829	9.7	25,567	37,307	353.1	NA
501	1.29	60	1	2,233	888	1,345	9.7	68,694	104,115	607.3	NA
502	1.29	60	1	2,233	888	1,345	9.7	68,694	104,115	607.3	NA
503	1.29	60	1	2,233	888	1,345	9.7	68,694	104,115	607.3	NA
505	0.85	275	1	2,233	888	1,345	9.7	207,457	314,431	1,834.2	NA
510	1.32	10	1	2,233	888	1,345	9.7	11,715	17,756	103.6	NA
523	0.84	30	1	1,397	568	829	9.7	14,317	20,892	197.7	NA
530	1.00	60	1	1,397	568	829	9.7	34,089	49,743	470.8	NA
533	1.37	42	1	2,233	888	1,345	9.7	51,068	77,400	451.5	NA
533	1.00	175	1	2,233	888	1,345	9.7	155,315	235,403	1,373.2	NA
534	1.32	50	1	1,397	568	829	9.7	37,498	54,717	517.9	NA
535	1.32	28	1	2,233	888	1,345	9.7	32,803	49,717	290.0	NA
535	1.32	50	1	2,233	888	1,345	9.7	58,576	88,780	517.9	NA
536	1.32	70	1	1,397	568	829	9.7	52,497	76,604	725.1	NA
537	1.09	70	1	2,233	888	1,345	9.7	67,717	102,636	598.7	NA
545	1.32	15	1	2,233	888	1,345	9.7	17,573	26,634	155.4	NA
546	0.81	100	1	1,397	568	829	9.7	46,020	67,153	635.6	NA
548	1.32	8	1	2,233	888	1,345	9.7	9,372	14,205	82.9	NA
556	0.84	30	1	2,233	888	1,345	9.7	22,365	33,898	197.7	NA
557	0.80	10	1	2,233	888	1,345	9.7	7,100	10,761	62.8	NA
558	1.00	80	1	2,233	888	1,345	9.7	71,001	107,613	627.8	NA
559	1.00	60	1	1,397	568	829	9.7	34,089	49,743	470.8	NA
560	1.00	50	1	1,397	568	829	9.7	28,408	41,452	392.3	NA
561	1.20	55	1	1,397	568	829	9.7	37,498	54,717	517.9	NA
562	1.20	55	1	1,397	568	829	9.7	37,498	54,717	517.9	NA
575	1.00	75	1	1,397	568	829	9.7	42,611	62,178	588.5	NA
576	1.00	50	1	2,233	888	1,345	9.7	44,376	67,258	392.3	NA
600	1.32	12	1	2,233	888	1,345	9.7	14,058	21,307	124.3	NA
624	1.32	13	1	2,233	888	1,345	9.7	15,230	23,083	134.7	NA
629	1.32	10	1	1,397	568	829	9.7	7,500	10,943	103.6	NA
629	1.00	35	1	1,397	568	829	9.7	19,885	29,017	274.6	NA

TABLE 2.13. (contd)

Existing A/C Characteristics and Operating Parameters

Facility Number	Existing Equipment Efficiency kW/ton	Rating Ton	# of Units	Operating Schedule Total FLE Hours	Hours on-peak	Hours off-peak	Equiv months on-peak	Energy Consumption (kWh) on-peak	off-peak	Sum of 12 Monthly Coincident Demand (kW-mo) on-peak	off-peak
630	1.32	10	1	2,233	888	1,345	9.7	11,715	17,756	103.6	NA
655	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
659	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
673	1.00	30	1	1,397	568	829	9.7	17,045	24,871	235.4	NA
685	1.32	7	1	2,233	888	1,345	9.7	8,201	12,429	72.5	NA
703	1.32	15	1	2,233	888	1,345	9.7	17,573	26,634	155.4	NA
710	1.32	4	1	2,233	888	1,345	9.7	4,686	7,102	41.4	NA
710	1.00	35	1	1,397	568	829	9.7	19,885	29,017	274.6	NA
722	1.00	70	1	1,397	568	829	9.7	39,771	58,033	549.3	NA
727	1.00	60	1	2,233	888	1,345	9.7	53,251	80,710	470.8	NA
732	1.00	49	1	1,397	568	829	9.7	27,839	40,623	384.5	NA
734	1.00	31	1	2,233	888	1,345	9.7	27,513	41,700	243.3	NA
735	1.32	8	1	2,233	888	1,345	9.7	9,372	14,205	82.9	NA
736	1.32	11	1	2,233	888	1,345	9.7	12,887	19,532	113.9	NA
738	1.00	31	1	2,233	888	1,345	9.7	27,513	41,700	243.3	NA
750	1.00	125	1	1,397	568	829	9.7	71,019	103,630	980.9	NA
751	1.00	65	1	1,397	568	829	9.7	36,930	53,888	510.0	NA
800	1.20	90	1	1,397	568	829	9.7	61,360	89,537	847.5	NA
800	1.00	180	1	1,397	568	829	9.7	102,267	149,228	1,412.4	NA
810	1.20	20	1	2,233	888	1,345	9.7	21,300	32,284	188.3	NA
908	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
912	1.32	8	1	2,233	888	1,345	9.7	9,372	14,205	82.9	NA
925	0.85	550	1	2,233	888	1,345	9.7	414,914	628,862	3,668.4	NA
926	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
929	0.85	240	1	2,233	888	1,345	9.7	181,053	274,412	1,600.8	NA
943	1.32	15	1	2,233	888	1,345	9.7	17,573	26,634	155.4	NA
945	1.00	60	1	1,397	568	829	9.7	34,089	49,743	470.8	NA
946	1.00	100	1	1,397	568	829	9.7	56,815	82,904	784.7	NA
957	1.20	20	1	2,233	888	1,345	9.7	21,300	32,284	188.3	NA
958	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
965	1.20	50	1	2,233	888	1,345	9.7	53,251	80,710	470.8	NA
967	1.20	20	1	1,397	568	829	9.7	13,636	19,897	188.3	NA
967	1.00	88	1	1,397	568	829	9.7	49,997	72,956	690.5	NA
969	1.00	32	1	2,233	888	1,345	9.7	28,401	43,045	251.1	NA
984	1.00	60	1	1,397	568	829	9.7	34,089	49,743	470.8	NA
986	0.85	200	1	2,233	888	1,345	9.7	150,878	228,677	1,334.0	NA
989	1.20	110	1	2,233	888	1,345	9.7	117,152	177,561	1,035.8	NA
989	1.00	530	1	2,233	888	1,345	9.7	470,383	712,934	4,158.8	NA
989	0.90	1,075	1	2,233	888	1,345	9.7	858,672	1,301,441	7,591.9	NA
990	1.20	30	1	2,233	888	1,345	9.7	31,951	48,426	282.5	NA
990	1.00	50	1	2,233	888	1,345	9.7	44,376	67,258	392.3	NA
991	1.20	24	1	2,233	888	1,345	9.7	25,560	38,741	226.0	NA
992	1.23	8	1	2,233	888	1,345	9.7	8,733	13,236	77.2	NA
992	1.00	30	1	2,233	888	1,345	9.7	26,625	40,355	235.4	NA
996	1.32	18	1	2,233	888	1,345	9.7	21,087	31,961	186.4	NA
996	1.00	40	1	2,233	888	1,345	9.7	35,501	53,806	313.9	NA
998	1.32	10	1	2,233	888	1,345	9.7	11,715	17,756	103.6	NA
998	0.85	130	1	2,233	888	1,345	9.7	98,071	148,640	867.1	NA
1316	1.00	40	1	2,233	888	1,345	9.7	35,501	53,806	313.9	NA
1353	1.00	40	1	2,233	888	1,345	9.7	35,501	53,806	313.9	NA
1360	1.32	8	1	2,233	888	1,345	9.7	9,372	14,205	82.9	NA
1364	1.32	10	1	2,233	888	1,345	9.7	11,715	17,756	103.6	NA
1364	0.85	216	1	2,233	888	1,345	9.7	162,948	246,971	1,440.7	NA
1365	1.00	160	1	2,233	888	1,345	9.7	142,003	215,225	1,255.5	NA
1369	1.20	30	1	2,233	888	1,345	9.7	31,951	48,426	282.5	NA
1380	0.90	320	1	2,233	888	1,345	9.7	255,605	387,406	2,259.9	NA
1391	1.32	15	1	2,233	888	1,345	9.7	17,573	26,634	155.4	NA
1491	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
1492	1.32	5	1	2,233	888	1,345	9.7	5,858	8,878	51.8	NA
1492	1.00	30	1	2,233	888	1,345	9.7	26,625	40,355	235.4	NA
1493	1.20	28	1	2,233	888	1,345	9.7	29,821	45,197	263.7	NA
1524	1.32	10	1	2,233	888	1,345	9.7	11,715	17,756	103.6	NA
3655	1.00	50	1	2,233	888	1,345	9.7	44,376	67,258	392.3	NA
3656	1.20	25	1	2,233	888	1,345	9.7	26,625	40,355	235.4	NA
3658	1.32	8	1	2,233	888	1,345	9.7	9,372	14,205	82.9	NA
3659	0.90	100	1	1,397	568	829	9.7	51,134	74,614	706.2	NA

TABLE 2.13. (contd)

High Efficiency A/C Characteristics and Operating Parameters

Facility Number	Energy Resource Opportunity: Efficiency kW/ton	Rating Ton	# of Units	Operating Schedule: Total FLE Hours	Hours on-peak	Hours off-peak	Equiv months on-peak	Energy Consumption (kWh): on-peak	off-peak	Sum of 12 Monthly Coincident Demand (kW-mo): on-peak	off-peak
100	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
102	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
104	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
106	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
204	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
205	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
206	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
250	1.15	5	1	1,397	568	829	9.7	3,267	4,767	45.1	NA
250	0.87	145	1	1,397	568	829	9.7	71,672	104,584	989.9	NA
251	1.15	17	1	2,233	888	1,345	9.7	17,351	26,298	153.4	NA
263	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
265	0.87	75	1	2,233	888	1,345	9.7	57,910	87,772	512.0	NA
310	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
312	0.87	31	1	1,397	568	829	9.7	15,323	22,359	211.6	NA
313	0.87	204	1	1,397	568	829	9.7	100,835	147,139	1,392.7	NA
317	1.15	5	1	1,397	568	829	9.7	3,267	4,767	45.1	NA
318	0.87	50	1	1,397	568	829	9.7	24,715	36,063	341.3	NA
321	1.15	15	1	2,233	888	1,345	9.7	15,310	23,204	135.4	NA
329	0.87	20	1	1,397	568	829	9.7	9,886	14,425	136.5	NA
330	0.87	50	1	1,397	568	829	9.7	24,715	36,063	341.3	NA
330	0.87	60	1	1,397	568	829	9.7	29,657	43,276	409.6	NA
330	0.64	300	1	1,397	568	829	9.7	109,085	159,176	1,506.6	NA
335	1.15	9	1	2,233	888	1,345	9.7	9,186	13,922	81.2	NA
345	1.15	7	1	2,233	888	1,345	9.7	7,145	10,829	63.2	NA
400	1.15	7	1	2,233	888	1,345	9.7	7,145	10,829	63.2	NA
400	0.87	80	1	2,233	888	1,345	9.7	61,771	93,623	546.1	NA
401	1.15	15	1	2,233	888	1,345	9.7	15,310	23,204	135.4	NA
402	0.87	20	1	2,233	888	1,345	9.7	15,443	23,406	136.5	NA
404	0.87	60	1	2,233	888	1,345	9.7	46,328	70,217	409.6	NA
408	0.87	40	1	1,397	568	829	9.7	19,772	28,851	273.1	NA
415	0.64	110	1	1,397	568	829	9.7	39,998	58,365	552.4	NA
423	0.64	610	1	1,397	568	829	9.7	221,806	323,659	3,063.4	NA
424	0.87	20	1	2,233	888	1,345	9.7	15,443	23,406	136.5	NA
425	0.87	25	1	1,397	568	829	9.7	12,357	18,032	170.7	NA
425	0.87	55	1	1,397	568	829	9.7	27,186	39,670	375.5	NA
425	0.64	480	1	1,397	568	829	9.7	174,536	254,682	2,410.6	NA
430	0.87	40	1	1,397	568	829	9.7	19,772	28,851	273.1	NA
431	0.87	100	1	1,397	568	829	9.7	49,429	72,127	682.7	NA
440	0.87	50	1	1,397	568	829	9.7	24,715	36,063	341.3	NA
501	0.87	60	1	2,233	888	1,345	9.7	46,328	70,217	409.6	NA
502	0.87	60	1	2,233	888	1,345	9.7	46,328	70,217	409.6	NA
503	0.87	60	1	2,233	888	1,345	9.7	46,328	70,217	409.6	NA
505	0.64	275	1	2,233	888	1,345	9.7	156,203	236,748	1,381.1	NA
510	1.15	10	1	2,233	888	1,345	9.7	10,206	15,469	90.2	NA
523	0.84	30	1	1,397	568	829	9.7	14,317	20,892	197.7	NA
530	0.87	60	1	1,397	568	829	9.7	29,657	43,276	409.6	NA
533	0.87	42	1	2,233	888	1,345	9.7	32,430	49,152	286.7	NA
533	0.87	175	1	2,233	888	1,345	9.7	135,124	204,800	1,194.7	NA
534	0.87	50	1	1,397	568	829	9.7	24,715	36,063	341.3	NA
535	0.87	28	1	2,233	888	1,345	9.7	21,620	32,768	191.1	NA
535	0.87	50	1	2,233	888	1,345	9.7	38,607	58,514	341.3	NA
536	0.87	70	1	1,397	568	829	9.7	34,600	50,489	477.9	NA
537	0.87	70	1	2,233	888	1,345	9.7	54,050	81,920	477.9	NA
545	1.15	15	1	2,233	888	1,345	9.7	15,310	23,204	135.4	NA
546	0.81	100	1	1,397	568	829	9.7	46,020	67,153	635.6	NA
548	1.15	8	1	2,233	888	1,345	9.7	8,165	12,375	72.2	NA
556	0.84	30	1	2,233	888	1,345	9.7	22,365	33,898	197.7	NA
557	0.80	10	1	2,233	888	1,345	9.7	7,100	10,761	62.8	NA
558	0.87	80	1	2,233	888	1,345	9.7	61,771	93,623	546.1	NA
559	0.87	60	1	1,397	568	829	9.7	29,657	43,276	409.6	NA
560	0.87	50	1	1,397	568	829	9.7	24,715	36,063	341.3	NA
561	0.87	55	1	1,397	568	829	9.7	27,186	39,670	375.5	NA
562	0.87	55	1	1,397	568	829	9.7	27,186	39,670	375.5	NA
575	0.87	75	1	1,397	568	829	9.7	37,072	54,095	512.0	NA
576	0.87	50	1	2,233	888	1,345	9.7	38,607	58,514	341.3	NA
600	1.15	12	1	2,233	888	1,345	9.7	12,248	18,563	108.3	NA
624	1.15	13	1	2,233	888	1,345	9.7	13,268	20,110	117.3	NA
629	1.15	10	1	1,397	568	829	9.7	6,534	9,534	90.2	NA
629	0.87	35	1	1,397	568	829	9.7	17,300	25,244	238.9	NA

TABLE 2.13. (contd)

High Efficiency A/C Characteristics and Operating Parameters

Facility	Energy Resource Opportunity			Operating Schedule			Equiv	Energy Consumption (kWh)		Sum of 12 Monthly Coincident Demand (kW-mo)	
Number	Efficiency kW/ton	Rating Ton	# of Units	Total FLE Hours	Hours on-peak	Hours off-peak	months on-peak	on-peak	off-peak	on-peak	off-peak
630	1.15	10	1	2,233	888	1,345	9.7	10,206	15,469	90.2	NA
655	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
659	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
673	0.87	30	1	1,397	568	829	9.7	14,829	21,638	204.8	NA
685	1.15	7	1	2,233	888	1,345	9.7	7,145	10,829	63.2	NA
703	1.15	15	1	2,233	888	1,345	9.7	15,310	23,204	135.4	NA
710	1.15	4	1	2,233	888	1,345	9.7	4,083	6,188	36.1	NA
710	0.87	35	1	1,397	568	829	9.7	17,300	25,244	238.9	NA
722	0.87	70	1	1,397	568	829	9.7	34,600	50,489	477.9	NA
727	0.87	60	1	2,233	888	1,345	9.7	46,328	70,217	409.6	NA
732	0.87	49	1	1,397	568	829	9.7	24,220	35,342	334.5	NA
734	0.87	31	1	2,233	888	1,345	9.7	23,936	36,279	211.6	NA
735	1.15	8	1	2,233	888	1,345	9.7	8,165	12,375	72.2	NA
736	1.15	11	1	2,233	888	1,345	9.7	11,227	17,016	99.3	NA
738	0.87	31	1	2,233	888	1,345	9.7	15,323	22,359	211.6	NA
750	0.87	125	1	1,397	568	829	9.7	61,786	90,159	853.3	NA
751	0.87	65	1	1,397	568	829	9.7	32,129	46,882	443.7	NA
800	0.87	90	1	1,397	568	829	9.7	44,486	64,914	614.4	NA
800	0.87	180	1	1,397	568	829	9.7	88,972	129,828	1,228.8	NA
810	0.87	20	1	2,233	888	1,345	9.7	15,443	23,406	136.5	NA
908	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
912	1.15	8	1	2,233	888	1,345	9.7	8,165	12,375	72.2	NA
925	0.64	550	1	2,233	888	1,345	9.7	312,406	473,496	2,762.1	NA
926	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
929	0.64	240	1	2,233	888	1,345	9.7	136,322	206,616	1,205.3	NA
943	1.15	15	1	2,233	888	1,345	9.7	15,310	23,204	135.4	NA
945	0.87	60	1	1,397	568	829	9.7	29,657	43,276	409.6	NA
946	0.87	100	1	1,397	568	829	9.7	49,429	72,127	682.7	NA
957	0.87	20	1	2,233	888	1,345	9.7	15,443	23,406	136.5	NA
958	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
965	0.87	50	1	2,233	888	1,345	9.7	38,607	58,514	341.3	NA
967	0.87	20	1	1,397	568	829	9.7	9,886	14,425	136.5	NA
967	0.87	88	1	1,397	568	829	9.7	43,498	63,472	600.8	NA
969	0.87	32	1	2,233	888	1,345	9.7	24,708	37,449	218.5	NA
984	0.87	60	1	1,397	568	829	9.7	29,657	43,276	409.6	NA
986	0.64	200	1	2,233	888	1,345	9.7	113,602	172,180	1,004.4	NA
989	0.87	110	1	2,233	888	1,345	9.7	84,935	128,732	750.9	NA
989	0.87	530	1	2,233	888	1,345	9.7	409,234	620,253	3,618.2	NA
989	0.64	1,075	1	2,233	888	1,345	9.7	610,611	925,469	5,398.7	NA
990	0.87	30	1	2,233	888	1,345	9.7	23,164	35,109	204.8	NA
990	0.87	50	1	2,233	888	1,345	9.7	38,607	58,514	341.3	NA
991	0.87	24	1	2,233	888	1,345	9.7	18,531	28,087	163.8	NA
992	1.15	8	1	2,233	888	1,345	9.7	8,165	12,375	72.2	NA
992	0.87	30	1	2,233	888	1,345	9.7	23,164	35,109	204.8	NA
996	1.15	18	1	2,233	888	1,345	9.7	18,372	27,845	162.4	NA
996	0.87	40	1	2,233	888	1,345	9.7	30,886	46,812	273.1	NA
998	1.15	10	1	2,233	888	1,345	9.7	10,206	15,469	90.2	NA
998	0.60	130	1	2,233	888	1,345	9.7	69,226	104,922	612.1	NA
1316	0.87	40	1	2,233	888	1,345	9.7	30,886	46,812	273.1	NA
1353	0.87	40	1	2,233	888	1,345	9.7	30,886	46,812	273.1	NA
1360	1.15	8	1	2,233	888	1,345	9.7	8,165	12,375	72.2	NA
1364	1.15	10	1	2,233	888	1,345	9.7	10,206	15,469	90.2	NA
1364	0.64	216	1	2,233	888	1,345	9.7	122,690	185,955	1,084.8	NA
1365	0.87	160	1	2,233	888	1,345	9.7	123,542	187,246	1,092.3	NA
1369	0.87	30	1	2,233	888	1,345	9.7	23,164	35,109	204.8	NA
1380	0.64	320	1	2,233	888	1,345	9.7	181,763	275,489	1,607.0	NA
1391	1.15	15	1	2,233	888	1,345	9.7	15,310	23,204	135.4	NA
1491	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
1492	1.15	5	1	2,233	888	1,345	9.7	5,103	7,735	45.1	NA
1492	0.87	30	1	2,233	888	1,345	9.7	23,164	35,109	204.8	NA
1493	0.87	28	1	2,233	888	1,345	9.7	21,620	32,768	191.1	NA
1524	1.15	10	1	2,233	888	1,345	9.7	10,206	15,469	90.2	NA
3655	0.87	50	1	2,233	888	1,345	9.7	38,607	58,514	341.3	NA
3656	0.87	25	1	2,233	888	1,345	9.7	19,303	29,257	170.7	NA
3658	1.15	8	1	2,233	888	1,345	9.7	8,165	12,375	72.2	NA
3659	0.87	100	1	1,397	568	829	9.7	49,429	72,127	682.7	NA

TABLE 2.13. (contd)

High Efficiency A/C ERO Economics

Facility Number	RI Cost ($)	Life (yr)	First Year Energy & Demand Savings					Life Cycle Cost	
			Energy (kWh)	Demand (kW-mo)	Energy (1993$)	Demand (1993$)	Total (1993$)	NPV ($)	SIR
100	2,500	15	1,898	7	73	42	114	-2,906	0.79
102	2,500	15	1,898	7	73	42	114	-4,137	0.79
104	2,500	15	1,898	7	73	42	114	-630	0.79
106	2,500	15	1,898	7	73	42	114	-845	0.79
204	2,500	15	1,898	7	73	42	114	-2,987	0.79
205	2,500	15	1,898	7	73	42	114	-153	0.79
206	2,500	15	1,898	7	73	42	114	-388	0.79
250	2,500	15	1,188	7	46	42	87	-527	0.75
250	72,500	15	26,337	148	1,010	924	1,934	-527	0.71
251	8,500	15	6,452	23	247	142	389	-527	0.79
263	2,500	15	1,898	7	73	42	114	-527	0.79
265	37,500	15	21,769	77	834	478	1,312	-527	0.74
310	2,500	15	1,898	7	73	42	114	-527	0.79
312	15,500	15	14,293	80	548	502	1,050	-527	0.88
313	102,000	15	37,054	208	1,421	1,301	2,722	-635	0.71
317	2,500	15	1,188	7	46	42	87	-20,916	0.75
318	25,000	15	9,082	51	348	319	667	-1,793	0.71
321	7,500	15	5,693	20	218	125	343	-527	0.79
329	10,000	15	9,221	52	354	324	677	-9,580	0.88
330	25,000	15	9,082	51	348	319	667	-527	0.71
330	30,000	15	27,664	155	1,061	971	2,032	-1,803	0.88
330	120,000	15	88,023	494	3,375	3,090	6,465	-29,427	0.83
335	4,500	15	3,416	12	131	75	206	-635	0.79
345	3,500	15	2,657	9	102	58	160	-7,212	0.79
400	3,500	15	2,657	9	102	58	160	-1,582	0.79
400	40,000	15	23,220	82	890	510	1,400	-1,163	0.74
401	7,500	15	5,693	20	218	125	343	-7,212	0.79
402	10,000	15	14,736	52	565	324	888	-3,490	0.97
404	30,000	15	2,679	9	103	59	162	-20,933	0.62
408	20,000	15	7,265	41	279	255	534	-949	0.71
415	44,000	15	32,275	181	1,238	1,133	2,371	-738	0.83
423	244,000	15	289,778	1,627	11,112	10,172	21,284	-738	0.97
424	10,000	15	14,736	52	565	324	888	-10,219	0.97
425	12,500	15	11,527	65	442	405	847	-1,582	0.88
425	27,500	15	9,990	56	383	351	734	-325	0.71
425	192,000	15	140,837	791	5,401	4,944	10,344	-11,343	0.83
430	20,000	15	7,265	41	279	255	534	-5,770	0.71
431	50,000	15	62,874	353	2,411	2,207	4,618	-7,676	0.99
440	25,000	15	2,096	12	80	74	154	-8,434	0.63
501	30,000	15	56,263	198	2,156	1,236	3,392	-325	1.07
502	30,000	15	56,263	198	2,156	1,236	3,392	-1,454	1.07
503	30,000	15	56,263	198	2,156	1,236	3,392	-7,934	1.07
505	110,000	15	128,937	453	4,940	2,832	7,772	-33,493	0.89
510	5,000	15	3,796	13	145	83	229	-5,770	0.79
523	15,000	15	0	0	0	0	0	-652	0.60
530	30,000	15	10,898	61	418	383	800	-9,364	0.71
533	21,000	15	46,886	165	1,796	1,030	2,826	2,035	1.16
533	87,500	15	50,793	179	1,946	1,116	3,062	2,035	0.74
534	25,000	15	31,437	177	1,206	1,103	2,309	2,035	0.99
535	14,000	15	28,132	99	1,078	618	1,696	-11,854	1.10
535	25,000	15	50,235	177	1,925	1,103	3,028	-1,054	1.10
536	35,000	15	44,012	247	1,688	1,545	3,233	-6,006	0.99
537	35,000	15	34,383	121	1,317	755	2,073	-8,655	0.84
545	7,500	15	5,693	20	218	125	343	3,297	0.79
546	40,000	15	0	0	0	0	0	-22,354	0.60
548	4,000	15	3,036	11	116	67	183	-326	0.79
556	15,000	15	0	0	0	0	0	1,418	0.60
557	5,000	15	0	0	0	0	0	2,532	0.60
558	40,000	15	23,220	82	890	510	1,400	-457	0.74
559	30,000	15	10,898	61	418	383	800	-5,430	0.71
560	25,000	15	9,082	51	348	319	667	-1,582	0.71
561	27,500	15	25,359	142	972	890	1,863	-16,016	0.88
562	27,500	15	25,359	142	972	890	1,863	-844	0.88
575	37,500	15	13,623	77	522	478	1,001	-6,006	0.71
576	25,000	15	14,512	51	556	319	875	-2,002	0.74
600	6,000	15	4,555	16	175	100	275	-10,219	0.79
624	6,500	15	4,934	17	189	108	297	-8,655	0.79
629	5,000	15	2,375	13	91	83	174	-7,212	0.75
629	17,500	15	6,357	36	244	223	467	-3,199	0.71

TABLE 2.13. (contd)

High Efficiency A/C ERO Economics

Facility Number	RI Cost ($)	Life (yr)	First Year Energy & Demand Savings					Life Cycle Cost	
			Energy (kWh)	Demand (kW-mo)	Energy (1993$)	Demand (1993$)	Total (1993$)	NPV ($)	SIR
630	5,000	15	3,796	13	145	83	229	-3,199	0.79
655	2,500	15	1,898	7	73	42	114	-10,819	0.79
659	2,500	15	1,898	7	73	42	114	-6,387	0.79
673	15,000	15	5,449	31	209	191	400	-1,265	0.71
685	3,500	15	2,657	9	102	58	160	-1,371	0.79
703	7,500	15	5,693	20	218	125	343	-1,270	0.79
710	2,000	15	1,518	5	58	33	92	-5,049	0.79
710	17,500	15	6,357	36	244	223	467	-1,054	0.71
722	35,000	15	12,714	71	488	446	934	-527	0.71
727	30,000	15	17,415	61	667	383	1,050	-527	0.74
732	24,500	15	8,900	50	341	312	654	-4,327	0.71
734	15,500	15	8,998	32	345	198	542	-738	0.74
735	4,000	15	3,036	11	116	67	183	-1,582	0.79
736	5,500	15	4,175	15	160	92	252	-422	0.79
738	15,500	15	31,531	32	1,207	198	1,405	-5,049	0.97
750	62,500	15	22,704	128	871	797	1,668	-10,097	0.71
751	32,500	15	11,806	66	453	414	867	-7,664	0.71
800	45,000	15	41,497	233	1,591	1,457	3,048	-7,068	0.88
800	90,000	15	32,694	184	1,254	1,148	2,401	-3,960	0.71
810	10,000	15	14,736	52	565	324	888	-844	0.97
908	2,500	15	1,898	7	73	42	114	-1,160	0.79
912	4,000	15	3,036	11	116	67	183	-534	0.79
925	220,000	15	257,874	906	9,881	5,664	15,545	-18,031	0.89
926	2,500	15	1,898	7	73	42	114	-9,376	0.79
929	96,000	15	112,527	395	4,311	2,472	6,783	-5,235	0.89
943	7,500	15	5,693	20	218	125	343	-25,965	0.79
945	30,000	15	10,898	61	418	383	800	-325	0.71
946	50,000	15	18,164	102	697	638	1,334	-527	0.71
957	10,000	15	14,736	52	565	324	888	-844	0.97
958	2,500	15	1,898	7	73	42	114	-23,708	0.79
965	25,000	15	36,839	129	1,412	809	2,221	-527	0.97
967	10,000	15	9,221	52	354	324	677	-10,345	0.88
967	44,000	15	15,984	90	613	561	1,174	-1,582	0.71
969	16,000	15	9,288	33	356	204	560	-8,655	0.74
984	30,000	15	10,898	61	418	383	800	-14,425	0.71
986	80,000	15	93,772	330	3,593	2,060	5,653	-325	0.89
989	55,000	15	81,046	285	3,105	1,780	4,886	-527	0.97
989	265,000	15	153,831	541	5,894	3,379	9,273	-813	0.74
989	430,000	15	624,033	2,193	23,910	13,708	37,617	-1,163	0.96
990	15,000	15	22,103	78	847	486	1,332	-12,694	0.97
990	25,000	15	14,512	51	556	319	875	-4,088	0.74
991	12,000	15	17,683	62	678	388	1,066	-8,655	0.97
992	4,000	15	1,429	5	55	31	86	-8,621	0.69
992	15,000	15	8,707	31	334	191	525	-1,788	0.74
996	9,000	15	6,832	24	262	150	412	-67,701	0.79
996	20,000	15	11,610	41	445	255	700	-16,378	0.74
998	5,000	15	3,796	13	145	83	229	-488	0.79
998	52,000	15	72,562	255	2,780	1,594	4,374	-6,387	0.95
1316	20,000	15	11,610	41	445	255	700	-390	0.74
1353	20,000	15	11,610	41	445	255	700	-1,245	0.74
1360	4,000	15	3,036	11	116	67	183	-3,832	0.79
1364	5,000	15	3,796	13	145	83	229	-1,898	0.79
1364	86,400	15	101,274	356	3,880	2,225	6,105	-5,110	0.89
1365	80,000	15	46,440	163	1,779	1,020	2,799	-1,054	0.74
1369	15,000	15	22,103	78	847	486	1,332	-2,705	0.97
1380	128,000	15	185,759	653	7,117	4,080	11,198	-5,110	0.96
1391	7,500	15	5,693	20	218	125	343	-5,110	0.79
1491	2,500	15	1,898	7	73	42	114	-844	0.79
1492	2,500	15	1,898	7	73	42	114	-1,054	0.79
1492	15,000	15	8,707	31	334	191	525	-9,311	0.74
1493	14,000	15	20,630	73	790	453	1,244	-20,438	0.97
1524	5,000	15	3,796	13	145	83	229	-488	0.79
3655	25,000	15	14,512	51	556	319	875	-4,875	0.74
3656	12,500	15	18,420	65	706	405	1,110	-1,582	0.97
3658	4,000	15	3,036	11	116	67	183	-527	0.79
3659	40,000	15	4,192	24	161	147	308	-527	0.63

2.4.2 Install Energy-Efficient Window Air Conditioners

Description

Patrick AFB currently has 76 window air conditioners installed in commercial facilities that are less than 18 years old. The energy efficiency ratio (EER) for these older units is lower than the EER for units currently available. The Association of Home Appliance Manufacturers estimates that the average window air conditioner produced in 1989 consumed 70% of the electricity consumed by a 1972 model with the same output. By replacing the existing window air conditioners at Patrick AFB with newer units having a higher EER, considerable electrical savings may be realized.

Assumptions

Technical assumptions are as follows:

- The existing units range in size from 0.5 ton to 1.5 tons capacity. Thirty-one 0.5-ton units have an EER of 6.0, thirty-two 1.0-ton units that have an EER of 6.0, and thirteen 1.5-ton units have an EER of 6.5.
- The units run during weekdays only, and all operating hours are during on-peak hours. The units run for an equivalent of 6 full-load hours per day. The number of days that the units operate per month are:

April:	10 days
May:	15 days
June:	20 days
July:	25 days
August:	25 days
Sept.:	15 days
October:	10 days
Total:	120 days

Cost assumptions are as follows:

- The cost of a new 0.5-ton unit with an EER of 9.4 is $475, a new 1.0-ton unit with an EER of 9.0 is $520, and a new 1.2-ton unit with an EER of 10.2 is $644. It is assumed that 1.2-ton units are capable of satisfying the demand of the existing 1.5-ton units.

Results

Complete quantitative results of this ERO are presented in Table 2.14.

Budget Implications. The first cost to replace existing window air conditioners included in this ERO is $27,903.

Energy and Cost Savings. It is estimated that this ERO will result in an annual energy savings of 41,650 kWh at a value of $1,625. Estimated demand savings are 260 kW-mo at a value of $1,625.

Energy Security. This recommendation has little impact on energy security.

Operations and Maintenance. This ERO involves replacing existing units with new units that have similar O&M requirements. Therefore, this ERO will not affect O&M.

Environmental Issues. Existing units must be disposed of properly so that CFCs are not released into the environment.

TABLE 2.14. Commercial Building Window Air-Conditioner ERO

Existing Window A/C Characteristics and Operating Parameters

	Existing Equipment				Operating Schedule		Equiv	Energy Consumption (kWh)		Sum of 12 Monthly Coincident Demands (kW-mo)	
ID	Equip Code	EER	Rating Ton	# of Units	Hrs on-peak	Hrs off-peak	months on-peak	on-peak	off-peak	on-peak	off-peak
1	WAC-0.5	6	0.5	31	720	NA	4.5	22,320	0	140	NA
2	WAC-1.0	6	1.0	32	720	NA	4.5	46,080	0	288	NA
3	WAC-1.5	6.5	1.5	13	720	NA	4.5	25,920	0	162	NA

Efficient Window A/C Characteristics and Operating Parameters

	Energy Resource Opportunity				Operating Schedule		Equiv	Energy Consumption (kWh)		Sum of 12 Monthly Coincident Demands (kW-mo)	
ID	Equip Code	EER	Rating Ton	# of Units	Hrs on-peak	Hrs off-peak	months on-peak	on-peak	off-peak	on-peak	off-peak
1A	WAC-0.5/9.0	9.0	0.5	31	720	NA	4.5	14,880	0	93	NA
1B	WAC-0.5/9.4	9.4	0.5	31	720	NA	4.5	14,247	0	89	NA
2A	WAC-0.8/9.0	9.0	0.8	32	720	NA	4.5	24,576	0	154	NA
2B	WAC-0.8/10.5	10.5	0.8	32	720	NA	4.5	21,065	0	132	NA
2C	WAC-1.0/9.0	9.0	1.0	32	720	NA	4.5	30,720	0	192	NA
3A	WAC-1.2/10.2	10.2	1.2	13	720	NA	4.5	13,214	0	83	NA
3B	WAC-1.2/9.0	9.0	1.2	13	720	NA	4.5	14,976	0	94	NA

Efficient Window A/C ERO Economics

	First	Non-Energy O&M			First Year Energy & Demand Savings					Life Cycle Cost	
ID	Cost ($)	Before ($/yr)	After ($/yr)	Life (yr)	Energy (kWh)	Demand (kW-mo)	Energy (1992 $)	Demand (1992 $)	Total (1992 $)	NPV $	SIR
1A	9,176	#N/A	#N/A	8	7,440	47	270	294	564	-2,906	0.68
1B	11,780	#N/A	#N/A	8	8,073	51	293	319	611	-4,137	0.65
2A	12,032	#N/A	#N/A	8	21,504	134	780	838	1,617	-630	0.95
2B	14,208	#N/A	#N/A	8	25,015	156	907	975	1,882	-845	0.94
2C	13,312	#N/A	#N/A	8	15,360	96	557	600	1,157	-2,987	0.78
3A	6,695	#N/A	#N/A	8	12,706	79	461	494	954	-153	0.98
3B	6,240	#N/A	#N/A	8	10,944	68	397	425	822	-388	0.94

2.4.3 Install Thermal Energy Storage Systems

Description

Patrick AFB purchases electrical services on a time-of-day rate basis. During the on-peak time, there is a charge per kilowatt-hour and a peak demand charge. During the off-peak time, there is a lower charge per kilowatt-hour and no peak demand charge. For this reason, it is less expensive to consume electrical energy during the off-peak period. Thermal energy storage (TES) systems allow cooling system energy to be stored for use during other time periods. In this type of system, the refrigeration equipment can produce ice or cold water for storage during the off-peak billing period. During the on-peak period, the refrigeration equipment can remain off while the ice or cold water meets the cooling requirements of the facilities. Although ice producing refrigeration equipment is less efficient than standard chillers, it has two main advantages. First, the cooling load on the refrigeration equipment can be optimized, running at full load until the storage system is at full capacity. Running the equipment at full load allows the equipment to operate at its best efficiency. Standard chillers operate at partial load the majority of the time; therefore, they are almost always operating at reduced efficiency, which tends to minimize the efficiency difference between a standard chiller and TES refrigeration equipment. Although the TES equipment is still less efficient, there is a second advantage. The TES equipment operates when the cost of energy is less expensive, which is its major advantage. Although energy consumption increases with TES, energy costs are almost always reduced.

Assumptions

Table 2.15 identifies the major refrigeration systems at Patrick AFB involving systems greater than 20 tons peak capacity that should be considered for TES systems.

Technical assumptions are as follows:

- Present energy consumption is estimated with the same assumptions as Table 2.13. Present and proposed energy consumption is for the compressor only.

- Proposed energy consumption for the TES system assumes that the compressor only operates during the off-peak utility time period. Changes in energy consumption are because of the change in refrigeration equipment efficiency. The efficiency of the proposed refrigeration equipment is for high-efficiency ice TES.

- The storage system is assumed to be superinsulated; therefore, heat gains because of the TES system are assumed to be negligible.

- Equipment capacity (tonnage) for the proposed refrigeration equipment is assumed to be 65% of the present equipment capacity. This equipment capacity has been estimated using a simplified BLAST analysis for ice TES systems, local weather data, and the off-peak utility time period.

Cost assumptions are as follows:

- Implementation costs are based on $500/ton for the refrigeration equipment, $35/ton-h for the storage systems (10-hour storage), and $150/ton for accessory equipment.

- The equipment and installation costs (in 1986 dollars) are estimated based on information from the Electric Power Research Institute (EPRI 1988).

Results

The results of the analysis are identified in Table 2.15. Proposed refrigeration equipment efficiencies are estimated based on best available information. Actual replacements should be based on the highest available efficiency using actual design and installation conditions. Specific equipment capacities should also be verified using the proper engineering analysis.

Budget Implications. Table 2.15 identifies 6,187 total tons of proposed refrigeration capacity for a total implementation cost of $6,187,000.

Energy and Cost Savings. TES systems do not save energy, but they reduce energy cost. Energy consumption is estimated to increase 1,233,600 kWh/yr or 4,209 MBtu/yr. Energy cost reduction is estimated to be $432,700/yr.

Energy Security. This ERO should have minimal impact on energy security. However, equipment downtime because of failure or other events will not necessarily result in loss of cooling for the facility because of the storage system.

Operations and Maintenance. TES systems do have more O&M requirements than standard chiller systems; however, they have some advantages. Failure of the system does not mean loss of cooling, which provides the maintenance staff with some time buffer in which to respond to problems. Future increases in building heat load can usually be compensated for by increasing modular storage capacity rather than replacing the refrigeration equipment with a larger size.

Environmental Issues. The new refrigeration equipment should be specified with alternative refrigerants other than CFCs. HFCs are the long-term preference, although CFCs are still allowable. HCFCs will be removed from service around 2020 to 2030.

TABLE 2.15. Thermal Energy Storage Analysis

Existing A/C Characteristics and Operating Parameters

Facility Number	Existing Equipment Efficiency kW/ton	Existing Equipment Rating Ton	# of Units	Operating Schedule Total FLE Hours	Operating Schedule Hours on-peak	Operating Schedule Hours off-peak	Equiv months on-peak	Energy Consumption (kWh) on-peak	Energy Consumption (kWh) off-peak	Sum of 12 Monthly Coincident Demand (kW-mo) on-peak	Sum of 12 Monthly Coincident Demand (kW-mo) off-peak
250	1.00	145	1	2,136	869	1,267	9.7	82,382	120,211	1,137.8	NA
265	1.00	75	1	3,414	1,357	2,057	9.7	66,564	100,887	588.5	NA
312	1.20	31	1	2,136	869	1,267	9.7	21,135	30,840	291.9	NA
313	1.00	204	1	2,136	869	1,267	9.7	115,903	169,125	1,600.8	NA
318	1.00	50	1	2,136	869	1,267	9.7	28,408	41,452	392.3	NA
329	1.20	20	1	2,136	869	1,267	9.7	13,636	19,897	188.3	NA
330	1.00	50	1	2,136	869	1,267	9.7	28,408	41,452	392.3	NA
330	1.20	60	1	2,136	869	1,267	9.7	40,907	59,691	565.0	NA
330	0.85	300	1	2,136	869	1,267	9.7	144,878	211,406	2,001.0	NA
400	1.00	80	1	3,414	1,357	2,057	9.7	71,001	107,613	627.8	NA
402	1.20	20	1	3,414	1,357	2,057	9.7	21,300	32,284	188.3	NA
404	0.89	60	1	3,414	1,357	2,057	9.7	47,393	71,831	419.0	NA
408	1.00	40	1	2,136	869	1,267	9.7	22,726	33,162	313.9	NA
415	0.85	110	1	2,136	869	1,267	9.7	53,122	77,516	733.7	NA
423	0.98	610	1	2,136	869	1,267	9.7	339,640	495,602	4,690.9	NA
424	1.20	20	1	3,414	1,357	2,057	9.7	21,300	32,284	188.3	NA
425	1.20	25	1	2,136	869	1,267	9.7	17,045	24,871	235.4	NA
425	1.00	55	1	2,136	869	1,267	9.7	31,248	45,597	431.6	NA
425	0.85	480	1	2,136	869	1,267	9.7	231,805	338,250	3,201.5	NA
430	1.00	40	1	2,136	869	1,267	9.7	22,726	33,162	313.9	NA
431	1.32	100	1	2,136	869	1,267	9.7	74,996	109,434	1,035.8	NA
440	0.90	50	1	2,136	869	1,267	9.7	25,567	37,307	353.1	NA
501	1.29	60	1	3,414	1,357	2,057	9.7	68,694	104,115	607.3	NA
502	1.29	60	1	3,414	1,357	2,057	9.7	68,694	104,115	607.3	NA
503	1.29	60	1	3,414	1,357	2,057	9.7	68,694	104,115	607.3	NA
505	0.85	275	1	3,414	1,357	2,057	9.7	207,457	314,431	1,834.2	NA
523	0.84	30	1	2,136	869	1,267	9.7	14,317	20,892	197.7	NA
530	1.00	60	1	2,136	869	1,267	9.7	34,089	49,743	470.8	NA
533	1.37	42	1	3,414	1,357	2,057	9.7	51,068	77,400	451.5	NA
533	1.00	175	1	3,414	1,357	2,057	9.7	155,315	235,403	1,373.2	NA
534	1.32	50	1	2,136	869	1,267	9.7	37,498	54,717	517.9	NA
535	1.32	28	1	3,414	1,357	2,057	9.7	32,803	49,717	290.0	NA
535	1.32	50	1	3,414	1,357	2,057	9.7	58,576	88,780	517.9	NA
536	1.32	70	1	2,136	869	1,267	9.7	52,497	76,604	725.1	NA
537	1.09	70	1	3,414	1,357	2,057	9.7	67,717	102,636	598.7	NA
546	0.81	100	1	2,136	869	1,267	9.7	46,020	67,153	635.6	NA
556	0.84	30	1	3,414	1,357	2,057	9.7	22,365	33,898	197.7	NA
557	0.80	10	1	3,414	1,357	2,057	9.7	7,100	10,761	62.8	NA
558	1.00	80	1	3,414	1,357	2,057	9.7	71,001	107,613	627.8	NA
559	1.00	60	1	2,136	869	1,267	9.7	34,089	49,743	470.8	NA
560	1.00	50	1	2,136	869	1,267	9.7	28,408	41,452	392.3	NA
561	1.20	55	1	2,136	869	1,267	9.7	37,498	54,717	517.9	NA
562	1.20	55	1	2,136	869	1,267	9.7	37,498	54,717	517.9	NA
575	1.00	75	1	2,136	869	1,267	9.7	42,611	62,178	588.5	NA
576	1.00	50	1	3,414	1,357	2,057	9.7	44,376	67,258	392.3	NA
629	1.00	35	1	2,136	869	1,267	9.7	19,885	29,017	274.6	NA
673	1.00	30	1	2,136	869	1,267	9.7	17,045	24,871	235.4	NA
710	1.00	35	1	2,136	869	1,267	9.7	19,885	29,017	274.6	NA
722	1.00	70	1	2,136	869	1,267	9.7	39,771	58,033	549.3	NA
727	1.00	60	1	3,414	1,357	2,057	9.7	53,251	80,710	470.8	NA
732	1.00	49	1	2,136	869	1,267	9.7	27,839	40,623	384.5	NA
734	1.00	31	1	3,414	1,357	2,057	9.7	27,513	41,700	243.3	NA
738	1.00	31	1	3,414	1,357	2,057	9.7	27,513	41,700	243.3	NA
750	1.00	125	1	2,136	869	1,267	9.7	71,019	103,630	980.9	NA
751	1.00	65	1	2,136	869	1,267	9.7	36,930	53,888	510.0	NA
800	1.20	90	1	2,136	869	1,267	9.7	61,360	89,537	847.5	NA
800	1.00	180	1	2,136	869	1,267	9.7	102,267	149,228	1,412.4	NA
810	1.20	20	1	3,414	1,357	2,057	9.7	21,300	32,284	188.3	NA
925	0.85	550	1	3,414	1,357	2,057	9.7	414,914	628,862	3,668.4	NA
929	0.85	240	1	3,414	1,357	2,057	9.7	181,053	274,412	1,600.8	NA
945	1.00	60	1	2,136	869	1,267	9.7	34,089	49,743	470.8	NA
946	1.00	100	1	2,136	869	1,267	9.7	56,815	82,904	784.7	NA
957	1.20	20	1	3,414	1,357	2,057	9.7	21,300	32,284	188.3	NA
965	1.20	50	1	3,414	1,357	2,057	9.7	53,251	80,710	470.8	NA
967	1.20	20	1	2,136	869	1,267	9.7	13,636	19,897	188.3	NA
967	1.00	88	1	2,136	869	1,267	9.7	49,997	72,956	690.5	NA
969	1.00	32	1	3,414	1,357	2,057	9.7	28,401	43,045	251.1	NA
984	1.00	60	1	2,136	869	1,267	9.7	34,089	49,743	470.8	NA
986	0.85	200	1	3,414	1,357	2,057	9.7	150,878	228,677	1,334.0	NA

TABLE 2.15. (contd)

Existing A/C Characteristics and Operating Parameters

Facility Number	Existing Equipment Efficiency kW/ton	Existing Equipment Rating Ton	# of Units	Operating Schedule Total FLE Hours	Operating Schedule Hours on-peak	Operating Schedule Hours off-peak	Equiv months on-peak	Energy Consumption (kWh) on-peak	Energy Consumption (kWh) off-peak	Sum of 12 Monthly Coincident Demand (kW-mo) on-peak	Sum of 12 Monthly Coincident Demand (kW-mo) off-peak
989	1.20	110	1	3,414	1,357	2,057	9.7	117,152	177,561	1,035.8	NA
989	1.00	530	1	3,414	1,357	2,057	9.7	470,383	712,934	4,158.8	NA
989	0.90	1,075	1	3,414	1,357	2,057	9.7	858,672	1,301,441	7,591.9	NA
990	1.20	30	1	3,414	1,357	2,057	9.7	31,951	48,426	282.5	NA
990	1.00	50	1	3,414	1,357	2,057	9.7	44,376	67,258	392.3	NA
991	1.20	24	1	3,414	1,357	2,057	9.7	25,560	38,741	226.0	NA
992	1.00	30	1	3,414	1,357	2,057	9.7	26,625	40,355	235.4	NA
996	1.00	40	1	3,414	1,357	2,057	9.7	35,501	53,806	313.9	NA
998	0.85	130	1	3,414	1,357	2,057	9.7	98,071	148,640	867.1	NA
1316	1.00	40	1	3,414	1,357	2,057	9.7	35,501	53,806	313.9	NA
1353	1.00	40	1	3,414	1,357	2,057	9.7	35,501	53,806	313.9	NA
1364	0.85	216	1	3,414	1,357	2,057	9.7	162,948	246,971	1,440.7	NA
1365	1.00	160	1	3,414	1,357	2,057	9.7	142,003	215,225	1,255.5	NA
1369	1.20	30	1	3,414	1,357	2,057	9.7	31,951	48,426	282.5	NA
1380	0.90	320	1	3,414	1,357	2,057	9.7	255,605	387,406	2,259.9	NA
1492	1.00	30	1	3,414	1,357	2,057	9.7	26,625	40,355	235.4	NA
1493	1.20	28	1	3,414	1,357	2,057	9.7	29,821	45,197	263.7	NA
3655	1.00	50	1	3,414	1,357	2,057	9.7	44,376	67,258	392.3	NA
3656	1.20	25	1	3,414	1,357	2,057	9.7	26,625	40,355	235.4	NA
3659	0.90	100	1	2,136	869	1,267	9.7	51,134	74,614	706.2	NA

TABLE 2.15. (contd)

High Efficiency Thermal Energy Storage A/C Characteristics and Operating Parameters

Facility Number	Energy Resource Opportunity: Efficiency kW/ton	Rating Ton	# of Units	Operating Schedule: Total FLE Hours	Hours on-peak	Hours off-peak	Equiv months on-peak	Energy Consumption (kWh): on-peak	off-peak	Sum of 12 Monthly Coincident Demand (kW-mo): on-peak	off-peak
250	1.20	94	1	2,150	0	2,150	0	0	242,352	0	NA
265	1.20	49	1	3,435	0	3,435	0	0	200,313	0	NA
312	1.20	20	1	2,150	0	2,150	0	0	51,813	0	NA
313	1.20	133	1	2,150	0	2,150	0	0	340,964	0	NA
318	1.20	33	1	2,150	0	2,150	0	0	83,570	0	NA
329	1.20	13	1	2,150	0	2,150	0	0	33,428	0	NA
330	1.20	33	1	2,150	0	2,150	0	0	83,570	0	NA
330	1.20	39	1	2,150	0	2,150	0	0	100,284	0	NA
330	0.88	195	1	2,150	0	2,150	0	0	368,859	0	NA
400	1.20	52	1	3,435	0	3,435	0	0	213,667	0	NA
402	1.20	13	1	3,435	0	3,435	0	0	53,417	0	NA
404	1.20	39	1	3,435	0	3,435	0	0	160,250	0	NA
408	1.20	26	1	2,150	0	2,150	0	0	66,856	0	NA
415	0.88	72	1	2,150	0	2,150	0	0	135,248	0	NA
423	0.88	397	1	2,150	0	2,150	0	0	750,014	0	NA
424	1.20	13	1	3,435	0	3,435	0	0	53,417	0	NA
425	1.20	16	1	2,150	0	2,150	0	0	41,785	0	NA
425	1.20	36	1	2,150	0	2,150	0	0	91,927	0	NA
425	0.88	312	1	2,150	0	2,150	0	0	590,175	0	NA
430	1.20	26	1	2,150	0	2,150	0	0	66,856	0	NA
431	1.20	65	1	2,150	0	2,150	0	0	167,139	0	NA
440	1.20	33	1	2,150	0	2,150	0	0	83,570	0	NA
501	1.20	39	1	3,435	0	3,435	0	0	160,250	0	NA
502	1.20	39	1	3,435	0	3,435	0	0	160,250	0	NA
503	1.20	39	1	3,435	0	3,435	0	0	160,250	0	NA
505	0.88	179	1	3,435	0	3,435	0	0	540,307	0	NA
523	1.16	20	1	2,150	0	2,150	0	0	48,413	0	NA
530	1.20	39	1	2,150	0	2,150	0	0	100,284	0	NA
533	1.20	27	1	3,435	0	3,435	0	0	112,175	0	NA
533	1.20	114	1	3,435	0	3,435	0	0	467,397	0	NA
534	1.20	33	1	2,150	0	2,150	0	0	83,570	0	NA
535	1.20	18	1	3,435	0	3,435	0	0	74,783	0	NA
535	1.20	33	1	3,435	0	3,435	0	0	133,542	0	NA
536	1.20	46	1	2,150	0	2,150	0	0	116,998	0	NA
537	1.20	46	1	3,435	0	3,435	0	0	186,959	0	NA
546	1.11	65	1	2,150	0	2,150	0	0	155,612	0	NA
556	1.16	20	1	3,435	0	3,435	0	0	77,362	0	NA
557	1.10	7	1	3,435	0	3,435	0	0	24,559	0	NA
558	1.20	52	1	3,435	0	3,435	0	0	213,667	0	NA
559	1.20	39	1	2,150	0	2,150	0	0	100,284	0	NA
560	1.20	33	1	2,150	0	2,150	0	0	83,570	0	NA
561	1.20	36	1	2,150	0	2,150	0	0	91,927	0	NA
562	1.20	36	1	2,150	0	2,150	0	0	91,927	0	NA
575	1.20	49	1	2,150	0	2,150	0	0	125,354	0	NA
576	1.20	33	1	3,435	0	3,435	0	0	133,542	0	NA
629	1.20	23	1	2,150	0	2,150	0	0	58,499	0	NA
673	1.20	20	1	2,150	0	2,150	0	0	50,142	0	NA
710	1.20	23	1	2,150	0	2,150	0	0	58,499	0	NA
722	1.20	46	1	2,150	0	2,150	0	0	116,998	0	NA
727	1.20	39	1	3,435	0	3,435	0	0	160,250	0	NA
732	1.20	32	1	2,150	0	2,150	0	0	81,898	0	NA
734	1.20	20	1	3,435	0	3,435	0	0	82,796	0	NA
738	1.20	20	1	3,435	0	3,435	0	0	82,796	0	NA
750	1.20	81	1	2,150	0	2,150	0	0	208,924	0	NA
751	1.20	42	1	2,150	0	2,150	0	0	108,641	0	NA
800	1.20	59	1	2,150	0	2,150	0	0	150,425	0	NA
800	1.20	117	1	2,150	0	2,150	0	0	300,851	0	NA
810	1.20	13	1	3,435	0	3,435	0	0	53,417	0	NA
925	0.88	358	1	3,435	0	3,435	0	0	1,080,615	0	NA
929	0.88	156	1	3,435	0	3,435	0	0	471,541	0	NA
945	1.20	39	1	2,150	0	2,150	0	0	100,284	0	NA
946	1.20	65	1	2,150	0	2,150	0	0	167,139	0	NA
957	1.20	13	1	3,435	0	3,435	0	0	53,417	0	NA
965	1.20	33	1	3,435	0	3,435	0	0	133,542	0	NA
967	1.20	13	1	2,150	0	2,150	0	0	33,428	0	NA
967	1.20	57	1	2,150	0	2,150	0	0	147,083	0	NA
969	1.20	21	1	3,435	0	3,435	0	0	85,467	0	NA

TABLE 2.15. (contd)

High Efficiency Thermal Energy Storage A/C Characteristics and Operating Parameters

Facility Number	Energy Resource Opportunity			Operating Schedule			Equiv months on-peak	Energy Consumption (kWh)		Sum of 12 Monthly Coincident Demand (kW-mo)	
	Efficiency kW/ton	Rating Ton	# of Units	Total FLE Hours	Hours on-peak	Hours off-peak		on-peak	off-peak	on-peak	off-peak
984	1.20	39	1	2,150	0	2,150	0	0	100,284	0	NA
986	0.88	130	1	3,435	0	3,435	0	0	392,951	0	NA
989	1.20	72	1	3,435	0	3,435	0	0	293,792	0	NA
989	1.20	345	1	3,435	0	3,435	0	0	1,415,544	0	NA
989	0.88	699	1	3,435	0	3,435	0	0	2,112,111	0	NA
990	1.20	20	1	3,435	0	3,435	0	0	80,125	0	NA
990	1.20	33	1	3,435	0	3,435	0	0	133,542	0	NA
991	1.20	16	1	3,435	0	3,435	0	0	64,100	0	NA
992	1.20	20	1	3,435	0	3,435	0	0	80,125	0	NA
996	1.20	26	1	3,435	0	3,435	0	0	106,833	0	NA
998	0.83	85	1	3,435	0	3,435	0	0	239,454	0	NA
1316	1.20	26	1	3,435	0	3,435	0	0	106,833	0	NA
1353	1.20	26	1	3,435	0	3,435	0	0	106,833	0	NA
1364	0.88	140	1	3,435	0	3,435	0	0	424,387	0	NA
1365	1.20	104	1	3,435	0	3,435	0	0	427,334	0	NA
1369	1.20	20	1	3,435	0	3,435	0	0	80,125	0	NA
1380	0.88	208	1	3,435	0	3,435	0	0	628,721	0	NA
1492	1.20	20	1	3,435	0	3,435	0	0	80,125	0	NA
1493	1.20	18	1	3,435	0	3,435	0	0	74,783	0	NA
3655	1.20	33	1	3,435	0	3,435	0	0	133,542	0	NA
3656	1.20	16	1	3,435	0	3,435	0	0	66,771	0	NA
3659	1.20	65	1	2,150	0	2,150	0	0	167,139	0	NA

TABLE 2.15. (contd)

Thermal Energy Storage ERO Economics

Facility Number	First Cost (1986$)	Non-Energy O&M Before ($/yr)	Non-Energy O&M After ($/yr)	First Year Savings Energy (Kwh)	First Year Savings Demand (kW-mo)	First Year Savings Cost (1993$)	Life Cycle Cost NPV ($)	Life Cycle Cost SIR
250	94,250	8,265	11,310	-39,759	1,138	5,932	42,257	1.45
265	48,750	4,275	5,850	-32,862	588	2,699	13,398	1.27
312	20,150	1,767	2,418	162	290	1,905	11,703	1.58
313	132,600	11,628	15,912	-55,937	1,598	8,346	59,451	1.45
318	32,500	2,850	3,900	-13,710	388	2,046	14,571	1.45
329	13,000	1,140	1,560	105	183	1,229	7,550	1.58
330	32,500	2,850	3,900	-13,710	386	2,046	14,571	1.45
330	39,000	3,420	4,680	314	558	3,686	22,650	1.58
330	195,000	17,100	23,400	-12,575	1,993	12,550	30,741	1.16
400	52,000	4,560	6,240	-35,053	619	2,878	14,291	1.27
402	13,000	1,140	1,560	167	178	1,258	5,802	1.45
404	39,000	3,420	4,680	-41,025	408	1,271	7,040	1.18
408	26,000	2,280	3,120	-10,968	302	1,637	11,657	1.45
415	71,500	6,270	8,580	-4,611	721	4,602	11,272	1.16
423	396,500	34,770	47,580	85,229	4,677	33,657	96,637	1.24
424	13,000	1,140	1,560	167	173	1,258	5,802	1.45
425	16,250	1,425	1,950	131	219	1,536	9,438	1.58
425	35,750	3,135	4,290	-15,081	415	2,250	16,028	1.45
425	312,000	27,360	37,440	-20,120	3,184	20,080	49,186	1.16
430	26,000	2,280	3,120	-10,968	295	1,637	11,657	1.45
431	65,000	5,700	7,800	17,290	1,016	7,375	42,915	1.66
440	32,500	2,850	3,900	-20,696	332	1,533	12,419	1.38
501	39,000	3,420	4,680	12,559	585	4,501	20,417	1.52
502	39,000	3,420	4,680	12[illegible]	584	4,501	20,417	1.52
503	39,000	3,420	4,680	[illegible]	583	4,501	20,417	1.52
505	178,750	15,675	21,450	-[illegible]	1,809	11,512	9,358	1.05
523	19,500	1,710	2,340	-13,[illegible]	172	799	6,583	1.34
530	39,000	3,420	4,680	-16,452	444	2,455	17,485	1.45
533	27,300	2,394	3,276	16,293	424	3,603	16,165	1.59
533	113,750	9,975	13,650	-76,678	1,344	6,297	31,262	1.27
534	32,500	2,850	3,900	8,645	488	3,688	21,458	1.66
535	18,200	1,596	2,184	7,736	259	2,213	9,996	1.55
535	32,500	2,850	3,900	13,815	486	3,952	17,851	1.55
536	45,500	3,990	5,460	12,103	692	5,163	30,041	1.66
537	45,500	3,990	5,460	-16,606	565	3,367	16,017	1.35
546	65,000	5,700	7,800	-42,440	601	2,567	10,294	1.16
556	19,500	1,710	2,340	-21,099	162	535	2,838	1.15
557	6,500	570	780	-6,698	26	170	792	1.12
558	52,000	4,560	6,240	-35,053	590	2,878	14,291	1.27
559	39,000	3,420	4,680	-16,452	432	2,455	17,485	1.45
560	32,500	2,850	3,900	-13,710	352	2,046	14,571	1.45
561	35,750	3,135	4,290	288	477	3,379	20,763	1.58
562	35,750	3,135	4,290	288	476	3,379	20,763	1.58
575	48,750	4,275	5,850	-20,565	546	3,069	21,857	1.45
576	32,500	2,850	3,900	-21,908	348	1,799	8,932	1.27
629	22,750	1,995	2,730	-9,597	230	1,432	10,200	1.45

TABLE 2.15. (contd)

Thermal Energy Storage ERO Economics

Facility Number	First Cost (1986$)	Non-Energy O&M Before ($/yr)	Non-Energy O&M After ($/yr)	First Year Savings Energy (Kwh)	First Year Savings Demand (kW-mo)	First Year Savings Cost (1993$)	Life Cycle Cost NPV ($)	Life Cycle Cost SIR
673	19,500	1,710	2,340	-8,226	189	1,227	8,743	1.45
710	22,750	1,995	2,730	-9,597	228	1,432	10,200	1.45
722	45,500	3,990	5,460	-19,194	501	2,864	20,400	1.45
727	39,000	3,420	4,680	-26,290	422	2,159	10,719	1.27
732	31,850	2,793	3,822	-13,436	334	2,005	14,280	1.45
734	20,150	1,767	2,418	-13,583	192	1,115	5,538	1.27
738	20,150	1,767	2,418	-13,583	191	1,115	(3,340)	0.83
750	81,250	7,125	9,750	-34,275	928	5,114	36,428	1.45
751	42,250	3,705	5,070	-17,823	456	2,659	18,943	1.45
800	58,500	5,130	7,020	472	792	5,529	33,975	1.58
800	117,000	10,260	14,040	-49,356	1,356	7,364	52,456	1.45
810	13,000	1,140	1,560	167	131	1,258	5,802	1.45
925	357,500	31,350	42,900	-36,839	3,610	23,024	18,716	1.05
929	156,000	13,680	18,720	-16,075	1,542	10,047	8,167	1.05
945	39,000	3,420	4,680	-16,452	411	2,455	17,485	1.45
946	65,000	5,700	7,800	-27,420	724	4,091	29,142	1.45
957	13,000	1,140	1,560	167	126	1,258	5,802	1.45
965	32,500	2,850	3,900	419	408	3,145	14,506	1.45
967	13,000	1,140	1,560	105	124	1,229	7,550	1.58
967	57,200	5,016	6,864	-24,130	626	3,600	25,645	1.45
969	20,800	1,824	2,496	-14,021	185	1,151	5,717	1.27
984	39,000	3,420	4,680	-16,452	404	2,455	17,485	1.45
986	130,000	11,400	15,600	-13,396	1,266	8,372	6,806	1.05
989	71,500	6,270	8,580	921	967	6,919	31,914	1.45
989	344,500	30,210	41,340	-232,226	4,089	19,070	94,680	1.27
989	698,750	61,275	83,850	48,003	7,521	52,235	66,542	1.10
990	19,500	1,710	2,340	251	210	1,887	8,704	1.45
990	32,500	2,850	3,900	-21,908	319	1,799	8,932	1.27
991	15,600	1,368	1,872	201	152	1,510	6,963	1.45
992	19,500	1,710	2,340	-13,145	160	1,079	5,359	1.27
996	26,000	2,280	3,120	-17,526	238	1,439	7,146	1.27
998	84,500	7,410	10,140	7,256	790	6,031	5,316	1.06
1316	26,000	2,280	3,120	-17,526	236	1,439	7,146	1.27
1353	26,000	2,280	3,120	-17,526	235	1,439	7,146	1.27
1364	140,400	12,312	16,848	-14,468	1,361	9,042	7,350	1.05
1365	104,000	9,120	12,480	-70,106	1,175	5,757	28,583	1.27
1369	19,500	1,710	2,340	251	200	1,887	8,704	1.45
1380	208,000	18,240	24,960	14,289	2,177	15,549	19,808	1.10
1492	19,500	1,710	2,340	-13,145	151	1,079	5,359	1.27
1493	18,200	1,596	2,184	234	179	1,761	8,123	1.45
3655	32,500	2,850	3,900	-21,908	306	1,799	8,932	1.27
3656	16,250	1,425	1,950	209	148	1,572	7,253	1.45
3659	65,000	5,700	7,800	-41,392	618	3,065	14,792	1.23

2.4.4 Install Gas Engine-Driven Chillers and Utilize Waste Heat for Cogeneration

Description

Chillers are typically driven by electric motors, either internal or external. However, it is possible to use a natural gas-fired engine to drive chillers. The waste heat from the engine's radiator and the hot exhaust gases can then be recovered and used to heat water for use at the facility. Patrick AFB has very few facilities that have significant hot water requirements during the cooling season. The only notable facilities are the hospital, technical laboratory and dormitories.

This ERO examines replacing the existing chillers with natural gas engine driven chillers at selected facilities.

Assumptions

Technical assumptions are as follows:

- Chiller sizes, efficiencies, and energy consumption assumptions are the same as ERO 2.4.1.
- Hot water requirements for the facilities are based on data from either natural gas meters or energy-use intensity (EUI) information provided by Florida Power & Light (FPL).
- Present boiler efficiencies are assumed to be 80% and electric water heater energy factors are assumed to be 89%.
- Performance characteristics of the natural gas engine driven chillers are from manufacturer's literature.

Cost assumption is as follows:

- Implementation cost estimates are based on $850/ton.

Results

The results of this analysis are identified in Table 2.16. The natural gas engines are always capable of supplying more hot water than there is demand. It is assumed that this waste heat will be dumped through the engine exhaust gas.

Budget Implications. Table 2.16 identifies 1,746 total tons of refrigeration capacity for a cost of $1,484,100.

Energy and Cost Savings. This ERO is mostly a fuel switching recommendation, from electricity to natural gas. Natural gas engines are less efficient than electrical motors; therefore, net energy consumption will increase. However, natural gas is less expensive than electricity so there is a net cost reduction. Electrical consumption is estimated to be reduced 3,961729 kWh/yr or 13,517.4 MBtu/yr. Natural gas consumption is estimated to increase 269,643 therms/yr or 26,964.3 MBtu/yr. The net result is an increase in energy consumption of 13,446.9 MBtu/yr. Energy costs are estimated to be reduced $133,444/yr.

Energy Security. Because natural gas is on an interruptible rate schedule, a backup fuel supply may be necessary. For some facilities, such as the hospital, this may not be a problem as a back-up fuel already exists. For natural gas engines, liquid propane is the usual standby fuel. The cost estimates do not include any added costs for backup.

Operations and Maintenance. O&M costs are estimated to increase $45,396/yr for the natural gas engines. This estimate is based on a study by Pfrommer (1990) where maintenance costs were estimated from a 150-ton chiller and prorated for the proposed chiller size.

Environmental Issues. Although natural gas is a clean burning fuel, there will be an increase in local emissions because of combustion. The U.S. Environmental Protection Agency (EPA) and Florida State clean air regulations may apply and permits may be required. No permitting costs have been assumed in this analysis, although they may exist. Natural gas engines are also noisier than electric motors; therefore, there will be an increase in noise levels.

TABLE 2.16. Gas Engine-Driven Chiller Analysis

Existing A/C Characteristics and Operating Parameters

Facility Number	Existing A/C Equipment Efficiency kW/ton	Existing A/C Equipment Rating Ton	Existing DHW Equipment Fuel Type	Existing DHW Equipment Efficiency EF	Total A/C FLE Hours	Equiv months on-peak	Chiller Energy On-peak (kWh)	Chiller Energy Off-Peak (kWh)	DHW Energy Electric (kWh)	DHW Energy Gas (therm/yr)	Total Energy Electric (kWh)	Total Energy Gas (therm)	Total Energy Total (MBtu)	On-Peak Demand (kW-mo)
501	1.29	60	Elec	0.89	2,233	9.7	68,694	104,115	76,023	NA	248,832	NA	849	607.3
502	1.29	60	Elec	0.89	2,233	9.7	68,694	104,115	76,023	NA	248,832	NA	849	607.3
503	1.29	60	Elec	0.89	2,233	9.7	68,694	104,115	76,023	NA	248,832	NA	849	607.3
04/505/506	0.85	275	Elec	0.89	2,233	9.7	207,457	314,431	208,107	NA	729,995	NA	2,491	1,834.2
989	0.90	1,075	NG	0.80	2,233	9.7	858,672	1,301,441	NA	79,200	2,160,113	79,200	7,920	7,591.9
1364	0.85	216	NG	0.80	2,233	9.7	162,948	246,971	NA	58,320	409,919	58,320	5,832	1,440.7

Gas Engine Driven Chiller Characteristics and Operating Parameters

Facility Number	Gas Engine A/C Equipment Eff. (hp/ton)	Gas Engine A/C Equipment DHW Recovery (cuft/hp-h)	Gas Engine A/C Equipment DHW Recovery max (Btu/h)	Gas Engine A/C Equipment Rating Ton	Total A/C FLE Hours	Equiv months on-peak	Chiller Energy Gas (therm/yr)	DHW Energy Electric (kWh)	DHW Energy Gas (therm/yr)	Total Energy Electric (kWh)	Total Energy Gas (therm)	Total Energy Total (MBtu)	On-Peak Demand (kW-mo)
501	1.19	9.25	207,605	60	2,233	NA	15,450	14,779	0	14,779	15,450	1,595	0.0
502	1.19	9.25	207,605	60	2,233	NA	15,450	14,779	0	14,779	15,450	1,595	0.0
503	1.19	9.25	207,605	60	2,233	NA	15,450	14,779	0	14,779	15,450	1,595	0.0
04/505/506	1.00	9.10	788,288	275	2,233	NA	58,666	40,457	0	40,457	58,666	6,005	0.0
989	1.00	9.10	3,081,488	1,075	2,233	NA	229,332	NA	15,397	NA	244,729	24,473	0.0
1364	1.00	9.10	619,164	216	2,233	NA	46,080	NA	11,388	NA	57,468	5,747	0.0

Gas Engine Driven Chiller ERO Economics

Facility Number	A/C Rating Ton	First Cost (1986$)	Non-Energy O&M Before ($/yr)	Non-Energy O&M After ($/yr)	First Year Savings Energy (MBtu/yr)	First Year Savings Energy ($/yr)	Life Cycle Cost NPV ($)	Life Cycle Cost SIR
501	60	51,000	3,420	5,040	-746	7,772	-36,702	0.28
502	60	51,000	3,420	5,040	-746	7,772	-36,702	0.28
503	60	51,000	3,420	5,040	-746	7,772	-36,702	0.28
04/505/506	275	233,750	15,675	23,100	-3,514	17,976	-309,522	-0.32
989	1,075	913,750	61,275	90,300	-16,553	67,098	-712,060	0.22
1364	216	183,600	12,312	18,144	85	25,055	97,991	1.53

2.4.5 Convert Hospital to Variable-Air-Volume HVAC System

Description

The hospital air-handling systems are scheduled to be rehabilitated. This ERO evaluates the potential of replacing the existing air-handling systems with variable-air-volume (VAV) air-handling system using variable frequency drives (VFD) for fan speed control. The present air-handling system consists of five main air handlers. AC-1 is identified as a high-pressure dual-duct system. AC-2 and AC-5 are identified as multizone systems. AC-3 and AC-4 are identified as spray coil (constant volume) systems. Energy savings can be achieved by replacing these types of air-handling systems with VAV systems.

Dual-duct air-handling systems achieve comfort control by supplying both warm and cold air ducts to the individual zones. A constant volume of air is supplied to the various control zones through mixing boxes. The required level of temperature control and dehumidification is maintained by properly mixing warm and cold air at the individual control zones. These systems are very good for temperature and humidity control. However, because these systems both heat and cool air, then mix them together, they are very energy intensive.

Multizone air-handling systems achieve comfort control by supplying a constant volume of tempered air to the individual zones. The required level of temperature control and dehumidification is maintained by mixing warm and cold air in mixing boxes at the air-handling unit for supply to the individual control zones. These systems are also good for temperature and humidity control. However, they are also energy intensive, but not as much as dual-duct systems.

Constant volume air-handling systems achieve temperature control by supplying tempered air. A constant volume system has only one control zone, unlike the systems described above. The tempered air is either heated or cooled, but not both. Temperature control is maintained by varying the supply air temperature. There is no humidity control unless reheat is added to the

system. Constant volume systems are only moderately energy intensive, but reheat systems are very energy intensive.

VAV air-handling systems are the least energy intensive air-handling systems. They supply either heated or cooled air at a constant temperature to the control zone, but vary the volume of air to meet changing heating or cooling loads. By supplying a constant air temperature, accurate humidity control is possible; and by varying the amount of supply air to the control zone, accurate temperature control is possible, saving energy in three major areas. First, in the cooling mode, unnecessary heating of cooled air is eliminated. Second, in the heating mode, unnecessary cooling of heated air is eliminated. Third, fan energy is significantly reduced throughout the year because supply air volume is varied to meet actual heating or cooling requirements. There are several methods of varying the volume flow rate of air. Of these methods, VFDs to control the fan motor speed saves the most energy.

Assumptions

Technical assumptions are as follows:

- The number of control zones for AC-1, AC-2, and AC-5 are 61, 8, and 5, respectively, according to the original mechanical schedule.
- The number of control zones for AC-3 and AC-4 are 8 and 11, respectively, based on a typical 750 cfm/zone.
- Each air-handling unit has a supply and return air fan totaling 89 hp.
- Reduction in reheating energy is based on specifications identified in the building construction drawing schedules, which assumes that the average reheat load is 50% of the design reheat capacity during the cooling season. This implies an average 5°F rise in supply air temperature because of reheat for AC-1, AC-2, and AC-5. Reduction in recooling energy is the same as reheating energy.
- The cooling mode occurs 7,057 h/yr from the weather data, assuming cooling occurs when the outside air temperature is above 65°F. The heating mode occurs 513 h/yr from the weather data, assuming heating occurs when the outside temperature is below 55°F.
- Boiler efficiency is assumed to be 80%.
- Chiller efficiency is 0.85 kW/ton.

Cost assumptions are as follows:

- Variable-speed drives for the fan motors are estimated to be $23,875, installed. VAV mixing boxes for the 93 estimated zones, at an average of $1,000 per box, is $93,000. However, this will eliminate the requirement for two multizone air-handling unit mixing stations and 61 dual-duct mixing boxes. If these systems are scheduled to be replaced in the rehabilitation, the cost differential will be less.

- The gas cost is $0.38/therm. The blended electrical cost is $0.053/kWh.

Results

The hospital VAV ERO analysis was conducted as a case study to demonstrate the potential savings due to changing air-handling systems to VAV. Therefore, no LCC analysis was completed and the results are not included in the ERO summary tables in Section 3.0. The estimated energy and dollar savings, and estimated implementation costs are detailed below.

Budget Implications. Because the hospital ductwork is already scheduled to undergo extensive rehabilitation, the additional costs to convert the system to VAV from the existing dual-duct/multizone/constant-volume systems are marginal. However, the cost estimate for converting the system to VAV is $116,875.

Energy and Cost Savings. Energy savings are estimated to be 151,200 kWh/yr, 516 MBtu/yr in reduced chiller load; 26,680 therms/yr, 2,668 MBtu/yr in reduced boiler load; and 363,000 kWh/yr, 1239 MBtu/yr in reduced fan energy for a total energy savings of 4,423 MBtu. Total energy cost reduction is estimated to be $30,742/yr.

Energy Security. This ERO has no impact on energy security.

Operations and Maintenance. O&M costs for a VAV system are not significantly different from dual-duct or multizone systems. The VFDs identified for fan speed control are electronic controls that have no special maintenance requirements. Fan and fan motor maintenance costs should be reduced, and useable life increased, because of the VFD control. Comfort level in terms of temperature and humidity control in the existing constant-volume zones are improved.

Environmental Issues. The new VAV mixing boxes for zone control should be equipped with minimum air flow set points so indoor air quality is not reduced.

2.5 RESIDENTIAL LIGHTING ERO

2.5.1 Replace Existing Lighting With Energy-Efficient Options

Description

Most of the installed lighting in family housing at Patrick AFB is incandescent fixtures. Retrofit fixtures are available that reduce overall energy consumption. Additional energy may be saved with the installation of occupancy sensors for interior lighting, although tenants tend to dismantle these items if they are a nuisance.

Assumptions

Technical assumptions are as follows:

- Approximately 11,000 light fixtures are currently installed in the base housing areas.
- The lighting hours of operation are assumed to be from 6 a.m. to 10 a.m. and 6 p.m. to 11 p.m. daily, for a total of 3,285 hrs/yr.
- Utilization factors were used for this lighting schedule to map the lighting counts with the EUI information provided by FPL.
- PNL's Lighting Technology Screening Matrix (FEMP 1993) computer program was used to determine costs of the retrofits that are feasible for a specific type of existing feature.
- All of the fixtures within the family unit are on the same schedule.
- Existing fixtures are one, two and three bulb incandescent. Utilizing the assumed operating schedule, this represents an annual energy consumption of 5,681,388 kWh.
- Fluorescent fixture replacements are not considered in this evaluation because a limited number of them are used in family housing.
- The terminology for the retrofit opportunities used in the following tables are: electronic ballast (ELC), compact fluorescent (CFL), reflector (REF), ballast (BLST), integral unit (INT), (bulb and ballast are all one unit). If two or more of these items are listed together, then both items are recommended.

- The lumen ratio (lumens/fixture after retrofit versus lumens/fixture before retrofit) is 0.8 or greater.
- The typical number of fixtures per housing unit were obtained from the Patrick AFB Billeting Office. Several different types of housing exist in the Capehart housing area, but for convenience, all units are assumed to have the same configuration.

Results

Results of this analysis are provided in Table 2.17. The most energy-efficient retrofit technology is the installation of compact fluorescent lighting that is an integral unit, which must be installed so that it cannot be removed.

Budget Implications. Installation of the designated retrofit lighting is estimated to cost $478,843, which includes the cost for procurement and installation of the lighting fixtures.

Energy and Cost Savings. It is estimated that this ERO will result in an annual energy savings of 82,469 kWh at a value of $161,100.

Energy Security. These lighting retrofit options should improve energy security because of less dependence on power.

Operations and Maintenance. The estimated O&M cost is $143,837, which represents a decrease in the current estimated O&M cost of $292,824.

Environmental Issues. This ERO has no adverse impact on the environment.

TABLE 2.17. Residential Lighting EROs

Existing Lighting Operating Parameters

Fixture Code	Existing Equipment: Fixture Type	Existing Equipment: Watts Each	Total # of Fixtures	Energy Consumption (kWh): On-Peak	Energy Consumption (kWh): Off-Peak	On Factor	Sum of 12 Monthly Coincident Demands (kW-mo): On-Peak	Sum of 12 Monthly Coincident Demands (kW-mo): Off-Peak
1	INC 3-60	180	6,224	1,217,053	2,677,880	0.75	10,083	#N/A
2	INC 2-60	120	3,112	378,532	832,884	0.75	3,361	#N/A
3	INC 1-60	60	1,556	179,683	395,356	0.75	840	#N/A

Efficient Lighting Operating Parameters

Fixture Code	ERO Fixture: Fixture Type	ERO Fixture: Watts Each	Total # of Fixtures	Energy Consumption (kWh): On-Peak	Energy Consumption (kWh): Off-Peak	On Factor	Sum of 12 Monthly Coincident Demands (kW-mo): On-Peak	Sum of 12 Monthly Coincident Demands (kW-mo): Off-Peak
1	None	54						
2	CFL 2-15 CEI	27	3,112	126,177	277,628	0.75	1,120	#N/A
3	CFL 15 CEIL	15	1,556	59,894	131,785	0.75	280	#N/A

Efficient Lighting ERO Economics

Fixture Code	Economic Parameters: First Cost ($)	Economic Parameters: Existing O&M ($/yr)	Economic Parameters: Retrofit O&M ($/yr)	Economic Parameters: Fixture Life (yr)	First Year Energy & Demand Savings: Energy (kWh)	First Year Energy & Demand Savings: Demand (kW-mo)	First Year Energy & Demand Savings: Energy (1992 $)	First Year Energy & Demand Savings: Demand (1992 $)	First Year Energy & Demand Savings: Total (1992 $)	Life Cycle Cost: NPV ($)	Life Cycle Cost: SIR
2	173,899	41,732	26,234	#N/A	807,611	2,241	27,502	14,004	41,506	729,393	5.19
3	73,319	19,839	15,902	#N/A	383,360	560	13,056	5,252	18,308	251,910	4.44

2.6 COMMERCIAL LIGHTING EROs

2.6.1 Replace Existing Lighting With Energy-Efficient Options

Description

Few, if any, of the existing lamps, ballasts, and light fixtures installed at Patrick AFB are as energy efficient as the retrofit fixtures currently available. Often, energy can also be saved by installing occupancy sensors or making other control and wiring modifications that result in reduced hours of operation. Sometimes the lighting levels can be reduced slightly.

Assumptions

This lighting analysis is based on grouping the base's various lighting configurations within the building classifications into four general schedules, which include most common occurrences. The schedules are as follows:

- Schedule 1: 7 a.m. to 4 p.m., 251 days/yr (365 days, 104 weekend days, 10 holidays). This schedule represents building categories such as ADMIN, CLINIC, COMCATN, DGR, OTHER, R&D, TERMINL, and TRAING.
- Schedule 2: 6 a.m. to 10 p.m., 365 days/yr. This schedule represents building categories such as BRK/ADM, CLUB, DINING, REC, GROCERY, MTRPOOL, HANGAR, MWR, PLT-BLD, RESTRNT, SHOP, SHOP-AIR, SHOP-ELEC, and SHOP-WPN.
- Schedule 3: 10 a.m. to 2 p.m., 365 days/yr. This schedule represents building categories such as CHAPEL, HSG-FAM, WHS, DET-RR, HUT, STOR-UH, and WHS-CLD.
- Schedule 4: 24 h/day, 365 days/yr. This schedule represents building categories such as HOSPITL and SECURITY.
- Within each lighting schedule, utilization factors were used to map the lighting counts with the EUI information provided by FPL.
- PNL's Lighting Technology Screening Matrix (FEMP 1993) computer program was used to determine first costs of fixture upgrades and retrofits that are feasible for a specific type of existing fixture.
- Operating Hours for the various schedules are shown in Table 2.18.

TABLE 2.18. Operating Schedules

Operating Parameters	Sched. 1 (h/yr)	Sched. 2 (h/yr)	Sched. 3 (h/yr)	Sched. 4 (h/yr)
On-Peak Occ.	900	2,154	293	2,154
On-Peak Unocc.	1,255	0	1,862	0
Off-Peak Occ.	1,359	3,686	1,167	6,606
Off-Peak Unocc.	5,246	2,920	5,438	0

Results

The results for schedule 1 through 4 buildings can be found in Tables 2.20 to 2.23.

Budget Implications. The cost to implement the retrofits for schedule 1 buildings will be $1,413,273. The implementation costs for schedule 2 through 4 buildings will be $892,922, $897,960, and $60,382 respectively.

Energy and Cost Savings. The energy and demand cost savings are as follows: schedule 1 buildings (3,948,058 kWh for $134,189, and 7,647 kW-mo for $47,803); schedule 2 buildings (2,176,398 kWh for $73,852 and 3,699 kW-mo for $23,117); schedule 3 buildings (5,186,333 kWh for $175,459 and 6,899 kW-mo for $43,122); and schedule 4 buildings (82,459 kWh for $2791 and 274 kW-mo for $1,711).

Energy Security. This recommendation has relatively little impact on energy security.

Operations and Maintenance. The O&M savings associated with these retrofits are as follows: schedule 1 buildings $67,551; schedule 2 buildings $33,597; schedule 3 buildings $41,484; and schedule 4 buildings $1,456.

Environmental Issues. This ERO has no adverse impact on the environment. Because some energy would be saved, the net effect on the environment will be positive (due to less electrical consumption, thus less generation).

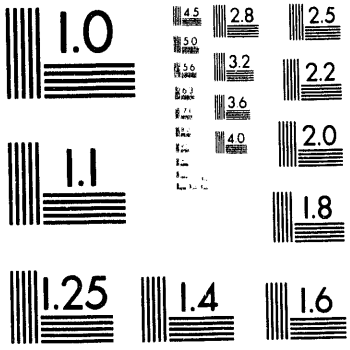
2.6.2 Upgrade Exterior Lighting

The Patrick AFB streets are illuminated by pole-mounted, 135-W low-pressure sodium (LPS) lamps and 55-W high-pressure sodium (HPS) lamps. LPS lamps are used in accordance with regulations affecting federally protected sea turtles. Air Force Regulation 88-15 (USAF 1985), along with direction provided by the United States Fish and Wildlife Service (USFW), has mandated that all exterior lighting that are not mission-, safety-, or security-essential be eliminated from May 1 to October 31 of each year. Furthermore, mission-essential lighting shall be provided by well-shielded LPS light. "Well-shielded" means that each light must be surrounded by a guard that prevents the light from shining on the beach, and the light must be directed only on the work area. If color rendition is critical, an exception can be made by substituting a well-shielded HPS lamp (USAF 1985).

Because of this USAF Regulation (USAF 1985), there are few options for EROs with regard to street lighting. One element that should be considered when changing to the LPS lamps, however, is the wattage of the LPS lamp that is being installed. Base personnel have indicated that 55-W HPS lamps are being replaced with 135-W LPS lamps. On a lumen basis, this is increasing the lighting level approximately six times. By replacing the 55-W HPS lamps with 55-W LPS lamps (3,600 lumens versus 8,000 lumens), there is over 2.2 times the amount of light being produced. Of course, the LPS lamp has poorer color characteristics than the HPS lamp, but the energy consumption will be reduced if 55-W LPS lamps are installed.

Photocells are no longer permitted for use in parking lots, storage areas, or for general lighting unless a mission, safety, or security measure must be met. If a photocell is required, it must be linked to a timer with an LPS lamp (unless color rendition is needed, then an HPS lamp is substituted) (USAF 1985). Although there are few exterior lighting ERO opportunities, the proper LPS lamp wattage should be installed when changing lights.

One area where a retrofit may be possible is the base's ballpark lighting, which currently contains two hundred forty-eight 1,000-W metal halide lamps. Delamping some of these fixtures may be an option using a new super-metal halide lamp with a higher lumen output. Initial calculations


1.0
4.5
2.8
2.5
5.0
3.2
2.2
5.6
3.6
2.0
4.0
1.1
1.8
1.25
1.4
1.6

2 of 3

indicate that approximately every four metal halide lamps currently installed can be replaced with three new super-metal halide lamps.

2.7 OCCUPANCY SENSOR ERO

2.7.1 Install Occupancy Sensors

Description

As in any administrative work environment, lights in office buildings at Patrick AFB are often left on when the areas that they light are unoccupied. Lights are not turned off when staff leave a particular area to go to lunch, attend meetings, or work in different areas. Most lights at the base are turned off at the end of each workday, but remain on for the entire day. Whenever fluorescent lights can be turned off for more than a fraction of a minute, energy savings can be realized. Although it is believed that frequently turning lights off and on leads to premature failure of tubes and ballasts, this is not a major problem and any additional cost is more than offset by energy savings while the lights are off. This ERO affects four building types: administration, chapel, dining, and several shops.

Assumptions

Technical assumptions are as follows:

- For each of the four building types addressed by this ERO, 50% of the affected fixture types can be controlled by occupancy sensors.
- For fixtures controlled by occupancy sensors, the percentage of electricity saved is tabulated as follows:

Building Type	Savings
ADMIN	25%
CHAPEL	20%
DINING	15%
SHOP	25%

- The number and types of fixtures in each building type that are affected by this ERO are shown in Table 2.19.

TABLE 2.19. Fixtures in Patrick AFB Buildings

Bldg. Type	2F34 Fixtures (total)	3F34 Fixtures (total)	4F34 Fixtures (total)	2F40 Fixtures (total)	3F40 Fixtures (total)
ADMIN	799	3921			
CHAPEL				63	26
DINING	259	115	30		
SHOP	222		57		

Cost assumptions are as follows:

- The cost for a wall sensor is $60. Installation labor is approximately $8, for an installed cost of $68/sensor.

Results

The quantitative results of this ERO appear in Tables 2.20 through 2.23. Results for Schedule 1 buildings are discussed below because a majority of the fixtures are installed in those building types.

Budget Implications. The total initial cost of adding occupancy sensors to buildings within Schedule 1 is $320,960.

Energy and Cost Savings. This ERO will save an estimated 232,686 kWh/yr at a value of $11,201. Demand savings are estimated to be 4,669 kW/mo at a value of $4,469. The total savings is estimated to be $15,670/yr.

Energy Security. This recommendation will have little impact on energy security.

Operations and Maintenance. Maintenance cost savings from this ERO are estimated to be $5,965/yr because of reduced lamp replacement. The maintenance cost for the sensors is considered to be minimal.

Environmental Issues. This ERO has no adverse impact on the environment. Electricity consumption and the associated pollution will decrease.

TABLE 2.20. Lighting EROs for Schedule 1 Buildings

Existing Lighting Operating Parameters

Fixture Code	Existing Equipment: Fixture Type	Existing Equipment: Watts Each	Total # of Fixtures	Energy Consumption (kWh): On-Peak	Energy Consumption (kWh): Off-Peak	On Factor	Sum of 12 Monthly Coincident Demands (kW-mo): On-Peak	Sum of 12 Monthly Coincident Demands (kW-mo): Off-Peak
1	1F40ES STD	48	25	1,610	3,841	0.75	11	#N/A
2	2F40ES STD	79	2,182	235,761	571,311	0.75	1,551	#N/A
3	2F40 STD	98	19	1,677	2,532	0.75	17	#N/A
4	4F40ES STD	158	267	60,686	152,373	0.75	379	#N/A
5	3F40ES STD	127	9,866	1,644,388	3,862,618	0.75	11,277	#N/A
6	4F40 STD	196	875	283,348	772,495	0.75	1,543	#N/A
7	6F40 STD	294	80	21,184	31,988	0.75	212	#N/A
8	EXIT INC(2x15)	30	546	35,283	108,207	1	197	#N/A
9	INC 75 Can	75	1,365	134,517	316,275	0.75	921	#N/A

Efficient Lighting Operating Parameters

Fixture Code	ERO Fixture: Fixture Type	ERO Fixture: Watts Each	Total # of Fixtures	Energy Consumption (kWh): On-Peak	Energy Consumption (kWh): Off-Peak	On Factor	Sum of 12 Monthly Coincident Demands (kW-mo): On-Peak	Sum of 12 Monthly Coincident Demands (kW-mo): Off-Peak
Retrofit Only:								
1	1F32T8 ELC	29	25	973	2,320	0.75	7	#N/A
2	2F32T8 ELC	65	2,182	193,981	470,066	0.75	1,276	#N/A
3	None							
4	3F40ES ELC REF	63	267	36,105	90,652	0.75	226	#N/A
5	2F40ES ELC REF	94	9,866	815,720	1,916,102	0.75	8,347	#N/A
6	3F32T8 ELC REF	97	875	140,228	382,306	0.75	763	#N/A
7	None							
8	LED	5	546	5,881	18,035	0.75	25	#N/A
9	CFL 20 + BLST	27	1,365	48,426	113,859	0.75	332	#N/A
Retrofit and Occupancy Sensor:								
2	Retrofit + Sensor	65	799	53,289	129,133	0.75	467	#N/A
2	Original Fixture + Senso	79	799	64,766	156,946	0.75	568	#N/A
5	Retrofit + Sensor	94	3,921	243,139	571,126	0.75	3,317	#N/A
5	Original Fixture + Senso	127	3,921	490,137	1,151,318	0.75	4,482	#N/A

Efficient Lighting ERO Economics

Fixture Code	Economic Parameters: First Cost ($)	Economic Parameters: Existing O&M ($/yr)	Economic Parameters: Retrofit O&M ($/yr)	First Year Energy & Demand Savings: Energy (kWh)	First Year Energy & Demand Savings: Demand (kW-mo)	First Year Energy & Demand Savings: Energy (1992 $)	First Year Energy & Demand Savings: Demand (1992 $)	First Year Energy & Demand Savings: Total (1992 $)	Life Cycle Cost: NPV ($)	Life Cycle Cost: SIR
Retrofit Only:										
1	1,187	87	60	2,158	4	73	27	100	835	1.70
2	114,152	11,367	7,615	143,025	275	4,862	1,718	6,580	49,265	1.43
4	34,655	2,623	1,654	86,302	153	2,931	960	3,891	42,470	2.23
5	1,010,583	68,273	31,571	2,775,184	5,682	94,380	35,518	129,898	1,632,047	2.61
6	126,567	9,988	7,268	533,308	779	18,085	4,870	22,955	281,604	3.22
8	72,799	20,513	0	119,575	164	4,046	1,024	5,070	328,429	5.51
9	53,331	13,828	10,961	288,507	590	9,811	3,686	13,497	206,458	4.87
Retrofit and Occupancy Sensor:										
2	53,780	4,163	2,091	113,195	218	3,847	1,360	5,207	61,524	2.14
2	11,968	4,163	2,091	73,904	142	2,512	888	3,399	74,545	7.23
5	460,312	27,133	9,410	1,374,342	2,814	46,739	17,589	64,329	841,312	2.83
5	58,684	27,133	9,410	547,152	1,120	18,608	7,003	25,610	626,160	11.67

TABLE 2.21. Lighting EROs for Schedule 2 Buildings

Existing Lighting Operating Parameters

Fixture Code	Existing Equipment: Fixture Type	Existing Equipment: Watts Each	Total # of Fixtures	Energy Consumption (kWh): On-Peak	Energy Consumption (kWh): Off-Peak	On Factor	Sum of 12 Monthly oincident Demands (kW-mo): On-Peak	Sum of 12 Monthly oincident Demands (kW-mo): Off-Peak
1	1F40ES STD	48	1,074	46,090	103,600	0.75	464	#N/A
2	1F40 STD	49	965	101,822	243,257	0.75	425	#N/A
3	2F40ES STD	79	1,831	286,800	865,236	0.75	1,302	#N/A
4	2F40 STD	98	83	7,238	16,270	0.75	73	#N/A
5	2F96 STD	175	68	13,822	23,653	0.75	107	#N/A
6	4F40 STD	196	69	29,143	69,623	0.75	122	#N/A
7	3F40ES STD	127	305	83,405	255,792	0.75	348	#N/A
8	4F40ES STD	158	3,297	527,286	1,268,591	0.75	4,689	#N/A
9	4F40 STD	196	518	218,609	663,006	0.75	913	#N/A
10	EXIT 2xPL9	22	413	19,579	60,047	0.75	109	#N/A
11	EXIT INC (2x15)	30	37	2,361	7,242	0.75	13	#N/A
12	EXIT INC (2x20)	40	52	4,503	13,811	0.75	25	#N/A
13	INC 2x60 Ceil	120	35	9,007	27,622	0.75	38	#N/A
14	INC 2x75 lamp	150	2,810	376,696	848,730	0.75	3,793	#N/A
15	INC 60 Ceil	60	658	85,009	203,090	0.75	355	#N/A
16	INC 75 Ceil	75	73	11,807	28,207	0.75	49	#N/A
17	INC 75 spot	75	31	4,963	15,222	0.75	21	#N/A

Efficient Lighting Operating Parameters

Fixture Code	ERO Fixture: Fixture Type	ERO Fixture: Watts Each	Total # of Fixtures	Energy Consumption (kWh): On-Peak	Energy Consumption (kWh): Off-Peak	On Factor	Sum of 12 Monthly oincident Demands (kW-mo): On-Peak	Sum of 12 Monthly oincident Demands (kW-mo): Off-Peak
Retrofit Only:								
1	1F32T8 ELC	29	1,074	27,846	62,592	0.75	280	#N/A
2	1F32T8 ELC REF	37	965	60,262	143,968	0.75	252	#N/A
3	2F32T8 ELC	65	1,831	235,975	711,903	0.75	1,071	#N/A
4	2F40ES ELC REF	63	83	4,653	10,460	0.75	47	#N/A
5	2F96ES ELC REF	105	68	8,293	14,192	0.75	64	#N/A
6	3F32T8 ELC REF	97	69	14,423	34,456	0.75	60	#N/A
7	2F40ES ELC REF	63	305	41,359	126,843	0.75	173	#N/A
8	3F40ES ELC REF	94	3,297	313,702	754,731	0.75	2,790	#N/A
9	3F32T8 ELC REF	97	518	108,189	328,120	0.75	452	#N/A
10	LED	5	413	4,450	13,647	0.75	25	#N/A
11	LED	5	37	394	1,207	0.75	2	#N/A
12	LED	5	52	563	1,726	0.75	3	#N/A
13	CFL 2-11 CEIL FIXT	30	35	2,252	6,906	0.75	9	#N/A
14	None							
15	CFL 11 CEIL FIXT	15	658	21,252	50,773	0.75	89	#N/A
16	CFL 2-9 + BLST	26	73	4,093	9,778	0.75	17	#N/A
17	None							
Retrofit and Occupancy Sensor:								
3	Retrofit + Sensor	65	481	46,500	140,284	0.75	211	#N/A
3	Original Fixture + Sensor	79	481	56,515	170,499	0.75	256	#N/A
7	Retrofit + Sensor	63	115	11,700	35,882	0.75	49	#N/A
7	Original Fixture + Sensor	127	115	23,586	72,335	0.75	99	#N/A
8	Retrofit + Sensor	94	87	6,207	14,934	0.75	55	#N/A
8	Original Fixture + Sensor	158	87	10,434	25,103	0.75	93	#N/A

TABLE 2.21. (contd)

Efficient Lighting ERO Economics

Fixture Code	Economic Parameters			First Year Energy & Demand Savings					Life Cycle Cost	
	First Cost ($)	Existing O&M ($/yr)	Retrofit O&M ($/yr)	Energy (kWh)	Demand (kW-mo)	Energy (1992 $)	Demand (1992 $)	Total (1992 $)	NPV ($)	SIR
Retrofit Only:										
1	50,908	2,191	913	59,252	184	2,017	1,148	3,165	19,480	1.38
2	85,271	5,460	4,872	140,848	173	4,788	1,084	5,872	17,491	1.21
3	95,801	17,007	13,712	204,158	231	6,911	1,442	8,353	88,730	1.93
4	8,464	231	102	8,396	26	286	163	449	707	1.08
5	9,970	392	280	14,990	43	513	267	780	4,214	1.42
6	9,990	946	726	49,887	62	1,696	384	2,080	26,580	3.66
7	31,230	4,460	2,509	170,872	176	5,782	1,098	6,880	108,849	4.49
8	428,310	20,972	10,815	727,444	1,899	24,727	11,871	36,598	313,367	1.73
9	74,937	8,533	6,835	445,305	461	15,072	2,884	17,956	237,624	4.17
10	55,088	8,805	0	61,529	84	2,082	527	2,609	124,019	3.25
11	4,872	1,373	0	8,003	11	271	69	340	21,981	5.51
12	6,969	558	0	16,025	22	542	137	679	12,568	2.80
13	1,693	1,054	736	27,472	28	930	176	1,106	20,895	13.34
15	26,350	8,288	5,170	216,074	266	7,346	1,665	9,011	165,899	7.30
16	3,069	1,228	1,232	26,142	32	889	201	1,090	14,230	5.64
Retrofit and Occupancy Sensor:										
3	32,379	4,468	2702	115,902	131	3,923	818	4,741	70,751	3.19
3	7,208	4,468	2702	75,671	85	2,561	534	3,095	69,704	10.67
7	13,479	1,682	710	80,311	83	2,718	516	3,234	53,225	4.95
7	1,700	1,682	710	31,973	33	1,082	205	1,287	34,002	21.00
8	12,592	553	214	26,240	69	892	428	1,320	13,738	2.09
8	1,292	553	214	11,845	31	403	193	596	13,502	11.45

TABLE 2.22. Lighting EROs for Schedule 3 Buildings

Existing Lighting Operating Parameters

Fixture Code	Existing Equipment: Fixture Type	Existing Equipment: Watts Each	Total # of Fixtures	Energy Consumption (kWh): On-Peak	Energy Consumption (kWh): Off-Peak	On Factor	Sum of 12 Monthly Coincident Demands (kW-mo): On-Peak	Sum of 12 Monthly Coincident Demands (kW-mo): Off-Peak
1	1F40 STD	49	29	737	2,596	0.75	13	#N/A
2	2F40 STD	98	1,711	312,278	964,195	0.75	1,509	#N/A
3	2F96 STD	175	2,137	274,407	917,815	0.75	3,365	#N/A
4	3F40 STD	147	52	3,945	13,900	0.75	68	#N/A
5	4F40ES STD	158	549	63,707	213,083	0.75	781	#N/A
6	4F40 STD	196	8	842	2,966	0.75	15	#N/A
7	EXIT INC(2x20)	40	27	2,329	7,143	0.75	13	#N/A
8	INC 100 Ceil	100	73	3,759	13,243	0.75	66	#N/A
9	INC 150	150	50	3,866	13,621	0.75	67	#N/A
10	INC 2x60 ceil	120	3,965	936,687	2,883,708	0.75	4,282	#N/A
11	INC 50 MR spot	50	12	322	1,135	0.75	6	#N/A
12	INC 75 Ceil	75	3,172	468,378	1,441,959	0.75	2,141	#N/A

Efficient Lighting Operating Parameters

Fixture Code	ERO Fixture: Fixture Type	ERO Fixture: Watts Each	Total # of Fixtures	Energy Consumption (kWh): On-Peak	Energy Consumption (kWh): Off-Peak	On Factor	Sum of 12 Monthly Coincident Demands (kW-mo): On-Peak	Sum of 12 Monthly Coincident Demands (kW-mo): Off-Peak
Retrofit Only:								
1	None							
2	2F40ES ELC REF	63	1,711	200,750	619,840	0.75	970	#N/A
3	2F96ES ELC REF	105	2,137	164,644	550,689	0.75	2,019	#N/A
4	2F40 STD REF	98	52	2,630	9,267	0.75	46	#N/A
5	3F40ES ELC REF	94	549	37,902	126,771	0.75	465	#N/A
6	3F32T8 ELC REF	97	8	417	1,468	0.75	7	#N/A
7	LED	5	27	291	893	0.75	1	#N/A
8	CFL 2-11 CEIL FIXT	30	73	1,128	3,973	0.75	20	#N/A
9	None							
10	CFL 2-11 CEIL FIXT	30	3,965	234,172	720,927	0.75	1,070	#N/A
11	None							
12	CFL 2-9 + BLST	26	3,172	162,371	499,879	0.75	742	#N/A
Retrofit and Occupancy Sensor:								
2	Retrofit + Sensor	63	63	5,545	17,119	0.75	27	#N/A
2	Original Fixture + Senso	98	63	8,625	26,630	0.75	42	#N/A
4	Retrofit + Sensor	98	26	987	3,476	0.75	17	#N/A
4	Original Fixture + Senso	147	26	1,480	5,214	0.75	26	#N/A

Efficient Lighting ERO Economics

Fixture Code	Economic Parameters: First Cost ($)	Economic Parameters: Existing O&M ($/yr)	Economic Parameters: Retrofit O&M ($/yr)	First Year Energy & Demand Savings: Energy (kWh)	First Year Energy & Demand Savings: Demand (kW-mo)	First Year Energy & Demand Savings: Energy (1992 $)	First Year Energy & Demand Savings: Demand (1992 $)	First Year Energy & Demand Savings: Total (1992 $)	Life Cycle Cost: NPV ($)	Life Cycle Cost: SIR
Retrofit Only:										
2	175,234	14,319	11,325	455,883	539	15,425	3,368	18,793	170,909	1.98
3	313,746	12,479	8,975	476,889	1,346	16,114	8,414	24,528	131,717	1.42
4	3,118	156	110	5,948	22	200	144	344	3,087	1.99
5	71,370	3,181	1,544	112,118	316	3,788	1,978	5,766	46,068	1.65
6	1,204	30	9	1,924	7	65	46	111	896	1.74
7	3,604	288	0	8,288	12	280	71	351	6,500	2.80
8	3,537	390	368	11,901	46	402	287	689	7,781	3.20
10	192,685	109,902	76,519	2,865,296	3,211	96,953	20,071	117,024	2,193,024	12.38
12	133,192	58,650	59,063	1,248,087	1,399	42,232	8,743	50,975	672,388	6.05
Retrofit and Occupancy Sensor:										
2	7,405	527	313	24,343	29	824	180	1,004	11,932	2.61
2	952	527	313	11,762	14	398	87	485	10,116	11.63
4	29,303	78	41	4,463	17	151	107	258	-24,615	0.16
4	27,744	78	41	2,231	9	75	54	129	-25,112	0.09

TABLE 2.23. Lighting EROs for Schedule 4 Buildings

Existing Lighting Operating Parameters

Fixture Code	Existing Equipment: Fixture Type	Existing Equipment: Watts Each	Total # of Fixtures	Energy Consumption (kWh): On-Peak	Energy Consumption (kWh): Off-Peak	On Factor	Sum of 12 Monthly Coincident Demands (kW-mo): On-Peak	Sum of 12 Monthly Coincident Demands (kW-mo): Off-Peak
1	2F40ES STD	79	291	22,578	69,245	0.75	207	#N/A
2	2F40 STD	98	152	8,009	24,563	0.75	134	#N/A
3	3F40ES STD	127	304	20,759	63,664	0.75	347	#N/A
4	4F40ES STD	158	108	14,358	44,034	0.75	154	#N/A
5	6F40 STD	294	639	101,170	310,273	0.75	1,691	#N/A

Efficient Lighting Operating Parameters

Fixture Code	ERO Fixture: Fixture Type	ERO Fixture: Watts Each	Total # of Fixtures	Energy Consumption (kWh): On-Peak	Energy Consumption (kWh): Off-Peak	On Factor	Sum of 12 Monthly Coincident Demands (kW-mo): On-Peak	Sum of 12 Monthly Coincident Demands (kW-mo): Off-Peak
1	2F32T8 ELC	65	291	18,577	56,974	0.75	170	#N/A
2	None							
3	2F40ES ELC REF	63	304	10,298	31,581	0.75	172	#N/A
4	3F40ES ELC REF	94	108	8,542	26,198	0.75	91	#N/A
5	None							

Efficient Lighting ERO Economics

Fixture Code	Economic Parameters: First Cost ($)	Economic Parameters: Existing O&M ($/yr)	Economic Parameters: Retrofit O&M ($/yr)	First Year Energy & Demand Savings: Energy (kWh)	First Year Energy & Demand Savings: Demand (kW-mo)	First Year Energy & Demand Savings: Energy (1992 $)	First Year Energy & Demand Savings: Demand (1992 $)	First Year Energy & Demand Savings: Total (1992 $)	Life Cycle Cost: NPV ($)	Life Cycle Cost: SIR
1	15,251	1,265	775	16,272	37	551	230	781	4,826	1.32
3	31,091	892	258	42,544	175	1,440	1,093	2,533	19,160	1.62
4	14,040	681	349	23,653	62	800	389	1,189	10,093	1.72

2.8 DOMESTIC HOT WATER EROs

2.8.1 Install Solar Hot-Water Heaters in Family Housing

Description

The climate at Patrick AFB makes the use of solar water heating equipment feasible because of the high number of sunny days, virtually year-round. Equipment is available that allows for the installation of a solar water heating system using the existing hot-water tanks. With the addition of a solar collector, a small pump, and piping, a large portion of the hot water consumed by a family is supplied by the solar heating system.

Assumptions

Technical assumptions are as follows:

- Current hot-water consumption in an average housing unit is characteristic of a family of three.
- The estimated yearly electricity consumption for heating water is 3,030 kWh in an average three-person housing unit. This value was obtained from FPL.
- It is assumed that a 70% savings can be achieved on domestic hot-water heating by installing solar hot-water heaters. This assumption was provided by FPL and confirmed by the Florida Solar Energy Center (FSEC).
- The total number of units is 1,606 (1,556 family housing units and 50 TLF units).

Cost assumptions are as follows:

- The cost of a solar hot-water heating system, with mounting hardware, is $542/unit. The system is approved by the FSEC.
- The installation cost is $156/unit, based on the assumption that two maintenance personnel work for three hours at a labor rate of $20/h. An additional 30% is included for contingencies.

Results

The quantitative results of this ERO appear in Table 2.24. The facilities affected by this ERO include Capehart and Wherry family housing, as well as the TLF. Specific housing units affected by this ERO, along with affected area values, are shown in Table 2.24. Although the north housing units will

be demolished, it is assumed that they will be replaced with the same number of units; thus the value of this ERO will be unchanged.

Budget Implications. The total initial cost of adding solar water heating systems to all of the housing units is $1,120,988.

Energy and Cost Savings. This ERO will save an estimated 2,120 kWh/yr for each unit at an approximate value of $116. The total electricity saved for all 1,606 units totals 3,404,077 kWh/yr. At an average electricity cost of 5.5 cents/kWh, this ERO will save an estimated $187,340/yr.

Energy Security. This recommendation will have little impact on energy security. If the solar heating system fails or becomes ineffective, the electric backup coil in the hot-water tank will continue to provide hot water.

Operations and Maintenance. Solar hot-water systems generally do not require maintenance if no component failures occur. The systems require infrequent repair, like the existing water heaters, and the maintenance cost increase is negligible. Major components of the system are maintenance-free. A small pump is used, along with an electric timer, to circulate water through the system. These items are typically guaranteed for one year and are relatively inexpensive to replace should they fail. A freeze protection valve ensures that the system is not damaged by freezing temperatures.

Environmental Issues. This ERO has no adverse impact on the environment. Because solar energy is utilized, there is no pollution of the environment in producing the hot water, and the pollution that would otherwise be produced in electricity generation is avoided.

TABLE 2.24. Solar Domestic Water Heating in Residential Housing

Existing Hot Water Heater Operation/Characterisics

	Existing Equipment			Operating Schedul		Average	Energy Consumption (kWh)		Sum of 12 Monthly Coincident Demands (kW-mo)	
ID	Application	Size (gal)	# of units	Hrs on-peak	Hrs off-peak	Load (kW/unit)	on-peak	off-peak	on-peak	off-peak
1	Family Hsg: APPR PFY50	40	3	220	537	4	2,640	6,444	#N/A	#N/A
2	Family Hsg: Capehart	40	999	220	537	4	879,120	2,145,852	#N/A	#N/A
3	Family Hsg: Wherry	40	554	220	537	4	487,520	1,189,992	#N/A	#N/A
4	Temporary Lodging Fac. (TL	40	50	220	537	4	44,000	107,400	#N/A	#N/A

Hot Water Heater with Solar Collector System Operation/Characterisics

	Energy Resource Opportunity			Operating Schedul		Average	Energy Consumption (kWh)		Sum of 12 Monthly Coincident Demands (kW-mo)	
ID	Application	Size (gal)	# of units	Hrs on-peak	Hrs off-peak	Load (kW/unit)	on-peak	off-peak	on-peak	off-peak
1	Family Hsg: APPR PFY50	40	3	66	161	4	792	1,933	#N/A	#N/A
2	Family Hsg: Capehart	40	999	66	161	4	263,736	643,756	#N/A	#N/A
3	Family Hsg: Wherry	40	554	66	161	4	146,256	356,998	#N/A	#N/A
4	Temporary Lodging Fac. (TL	40	50	66	161	4	13,200	32,220	#N/A	#N/A

Electric Hot Water Heater/Solar System ERO Economics

	Economic Parameters		First Year Energy & Demand Savings					Life Cycle Cost	
ID	First Cost R1$ (1993)	Life (yr)	Energy (kWh)	Demand (kW-mo)	Energy (1992 $)	Demand (1992 $)	Total (1992 $)	NPV ($)	SIR
1	2,094	10	6,359	NA	216	NA	216	$500	1.24
2	697,302	10	2,117,480	NA	71,958	NA	71,958	$166,485	1.24
3	386,692	10	1,174,258	NA	39,905	NA	39,905	$92,325	1.24
4	34,900	10	105,980	NA	3,602	NA	3,602	$8,333	1.24

2.8.2 Recover Waste Heat from Heat Pumps in Family Housing

Description

Family housing units at Patrick AFB currently use a mixture of ground source and air source heat pumps. The majority of units are ground source heat pumps, except for Capehart housing. All units in Capehart have had, or are scheduled to have, new air source heat pumps installed to replace the older ground source heat pumps. This ERO evaluates the option of installing heat recovery devices, or desuperheaters, to reclaim some of the waste heat given off by the heat pumps as part of the refrigeration cycle. Many units of this type were installed at Patrick AFB family housing units a number of years ago, and most of them were improperly installed, rendering them useless. Some Base personnel have expressed the opinion that equipment of this type is unreliable and somewhat of a "gimmick," mostly because of bad experiences with the previously installed desuperheaters. However, desuperheaters can save electricity if they are properly installed by a contractor who is held accountable for their effective operation.

Assumptions

Technical assumptions are as follows:

- The new air source heat pumps being installed at Capehart housing are 3-ton units.
- The temperature of supply water at Patrick AFB is 70°F, based on data from FSEC.
- The heat pumps in the Capehart housing area have a coefficient of performance (COP) of 1.5.
- Approximately 26% of the heat moved by the heat pump can be recovered by a desuperheater, based on information from National Energy Systems, Inc.
- The annual domestic hot water load of the average Capehart housing unit is 3,030 kW, or 8.27 MBtu (assuming an existing hot water unit efficiency of 88.5%), which is based on an average of three persons per housing unit and information provided by FPL.
- The distribution of energy use by existing hot water heaters is assumed to be characteristic of the base's cumulative load for 1991 (29% on-peak and 71% off-peak).

- The full-load consumption of hot water heaters in Capehart housing is 4 kW, with an average peak coincident demand of 0.553 kW.

Cost assumption is as follows:

- The installed cost of the desuperheater unit is approximately $350.

Results

The quantitative results of this ERO appear in Table 2.25.

Budget Implications. The total initial cost of adding desuperheaters to all Capehart housing units is $349,650.

Energy and Cost Savings. This ERO will save an estimated 1,966,032 kWh/yr at a value of approximately $74,592. Annual demand savings will be approximately 482 kW-mo at a value of $3,011. Total savings will be approximately $77,603/yr.

Energy Security. This recommendation will have little impact on energy security.

Operations and Maintenance. Quality desuperheater systems, when properly installed, should have no impact on O&M. Failed systems result in increased electricity consumption, but require no maintenance unless the unit is replaced.

Environmental Issues. This ERO has no adverse impact on the environment. Electricity consumption, and the associated pollution, will decrease. Waste heat is utilized, rather than being dumped to the atmosphere, resulting in decreased thermal pollution.

TABLE 2.25. Heat Recovery (Desuperheaters) in Capehart Housing

Existing Hot Water Heater Characteristics and Operating Parameters

	Existing Equipment		Operating Schedule		Full-load	Energy Consumption		Sum of 12 Monthly	
		# of	Hrs	Hrs	Demand	(kWh)		Coincident Demand (kW-mo)	
ID	Description	Units	on-peak	off-peak	(kW)	on-peak	off-peak	on-peak	off-peak
1	Hot water heater	999	220	537	4.0	879,120	2,145,852	553	NA

Desuperheater ERO Characteristics and Operating Parameters

	Energy Resource Opportunity		Operating Schedule		Full-load	Energy Consumption		Sum of 12 Monthly	
		# of	Hrs	Hrs	Demand	(kWh)		Coincident Demand (kW-mo)	
ID	Description	Units	on-peak	off-peak	(kW)	on-peak	off-peak	on-peak	off-peak
1	Hot water heater w/ desuperheate	999	77	188	4.0	307,692	751,248	71	NA

Desuperheater ERO Economics

	First Cost		First Year Energy & Demand Savings					Life Cycle Cost	
	RI	Life	Energy	Demand	Energy	Demand	Total	NPV	
ID	($)	(yr)	(kWh)	(kW-mo)	(1992 $	(1992 $)	(1992 $)	$	SIR
1	349,650	8	1,966,032	482	74,592	3,011	77,603	252,964	1.72

2.8.3 Install High-Efficiency Electric Water Heaters

Description

The electric water heaters at Patrick AFB are approximately 5 years old, on the average. This ERO explores two options: converting to high-efficiency electric water heaters and converting to an air source electric heat pump water heater.

Assumptions

- The total area in family housing is 1,873,722 ft^2.
- The EUI for domestic hot water is 1.29 $kWh/ft^2 \cdot yr$. This value was obtained from FPL data.
- The total number of family housing units involved in this ERO is 1,556.
- The standard efficiency (energy factor) of the existing water heaters is 0.855.
- The energy factor of the high-efficiency electric water heater is 0.955.
- The energy factor of the air source electric heat pump water is 3.10.
- The average cost of electricity (including demand) is $0.053/kWh.
- The existing domestic hot water heaters are 30- and 40-gal units.

Results

The complete quantitative analysis of this ERO appears in Table 2.26.

Budget Implications. The estimated initial cost (including labor) of implementing the high-efficiency electric water heater ERO is $637,960. The cost of going to an air source heat pump water heater is $2,256,200.

Energy and Cost Savings. It is estimated that this ERO will save a total of 177,169 kWh/yr if the high-efficiency electric water heater is chosen. If the air source electric heat pump water heater is chosen, an estimated 1,727,058 kWh will be saved. These savings have an annual value of $9,390 and $91,534, respectively.

Energy Security. These recommendations will have little impact on energy security.

Operations and Maintenance. These recommendations will have little impact on O&M.

Environmental Issues. This ERO will reduce electricity consumption, resulting in reduced pollution.

TABLE 2.26. Family Housing Domestic Hot Water EROs

Existing Hot Water Heater Parameters

ID	Existing Equipment Application	Size (gal)	# of units	Efficiency	Energy Consumption (kWh)	Sum of 12 Monthly coincident Demands (kW-mo) on-peak	off-peak
1	Elec. Wtr. Htrs	40	1,556	0.855	2,417,101	#N/A	#N/A

High Efficiency Electric or Electric Heat Pump Parameters

ID	Existing Equipment Application	Size (gal)	# of units	Efficiency	Energy Consumption (kWh)	Sum of 12 Monthly coincident Demands (kW-mo) on-peak	off-peak
1	Elec. Wtr. Htrs (High Eff)	40	1,556	0.955	2,239,932	#N/A	#N/A
2	Electric Heat Pump	40	1,556	3.100	690,043	#N/A	#N/A

High Efficiency Electric or Electric Heat Pump ERO Economics

ID	Economic Parameters First Cost ROF$	First Cost RI$ (1993)	Life (yr)	First Year Energy & Demand Savings Energy (kWh)	Demand (kW-mo)	Energy (1992 $)	Demand (1992 $)	Total (1992 $)	Life Cycle Cost (RI) NPV ($)	SIR	Life Cycle Cost (ROF) NPV ($)	SIR
1	524,357	637,960	10	177,170	NA	6,020	NA	6,020	-489,926	0.23	-142,409	0.71
2	1,854,432	2,256,200	10	1,727,058	NA	58,687	NA	58,687	-2,182,646	0.03	-1,176,864	0.31

2.9 RESIDENTIAL HVAC ERO

2.9.1 Switch From Air Source to Ground-Coupled Water Source Heat Pumps

Discussion

The majority of family housing units at Patrick AFB presently use ground-coupled water source heat pumps. The ground water is the heat sink used in the refrigeration cycle. Therefore, the water source heat pumps are referred to as ground coupled. Because ground temperatures, and therefore groundwater temperatures, are usually moderate and do not vary considerably throughout the year, ground-coupled water source heat pumps are one of the most efficient heating and cooling systems available today.

The family housing units in south housing are currently being refurbished using air source heat pumps. These systems are not as effective, nor as efficient, as ground-coupled water source heat pumps.

This ERO compares the energy consumption that would result by alternative heating and cooling systems in family housing units.

Assumptions

- Present heating and cooling energy consumptions are estimated using FPL EUIs. The heating and cooling loads are then modified based on changes in equipment efficiency as shown in Table 2.27.
- Because specific load factors and demand ratings cannot be readily assumed, the average electrical energy cost, including demand, is used to determine energy costs.
- There are 1,556 family housing units with a total area of 1,873,722 ft^2, as identified in Wahlstrom et al. (1993).
- Only 144 housing units have been converted to air source heat pumps.
- Equipment cost estimates are from the 1992 MEANS Cost Data (Means 1992).

Results

Table 2.27 identifies annual energy costs for the various heating and cooling alternatives and provides potential annual savings as compared to the existing heating and cooling system. The only option that was included in the

LCC analysis was replacing the 144 air source heat pumps with ground-coupled water source heat pumps, as described below.

The base has converted approximately 144 family units to air source heat pumps and is in the process of converting the remainder of the units. Because of the other renovations occurring in the housing units, the 3-ton air source heat pumps are oversized. The oversized units result in an increased implementation cost, decreased unit efficiency, decreased comfort because of reduced dehumidification effectiveness, and increased energy consumption.

Budget Implications. Replacing the 144 air source heat pumps with ground-coupled water source heat pumps is estimated to cost $155,200. If the units are replaced on failure, the implementation cost for ground-coupled heat pumps is estimated to be $100,800 less than the cost of the air source heat pumps. This assumes the ground-coupling system is readily accessible.

Energy and Cost Savings. Replacing the 144 air source heat pumps with ground-coupled heat pumps is estimated to reduce electricity consumption by 179,615 kWh/yr at a value of $9,520/yr.

Energy Security. This recommendation has little impact on energy security.

Operations and Maintenance. This ERO should have minimal impact on O&M.

Environmental Issues. There is some concern about groundwater depletion in the area. Because the groundwater is used only for a heat sink, the water can be reinjected into the water table with no environmental effects. There is a reason for concern if the water is routed to sewer drains. Site visits did not confirm where the existing groundwater is going after use.

TABLE 2.27. Family Housing HVAC EROs

Existing HVAC Characteristics and Operating Parameters

ID	Cooling Source	Efficiency	Heating Source	Efficiency	Number of Units	Energy Consumption Electric (kWh/yr)	Energy Consumption NG (therms/yr)
1	Ground coupled heat pump	14.50 SEER	Ground coupled heat pump	3.00 COP	1,412	3,876,921	0
2	Air Source HP (std eff)	10.00 SEER	Air Source HP (std eff)	6.80 HSPF	144	574,995	0

Alternative HVAC Characteristics and Operating Parameters

ID	Cooling Source	Efficiency	Heating Source	Efficiency	Number of Units	Energy Consumption Electric (kWh/yr)	Energy Consumption NG (therms/yr)
1a	A/C (standard efficiency)	10.00 SEER	Resistance Heat	100% AFUE	1,556	6,707,925	0
1b	A/C (standard efficiency)	10.00 SEER	Gas Heat (standard efficiency)	62% AFUE	1,556	5,714,852	54,651
1c	A/C (standard efficiency)	10.00 SEER	Gas Heat (vent damper)	68% AFUE	1,556	5,714,852	49,829
1d	A/C (standard efficiency)	10.00 SEER	Gas Heat (power combustion)	76% AFUE	1,556	5,714,852	44,584
1e	A/C (standard efficiency)	10.00 SEER	Gas Heat (condensing)	94% AFUE	1,556	5,714,852	36,046
1f	Air Source HP (std eff)	10.00 SEER	Air Source HP (std eff)	6.80 HSPF	1,556	6,213,141	0
1g	Air Source HP (high eff)	13.00 SEER	Air Source HP (high eff)	8.20 HSPF	1,556	4,809,255	0
1h	Ground coupled heat pump	14.50 SEER	Ground coupled heat pump	3.00 COP	1,556	4,272,301	0

Alternative HVAC Economic Parameters

ID	Qty	First Cost (a) ($)	Energy Consumption and Cost: Gas (therm/yr)	Electric (kWh/yr)	Electric ($/yr)	Gas ($/yr)	Total ($/yr)
1a	1,556	2,738,560	0	6,707,925	355,520	0	355,520
1b	1,556	NA	54,651	5,714,852	302,887	20,838	323,725
1c	1,556	NA	49,829	5,714,852	302,887	19,000	321,887
1d	1,556	3,415,420	44,584	5,714,852	302,887	17,000	319,887
1e	1,556	4,387,920	36,046	5,714,852	302,887	13,745	316,632
1f	1,556	2,334,000	0	6,213,141	329,296	0	329,296
1g	1,556	3,656,600	0	4,809,255	254,890	0	254,890
1h	1,556	1,244,800	0	4,272,301	226,432	0	226,432

(a) NA - Equipment below federal efficiency standards and not applicable.

Replace Air-Source Heat Pumps with Ground-Source Heat Pumps ERO Economics

ID	Qty	ROF or RI	Cost (19993$)	Energy Savings ($/yr)	Life Cycle Cost: NPV ($)	Life Cycle Cost: Value Index
2	144	RI	115,200	9,520	-966,469	0.60
2	144	ROF	-100,800	9,520	1,296,699	1.80

2.10 RESIDENTIAL APPLIANCE ERO

2.10.1 Install Energy-Efficient Dishwashers

Description

Between 1972 and 1980, the average efficiency of household dishwashers improved by 35%, even though the U.S. Department of Energy (DOE) does not set efficiency standards for dishwashers in the same manner as for refrigerators and window air conditioners. The most recent dishwasher requirement is that all units produced after 1988 must have an energy-saving drying cycle (no-heat dry). Improvements in efficiency between 1972 and 1989 were because of improved technology and design, such as decreased water consumption, efficient motors, and more efficient drying cycles. Therefore, it is believed that new models, which are currently available, are considerably more efficient than the units in place at Patrick AFB. This ERO is not considered as an ROF option because units that fail are assumed to be replaced with new units.

Assumptions

Technical assumptions are as follows:

- The average efficiency of existing dishwashers at Patrick AFB is midway between the average 1972 efficiency and the average 1989 efficiency. Because average energy consumption decreased 35% in this period, the existing units are assumed to consume roughly 17% less energy than those produced in 1972.
- The energy efficiency of the 1989 dishwashers is 5% less efficient than the 1993 units. Therefore, the 1993 dishwashers consume roughly 5% less energy than the 1989 units, and only 75% of the energy consumed by the units currently in use at the base.
- Based upon operating conditions that are considered to be typical, the yearly electrical consumption of the existing dishwashers is 1,111 kWh/yr.
- Dishwashers are assumed to operate, on average, 1.5 h/day and 5 days/wk.

Cost assumption is as follows:

- The installed cost of new dishwashers is approximately $420/unit.

Results

Complete quantitative results of this ERO appear in Table 2.28.

Budget Implications. The initial cost of this ERO for all housing units is $677,880.

Energy and Cost Savings. The annual electricity savings from this measure is estimated at 446,917 kWh at a value of $17,284, and the demand savings is estimated at 138 kW/mo at a value of $865, for a total yearly savings of $18,150.

Energy Security. This recommendation will have little impact on energy security.

Operations and Maintenance. New dishwasher units will have minimal O&M impact. Newer units may decrease maintenance requirements because of their increased reliability over older units.

Environmental Issues. This ERO will result in decreased pollution because of lower energy consumption.

TABLE 2.28. Energy-Efficient Domestic Dishwasher ERO

Existing Dishwasher Operation/Characterisics

	Existing Equipment		Operating Schedul		Average	Energy Consumption (kWh)		Sum of 12 Monthly Coincident Demand (kW-mo)	
ID	Application	# of units	Hrs on-peak	Hrs off-peak	Load (kW/unit)	on-peak	off-peak	on-peak	off-peak
1	Family Housing	1,614	195	195	2.840	893,833	893,833	554	#N/A

Energy Efficient Dishwasher Operation/Characterisics

	ERO Equipment		Operating Schedul		Average	Energy Consumption (kWh)		Sum of 12 Monthly Coincident Demand (kW-mo)	
ID	Application	# of units	Hrs on-peak	Hrs off-peak	Load (kW/unit)	on-peak	off-peak	on-peak	off-peak
1	Family Housing	1,614	195	195	2.130	670,375	670,375	415	#N/A

Efficient Dishwasher ERO Economics

	Economic Parameters		First Year Energy & Demand Savings					Life Cycle Cost	
ID	First Cost RI$ (1993)	Life (yr)	Energy (kWh)	Demand (kW-mo)	Energy (1992 $)	Demand (1992 $)	Total (1992 $)	NPV ($)	SIR
1	677,880	10	446,917	138	17,284	865	18,150	-303,378	0.55

2.11 BOILER EROs

2.11.1 Tune Up Boilers

Description

There are 50 boilers at Patrick AFB. These boilers should be combustion tested on a routine basis and tuned-up on an as-needed basis as part of a regular maintenance program. A boiler tune-up will include mechanical adjustments to controls (linkage, control elements, controller), refractory repair, and cleaning or replacing tips/orifices. Once the mechanical adjustments are complete, the operating conditions can be adjusted to increase efficiency. The boilers' combustion is presently being tested using a carbon dioxide (CO_2) gas absorption process, which should be replaced with an electronic oxygen (O_2) and carbon monoxide (CO) combustion analyzer. CO_2 cannot be used for fine-tuning boilers because the amount of CO_2 decreases with both excess air (an energy waste) and deficient air (an energy waste and hazardous operating condition). However, O_2 always increases with excess air. The air-to-fuel ratio should be checked and adjusted for all possible firing rates. Excess O_2 should be reduced to the minimum level so that CO does not exceed 200 ppm. The amount of O_2 in the stack gases should be around 1.5% to 2.0% for natural gas at high fire. If the level of O_2 is greater when CO is around 200 ppm, then the air mixing vanes are worn and should be replaced.

Adjusting the excess air in the boilers at the base will improve their operating efficiency, as well as minimize soot buildup on heat transfer surfaces caused by incomplete combustion. Regular testing of excess air should be done at least monthly, with fine tuning as needed.

Assumptions

Technical assumptions are as follows:

- An average efficiency improvement of 2% is anticipated.
- The extent of efficiency improvement by tuning a boiler is based on interviews with boiler steam plant operating staff. Boilers are presently combustion tested on a routine basis using a Bacharach CO_2 gas absorption process. The boilers are operated to achieve an 8% CO_2 level in the exhaust stack gases. This level corresponds to 40% excess air, which indicates that a 2% reduction in fuel consumption can be achieved.

- Boiler fuel consumption consists of 23,819 MBtu of natural gas and 7,313 MBtu of No. 2 fuel oil.
- The marginal cost of natural gas is $0.3813/therm.
- The marginal cost of fuel oil is $1.03/gal.
- The energy content of fuel oil is 140,000 Btu/gal.
- The total number of boilers to tune up is 50.

Cost assumptions are as follows:

- The reported cost of a boiler tune-up varies between $100 and $500/boiler for boilers in the size range of those at Patrick AFB. An average cost of $250/boiler was established based on conversations with HVAC maintenance contractors.
- The combustion analyzer is estimated to cost $5,000, with an annual O&M cost of $500.

Results

Complete quantitative results of this ERO appear in Table 2.29.

Budget Implications. At an average cost of $250/boiler tune-up, the initial cost of this measure is estimated to be $12,500. In addition, a portable combustion gas analyzer should be purchased for periodic testing and fine tuning the boilers. The analyzer should, at a minimum, monitor and display O and CO, stack temperature rise, and calculate combustion efficiency.

Energy and Cost Savings. An average improvement in boiler operating efficiency of 2% will result in an annual energy savings of 4,764 therms (476.4 MBtu), at a value of $1,816 for natural gas and an annual energy savings of 1,045 gal (146.3 MBtu), at a value of $1,076 for fuel oil. The total annual savings is estimated to be 622.7 MBtu at a value of $2,892.

Energy Security. Properly maintaining combustion equipment saves fuel, which inherently improves energy security.

Operations and Maintenance. The O&M personnel at Patrick AFB have the training to perform a routine tune-up on the boilers. They are currently performing this service, however, the procedure needs to be modified. Therefore, there will be minimal impact on O&M.

Environmental Issues. If a condition exists where boilers are operating on deficient air, incomplete combustion is occurring. Here, flue gases will contain unburned hydrocarbons and a higher volume of CO. In a condition of high excess air, the boilers are burning additional fuel, resulting in a higher volume of CO_2 and oxides of nitrogen (NO_x). A tune-up will minimize either of these effects.

2.11.2 Install New Energy-Efficient Boilers

Description

The majority of the boilers at Patrick AFB are standard-packaged scotch marine firetube-type boilers sized for peak load. Although standard, these boilers can provide as high an efficiency as any other available standard, noncondensing-type boilers, provided they are properly tuned. The only methods readily available to significantly increase operating efficiency are: 1) optimally tune the boilers, as identified in Section 2.11.1; 2) replace with condensing-type boilers, as identified in Section 2.11.3; or 3) replace with smaller modular-type boilers. The advantage of modular boilers is in their operation. Net boiler efficiency is highly dependent on load. The lower the boiler load, the lower the efficiency. By using several small boilers instead of one large boiler, the number of boilers operating can be varied based on load, which allows the boilers to be operated at a higher load, therefore at a higher efficiency. The potential energy savings, however, would not justify the high capital cost required to replace any of the existing boilers at the base. This is mainly because of the few operating hours required for boiler operation in the area, specifically for heating.

Other methods to increase operating efficiency include lowering the stack temperature by using firetube turbulators, or by using economizers to preheat feedwater or makeup water. During the site visit, the majority of boilers were not in operation; therefore, the application of these waste heat recovery opportunities could not be reliably analyzed.

2.11.3 Install Natural-Gas Pulse or Condensing Boilers

Description

The boilers at Patrick AFB are typical firetube-type boilers. These boilers are moderately efficient when operated properly. Combustion efficiencies are usually around 80%, resulting in annual fuel utilization efficiencies (AFUEs) between 70% and 75%. Lower AFUEs will result when a hot standby boiler is used for backup. Efficiency also drops off significantly at low loads as the radiative heat losses remain constant, regardless of load, and the prefire and postfire purges become more significant.

This ERO recommends replacing all hot-water boilers with natural gas-fired modular pulse-condensing boilers. Using modular boilers instead of one full-size boiler allows the operating boiler capacity to more closely match the boiler load. Operating the boilers closer to full load can significantly increase the net AFUE. Because the boilers are smaller, cold startup requires less time, usually less than 5 min, thereby eliminating the need for hot standby. Furthermore, modular boilers require less backup capacity. Only one small boiler is usually required, if any, because the probability of multiple units going down is small.

Natural-gas-fired pulse-condensing boilers are also highly efficient with an AFUE of 90%. Stack gas temperatures are kept low, below the condensing temperature of the moisture in the exhaust, usually 100°F to 120°F, which makes the boilers very efficient and reduces the waste caused by excess air.

Assumptions

Technical assumptions are as follows:

- Existing boilers were estimated to be operating at an AFUE of 75%.
- New natural-gas-fired pulse-condensing boilers have an AFUE of 90%.
- Table 2.29 identifies current estimated fuel consumption of the affected boilers by facility number.
- The implementation cost is estimated from 1992 MEANS Cost Data (Means 1991), including equipment, labor, and O&M.

- Estimates provided in Table 2.29 are based on the previous year's fuel consumption.

Cost assumptions are as follows:

- Estimates are based on reducing capacity approximately 25% because of better sizing and reduced backup capacity requirements. The estimated initial cost of this measure is $574,000.

Results

Complete quantitative results of this ERO are found in Table 2.29.

Budget Implications. Actual boiler capacity requirements should be reevaluated prior to implementing this recommendation to minimize the installation of excess capacity.

Energy and Cost Savings. Energy and cost savings are highly dependant on weather conditions for the area because most boilers are used primarily for heating. The total energy savings potential of this ERO is 2,038 MBtu/yr at a value of $11,897.

Energy Security. This ERO will have little impact on energy security.

Operations and Maintenance. Condensing boilers have different operating characteristics than typical firetube type boilers. O&M training is recommended to insure operation at high efficiency and prolong equipment life.

Environmental Issues. Condensing boilers are more efficient than other boilers, resulting in less fuel consumption to meet the demand. Lower fuel consumption results in reduced exhaust emissions and less pollutants. Furthermore, natural gas condensing boilers have lower emission rates for NOx.

TABLE 2.29. Boiler EROs

Existing Boiler Characteristics and Operating Parameters

Fac No	Facility/Type	Boiler Rating (Bohp)	Type	Fuel Type (D,G or O)	Efficiency	Energy Consumption Gas (therm/yr)	Oil (gal/yr)	Total (MBtu/yr)
All	18 Steam Boilers	NA	Stm	G & O	75%	149,800	28,000	18,900
All	32 Hot Water Boilers	NA	HW	G & O	75%	88,527	24,266	12,250
All	All Boilers	NA	Both	G & O	75%	238,327	52,266	31,150
430	Admin	20	HW	O	75%	0	541	75.74
440	Ref	15.5	HW	O	75%	0	419	58.66
629	Admin, HQ	9.7	HW	O	75%	0	262	36.68
632	HQ	28	HW	O	75%	0	757	105.98
650	Wst Trtmt Bldg	8.7	HW	O	75%	0	235	32.9
672	Water Supply Bldg	23.7	HW	O	75%	0	641	89.74
673	HQ Group	8.9	HW	O	75%	0	241	33.74
681	Maintenace Shop	3	HW	O	75%	0	81	11.34
691	Gas Station	10.8	HW	O	75%	0	292	40.88
703	Maintenance Shop	4.4	HW	O	75%	0	119	16.66
810	Terminal, Admin	10	HW	O	75%	0	270	37.8
925	Fire Station	92	HW	G	75%	8,845	0	884.5
945	A.C. Plant Bldg	30	HW	G	75%	2,885	0	288.5
957	Trans/Rec Bldg	7.8	HW	O	75%	0	211	29.54
984	Film Stor Vault	40	HW	O	75%	0	1081	151.34
988	Msl/Space Rsch & Test	13.5	HW	G	75%	1,298	0	129.8
989	Tech Lab	320	HW	G	75%	93,850	0	9385
990	Thrift Shop	6.9	HW	O	75%	0	187	26.18
992	Radome Twr Bldg	8.4	HW	O	75%	0	227	31.78
998	Ed. Center, NCO	40	HW	G	75%	920	0	92
1316	RAPCON Center	25	HW	O	75%	0	676	94.64
1364	BX (mini mall)	51	HW	D	75%	2,860	1379	479.06
1492	Golf Clubhouse	7	HW	O	75%	0	189	26.46
1497	Waste Treat Bldg	8.7	HW	O	75%	0	235	32.9
3695	Chapel	10	HW	O	75%	0	270	37.8

Boiler ERO Characteristics and Operating Parameters

Fac No	ERO Description	Boiler Rating (Bohp)	Type	Fuel Type (D,G or O)	Efficiency	Energy Consumption Gas (therm/yr)	Oil (gal/yr)	Total (MBtu/yr)
All	Tune-up Stm Boilers	NA	Stm	NA	77%	146,804	27,440	18,522
All	Tune-up HW Boilers	NA	HW	NA	77%	86,756	23,781	12,005
All	Tune-up All Boilers	NA	Both	NA	77%	233,560	51,221	30,527
430	Admin	20	HW	G	90%	631	NA	63
440	Ref	15.5	HW	G	90%	489	NA	49
629	Admin, HQ	9.7	HW	G	90%	306	NA	31
632	HQ	28	HW	G	90%	883	NA	88
650	Wst Trtmt Bldg	8.7	HW	G	90%	274	NA	27
672	Water Supply Bldg	23.7	HW	G	90%	748	NA	75
673	HQ Group	8.9	HW	G	90%	281	NA	28
681	Maintenace Shop	3	HW	G	90%	95	NA	9
691	Gas Station	10.8	HW	G	90%	341	NA	34
703	Maintenance Shop	4.4	HW	G	90%	139	NA	14
810	Terminal, Admin	10	HW	G	90%	315	NA	32
925	Fire Station	92	HW	G	90%	7,371	NA	737
945	A.C. Plant Bldg	30	HW	G	90%	2,404	NA	240
957	Trans/Rec Bldg	7.8	HW	G	90%	246	NA	25
984	Film Stor Vault	40	HW	G	90%	1,261	NA	126
988	Msl/Space Rsch & Test	13.5	HW	G	90%	1,082	NA	108
989	Tech Lab	320	HW	G	90%	78,208	NA	7,821
990	Thrift Shop	6.9	HW	G	90%	218	NA	22
992	Radome Twr Bldg	8.4	HW	G	90%	265	NA	26
998	Ed. Center, NCO	40	HW	G	90%	767	NA	77
1316	RAPCON Center	25	HW	G	90%	789	NA	79
1364	BX (mini mall)	51	HW	G	90%	3,992	NA	399
1492	Golf Clubhouse	7	HW	G	90%	221	NA	22
1497	Waste Treat Bldg	8.7	HW	G	90%	274	NA	27
3695	Chapel	10	HW	G	90%	315	NA	32

Table 2.29. (contd)

Boiler ERO Economic Parameters

Fac No	First Cost ($)	Energy Savings (MBtu/yr)	Life (yr)	Energy Savings ($/yr)	O&M Savings ($/yr)	Life Cycle Cost NPV ($)	Life Cycle Cost SIR
All	9500	378	NA	31,206	-9,000	9,264	1.98
All	13000	245	NA	18,470	-16,000	-6,972	0.46
All	17500	623	NA	49,675	-25,000	19,734	2.13
430	14,775	13	25	317	NA	-8,527	0.40
440	10,750	10	25	245	NA	-6,427	0.42
629	6,450	6	25	153	NA	-4,475	0.35
632	19,350	18	25	443	NA	-8,095	0.60
650	6,450	5	25	138	NA	-3,608	0.42
672	17,075	15	25	375	NA	-9,522	0.44
673	6,450	6	25	141	NA	-3,247	0.49
681	2,150	2	25	47	NA	-1,206	0.44
691	8,325	7	25	171	NA	-4,981	0.35
703	4,050	3	25	70	NA	-1,768	0.44
810	8,100	6	25	158	NA	-4,570	0.36
925	64,500	147	25	562	NA	-30,520	0.54
945	21,500	48	25	183	NA	-13,672	0.36
957	6,450	5	25	123	NA	-2,574	0.54
984	27,950	25	25	633	NA	-13,934	0.51
988	10,475	22	25	82	NA	-6,485	0.33
989	227,900	1,564	25	5,964	NA	-83,260	0.64
990	6,075	4	25	109	NA	-1,475	0.70
992	6,450	5	25	133	NA	-3,260	0.46
998	27,950	15	25	58	NA	-23,317	0.18
1316	17,200	16	25	396	NA	-9,325	0.48
1364	36,275	80	25	989	NA	-20,685	0.43
1492	6,075	4	25	111	NA	-1,597	0.68
1497	6,450	5	25	138	NA	-3,608	0.42
3695	6,450	6	25	158	NA	-4,570	0.36

2.11.4 Improve Domestic Hot Water (Dormitories)

Description

Solar collectors are presently installed on top of Building 404 to heat domestic hot water. Although accurate savings are not known, the system operates satisfactorily from an O&M standpoint. Six buildings, Facilities 501-506, are grouped in the west-central portion of the base that provide dormitory space for a total of 952 people. The total area of all six facilities is approximately 166,667 ft^2. This ERO recommends installing solar collectors on these facilities to provide a large portion of the domestic hot water for the tenants.

Assumptions

Technical assumptions are as follows:

- Approximately 106 kWh of equivalent hot water can be supplied annually per square foot to the solar collector area.

Cost assumptions are as follows:

- The installed cost of a solar hot water heating system with 63 ft^2 of collector area, including all valves and piping, is $5,293 (Means 1991). Each additional 63 ft^2 of panel area (three 3-ft by 7-ft panels) costs $1,383 plus 5% of the primary system, or $1,648 for each additional 63 ft^2 of panel area.

Results

The quantitative results of this ERO appear in Table 2.30.

Budget Implications. The total initial cost of adding solar water heating systems to all six of the dormitories is $117,454.

Energy and Cost Savings. This ERO will save an estimated 346,323 kWh/yr at a value of approximately $19,047.

Energy Security. This recommendation will have little impact on energy security. If the solar heating system fails or becomes ineffective for some reason, the existing electric backup system will continue to provide hot water.

Operations and Maintenance. Solar hot water systems generally do not require maintenance if no component failures occur. The systems require

infrequent repair, like the existing water heaters, and the maintenance cost increase is negligible. The system must be a draindown-type to prevent freeze damage.

Environmental Issues. This ERO has no adverse impact on the environment. Because solar energy is utilized, there is no pollution of the environment when producing the hot water, and the pollution that would otherwise be produced in electricity generation is avoided.

TABLE 2.30. Dormitory Solar Hot Water ERO

Dormitory Solar Hot Water ERO Parameters

ID	ERO Type	Area (sq ft)	Panel Sets	First Cost ($)	Life (yr)	Energy Savings (kWh/yr)	Energy and O&M Savings		Life Cycle Cost	
							Energy ($/yr)	O&M ($/yr)	NPV ($)	SIR
1a	Facility 501	25,341	10	20,125	15	59,634	3,280	N/A	4,216	1.21
1b	Facility 502	25,341	10	20,125	15	59,634	3,280	N/A	4,216	1.21
1c	Facility 503	25,341	10	20,125	15	59,634	3,280	N/A	4,216	1.21
1d	Facility 504	25,119	10	20,125	15	59,696	3,283	N/A	4,250	1.21
1e	Facility 505	22,125	9	18,477	15	53,863	2,962	N/A	3,387	1.18
1f	Facility 506	22,125	9	18,477	15	53,863	2,962	N/A	3,387	1.18

2.12 BUILDING ENVELOPE EROs

2.12.1 Improve Ceiling Insulation

Description

The majority of facilities at Patrick AFB are fairly well insulated. Although wall insulation is minimal in some facilities, increasing it is not considered to be a worthwhile ERO because of the relatively low heat gain through the walls and the high cost of adding insulation to the concrete-block facilities. Because more heat is typically gained through poorly insulated ceilings than poorly insulated walls, and because installing additional ceiling insulation is less expensive, adding ceiling insulation is viewed as a much more cost-effective ERO. The majority of facilities at the base have sufficient ceiling insulation. Most administration and dormitory facilities have suspended ceilings with R-22 batt insulation above the ceiling panels. All of the Capehart family housing units have recently been retrofitted with improved insulation, but Wherry housing units have not been updated and are not insulated. In addition, Facility 986 has insufficient ceiling insulation. This ERO applies to Wherry housing units and to Facility 986.

Assumptions

- The total number of Wherry housing units involved in this ERO is 554, in 234 separate buildings.
- The base temperature during cooling hours is 65°F.
- The COP of chiller in Facility 986 is 2.9.
- The COP of housing units is 1.5.
- Ceilings of housing units that are currently not insulated have an overall insulation value of R-4. This is the approximate insulation value of the plywood, plaster, and framing of the ceiling.
- Blown-in cellulose insulation (R-30) is added above the ceiling of the family housing units.
- Batt insulation (R-19) is added to the ceiling of Facility 986.

The cost assumptions are as follows:

- The average costs for upgrading ceiling insulation are $0.39/ft^2 for materials and $0.17/ft^2 for labor.

Results

The complete quantitative analysis of this ERO appears in Table 2.31.

Budget Implications. The estimated initial cost of implementing this ERO on family housing is $416,680. To insulate Facility 986, the estimated cost is $14,850.

Energy and Cost Savings. It is estimated that this ERO will save 15,500 kWh/yr for Facility 986 at a value of $852. In the family housing units, an estimated 3,368,874 kWh/yr will be saved at a value of $185,036.

Energy Security. This recommendation will have little impact on energy security.

Operations and Maintenance. This recommendation will have little impact on O&M.

Environmental Issues. This ERO will reduce electricity consumption, resulting in reduced air pollution.

2.12.2 Install Multiglazed (Double-Pane) Windows

Description

Most facilities at Patrick AFB have single-pane windows. Compared to windows with two panes and an air space between the panes, single-pane windows allow more heat to enter the cooled space of a building during the summer and more heat to escape from a building during the heating season. By installing multiglazed windows, both conductive and radiative heat gain is reduced. This ERO applies to facilities that typically have both a large number of windows and a high cooling load. This ERO will affect the following building types: administration, dormitory, hotel (TLF), family housing, and training.

Assumptions.

- The total number of facilities addressed by this ERO are
  - family housing - 1556 units, 1,873,722 ft^2
  - other facilities - 85 buildings, 1,333,433 ft^2.

- 25% of all windows face north, south, east, and west each.
- The chiller COP, excluding family housing, is 2.9. Family housing units have heat pumps with a COP of 1.5.
- Existing windows have a shading coefficient of 1.0 and a coefficient of heat transfer of 0.98. This ERO calls for double-pane windows with a shading coefficient of 0.88 and a coefficient of heat transfer of 0.51.
- This ERO calculates yearly energy savings based on cooling load reduction only. Heating load reduction is not calculated.
- Because some windows may not be retrofitted for various reasons, this ERO assumes that 80% of all windows are affected.

The cost assumptions are as follows:

- The estimated costs for replacing single-pane windows with double-pane windows are $9/ft^2$ for materials and $8/ft^2$ for labor.

Results

The complete quantitative analysis of this ERO appears in Table 2.31.

Budget Implications. The estimated initial cost of implementing this ERO on family housing is $448,892. The cost of retrofitting the remaining facilities is estimated at $1,294,250.

Energy and Cost Savings. It is estimated that this ERO will save 942,523 kWh/yr for family housing at a value of $51,839/yr. An estimated 1,270,152 kWh will be saved in the remaining facilities at a value of $69,858.

Energy Security. This recommendation will have little impact on energy security.

Operations and Maintenance. This recommendation will have little impact on O&M.

Environmental Issues. This ERO will reduce electricity consumption, resulting in reduced air pollution.

2.12.3 Install Reflective Window Film

Description

Many facilities at Patrick AFB already have reflective film on the exterior surfaces of their windows to reduce radiative heat gain. By reducing the amount of sunlight that enters through the windows, the cooling load can be substantially reduced.

Assumptions

- The facilities addressed by this ERO are
  - family housing - 1556 units, 1,873,722 ft^2
  - TLF - 58 buildings, 64,060 ft^2.
- 25% of all windows face north, south, east, and west each.
- The chiller COP is 1.5.
- Existing windows have a shading coefficient of 1.0. This ERO calls for installing a reflective film that will increase the shading coefficient to 0.30. (A lower shading factor results in less sunlight being transmitted through the window.)

The cost assumption is as follows:

- The estimated cost to install reflective window film is \$3.95/ft^2. This cost includes both materials and labor.

Results

The complete quantitative analysis of this ERO appears in Table 2.31.

Budget Implications. The estimated initial cost of implementing this ERO is \$237,005.

Energy and Cost Savings. It is estimated that this ERO will save 3,580,555 kWh/yr for family housing at a value of \$196,931/yr. An estimated 684,880 kWh will be saved in the remaining facilities at a value of \$37,668.

Energy Security. This recommendation will have little impact on energy security.

Operations and Maintenance. This recommendation will have little impact on O&M.

Environmental Issues. This ERO will reduce electricity consumption, resulting in reduced air pollution.

2.12.4 Weatherize Doors and Openings

Description

Many facilities at Patrick AFB have infiltration rates higher than normal because of poor seals around doors and miscellaneous openings to the outside. By adding weatherstripping to those doors and sealing holes, considerable energy can be saved in cooling and heating. This ERO addresses administration, dormitories, club, training, and family housing building categories. Although infiltration rates and savings potential are difficult to calculate, a rough estimate of savings potential is included.

Assumptions

Technical assumptions are as follows:

- The amount of cooling load because of infiltration of warm air into a building is 15%. The portion of heating load because of infiltration is 25%.
- By implementing this ERO, both cooling load and heating load from infiltration will be reduced by 50%.

The cost assumptions are as follows:

- The cost estimates for implementing the weatherization ERO are as follows:

	Labor ($/1,000 ft^2)	Material ($)
Weatherstripping (Doors)	30	15
Seal Miscellaneous Openings	50	15

Results

The quantitative results of this ERO are presented in Table 2.31.

Budget Implications. The estimated cost to implement this ERO on all facilities in each of the affected building types is $355,366.

Energy and Cost Savings. This ERO will save an estimated 2,867,436 kWh/yr in decreased cooling and heating loads at a value of $67,850. Component savings are listed below:

Building Type	Yearly Savings ($)
ADMIN	23,157
BRK/ADM	9,726
CLUB	1,949
TRAING	705
FAM HSG	32,313

Energy Security. This recommendation will have little impact on energy security.

Operations and Maintenance. This measure has no affect on O&M.

Environmental Issues. This ERO will result in less energy consumed and less pollution.

2.12.5 Install Radiant Barriers

Description

Radiant barriers are reinforced aluminum foil sheets installed in the attic of a structure to reduce radiative heat gain, and thus cooling load, of the structure. The material must be properly installed to be effective, and installation typically must be done at the time of building construction to be cost-effective. Although radiant barriers would decrease the cooling load in building types such as administration and dormitories, the cost of installing the material above the existing ceilings is prohibitively expensive. For this reason, this ERO is considered only for the new construction in Wherry housing.

Assumptions

Technical assumptions are as follows:

- Radiant barriers will reduce the cooling load on the family housing units by an average of 10%.

Cost assumptions are as follows:

- The material cost of the radiant barrier is $0.85/ft^2, and the labor cost for installation at the time of construction is approximately $0.20/ft^2, for a total installed cost of $1.05/ft^2.

Results

Complete quantitative results of this ERO are shown in Table 2.31.

Budget Implications. The total additional cost of installing radiant barriers at the time the new housing units are constructed is estimated to be $717,380.

Energy and Cost Savings. It is estimated that this ERO will result in an annual energy savings of 340,710 kWh at a value of $18,739.

Energy Security. This recommendation will have little impact on energy security.

Operations and Maintenance. This ERO will have no impact on O&M.

Environmental Issues. This ERO will reduce electricity consumption, resulting in reduced air pollution.

TABLE 2.31. Building Envelope EROs

Building Envelope ERO Parameters

ID	ERO Type	Sector	First Cost ($)	Life (yr)	Cooling Energy Savings (kWh/yr)	Heating Energy Savings (kWh/yr)	Energy and O&M Savings: Energy ($/yr)	Energy and O&M Savings: O&M ($/yr)	Life Cycle Cost: NPV ($)	Life Cycle Cost: SIR
1a	Ceiling Insulation	Fac. 989	14,850	25	15,499	NA	852	N/A	-5,898	0.60
1b	Ceiling Insulation	Wherry	416,680	25	3,007,057	361,972	185,297	N/A	1,529,257	4.67
2a	Reflective Window Treatment	TLF	166,002	25	684,880	NA	37,668	N/A	229,582	2.38
2b	Reflective Window Treatment	FAM HSG	448,892	25	3,580,555	NA	196,931	N/A	1,619,221	4.61
3a	Multi-Glazed Windows	ADMIN	623,596	25	541,797	NA	29,799	N/A	-310,656	0.50
3b	Multi-Glazed Windows	BRK/ADM	374,463	25	406,680	NA	22,367	N/A	-139,566	0.63
3c	Multi-Glazed Windows	HOTEL	186,002	25	180,284	NA	9,916	N/A	-61,871	0.63
3d	Multi-Glazed Windows	FAM HSG	448,892	25	942,523	NA	51,839	N/A	95,505	1.21
3e	Multi-Glazed Windows	TRAING	130,190	25	141,391	13,254	89,859	N/A	-40,868	0.69
4a	Weatherization Package	ADMIN	99,440	25	410,190	10,848	23,157	N/A	143,750	2.45
4b	Weatherization Package	BRK/ADM	35,857	25	156,467	20,373	9,726	N/A	66,285	2.85
4c	Weatherization Package	CLUB	2,573	25	34,560	877	1,949	N/A	17,895	7.96
4d	Weatherization Package	TRAING	4,334	25	12,707	108	705	N/A	3,068	1.71
4e	Weatherization Package	FAM HSG	213,156	25	459,363	128,138	32,313	N/A	126,182	1.59
5	Radiant Barriers	Wherry	717,380	25	340,710	NA	18,739	N/A	-520,587	0.27

2.13 VEHICLE ERO

2.13.1 Convert Fleet Vehicles to Compressed Natural Gas

Description

The Patrick AFB motor vehicle fleet consists of 366 "B" category vehicles that presently run on unleaded gasoline, premium unleaded gasoline, or diesel fuel. There are also 65 "E" category vehicles. "B" category vehicles are general transportation vehicles including cars, pickups, trucks, vans, and wagons. "E" category vehicles are material handling vehicles consisting of forklifts, lift trucks, and tractors. All of these vehicles can be converted to operate on compressed natural gas (CNG) as a primary fuel source.

Converting Gasoline Vehicles to Compressed Natural Gas. Most gasoline powered cars and trucks can be converted to operate on CNG in either a single-fuel (CNG only) or a dual-fuel (either gasoline or CNG) configuration. Modifications include changes to the fuel delivery and carburetion system. Fuel injected cars can also be easily converted. The conversion equipment consists of fuel storage cylinders, a pressure regulator, a gas/air mixer, a fuel selector control (for dual-fuel use), and a fuel gage. A typical vehicle can usually be converted to CNG in less than a day.

Converting Diesel Vehicles to Compressed Natural Gas. One of the primary advantages of diesel fuel is its high centane rating, which allows the fuel to autoignite when sufficiently compressed. Compression ignition simplifies the diesel engine, as compared to spark plug engines, by eliminating the spark plugs, distributors, and other electrical components. Ordinarily natural gas will not autoignite because of its low centane rating. Therefore, some means of igniting the alternative fuel must be provided. Some of the proven ignition methods are to add spark plugs, glow plugs, or use a fumigation system. The traditional idea of having a diesel engine burn natural gas means adding spark plugs and associated electronics. Rather than make these extensive engine modifications, a fumigation system can be used. A fumigation system burns natural gas in tandem with diesel fuel. For this type of conversion, diesel is used as a pilot fuel for starting and for low engine

revolution per minute (rpm) operation. The amount of natural gas is increased as engine speed increases. Retrofitting a diesel engine to CNG using a fumigation system is very similar to converting a gasoline engine to CNG. The major difference is the need for an rpm monitoring device to control the mixture of diesel and natural gas. The mixture of fuels is controlled by either mechanical or solenoid switches. Diesel is used to start the engine and is decreased as engine speed increases. When engine speed drops off during gear changes, diesel again becomes the primary fuel.

Assumptions

Table 2.32 identifies all the vehicles at Patrick AFB under consideration for conversion to CNG.

Technical assumptions are as follows:

- Gasoline energy content is 110,000 Btu/gal.
- Diesel energy content is 135,000 Btu/gal.
- CNG fuel efficiency is 7% greater than gasoline or diesel fuel (DOE 1988).
- The fumigation system conversion operates with an overall average fuel mix ratio of 40% diesel and 60% CNG.
- Vehicle mileage, fuel consumption, fuel cost, and O&M costs are based on records maintained by the support contractor for FY92.
- O&M costs for vehicles operating on CNG are estimated to be reduced by as much as 50%. For this analysis, an average 25% reduction is assumed.

The cost assumption is as follows:

- The estimated cost of the CNG refueling station is approximately $150,000. The cost of the station depends on the size of the compressor and the number and capacity of fast-fill and slow-fill stations.

Results

The complete results of this ERO appear in Table 2.32.

Budget Implications. The implementation cost is estimated to be $1,397,000 for all vehicles identified in Table 2.32 and the CNG refueling station. The life of the compressor station should exceed the 25-year LCC

analysis. In addition, the conversion equipment lifetime should also last close to 25 years. Because the life of the conversion equipment is longer than the life of the vehicles, the equipment may be transferred from older vehicles to their replacements.

Another option in implementing this ERO is to specify CNG vehicles in place of gasoline or diesel vehicles as the vehicles are replaced at the end of their life. CNG vehicles are available through normal GSA contracts at costs similar to typical vehicles. Under this plan, only a CNG refueling station is required.

Energy and Cost Savings. It is estimated that this ERO will reduce annual gasoline consumption by 140,421 gal/yr and diesel by 22,989 gal/yr. Natural gas consumption will increase by 172,513 therms/yr. Electrical consumption by the natural gas compressor station is estimated to be 189,000 kWh/yr. Net energy savings will be 653.6 MBtu/yr.

This estimated energy use will result in a fuel cost reduction of $118,146/yr in gasoline and $16,099/yr in diesel, and a cost increase of $65,779/yr in natural gas and $10,000/yr in electricity. The net energy cost reduction is $58,466/yr.

Energy Security. Natural gas is a domestic energy source, whereas most gasoline and diesel fuel rely on imported oil. For this reason, CNG vehicles are less vulnerable to world oil supply problems and cost fluctuations.

Operations and Maintenance. Natural gas has many advantages over liquid fuels, such as gasoline and diesel. It burns more easily and completely. It also burns cooler than gasoline. For these and other reasons, CNG vehicles require less O&M than standard vehicles. Spark plugs last longer and the engine operates cleaner. Oil changes may be less frequent and the oil is still cleaner. Changes in vehicle performance result in reduced engine, transmission, and tire wear. It has been estimated by some sources that these factors may result in increased vehicle life and resale value. Some sources have estimated that O&M costs can be reduced by as much as 50%. Furthermore, with overnight slow-fill stations, operator time is no longer wasted waiting in refueling lines at the beginning or end of the day. For fast-fill

stations, the refueling time is similar to that of standard fuel vehicles. Net reduction in O&M costs are estimated to be $121,917/yr.

Environmental Issues. Natural gas is a much cleaner burning fuel than gasoline or diesel fuel. Emissions are estimated to significantly reduce. Federal and state regulations highly encourage CNG vehicles over standard fuel vehicles because of reductions in emissions.

TABLE 2.32. Compressed Natural-Gas Vehicle ERO

Existing Vehicle Characteristics and Operating Parameters

Cat	Code	Type	Description	Life	Qty	Fuel	Operation (mile/yr)	Operation (h/yr)	Economy (mpg)	Economy (hpg)	Consumption (gal/yr)
B	102	Sedan	Compact, 4 psgr, Class II	7	24	G	272,262	NA	30.6	NA	8,910
B	103	Sedan	Midsize, 5 psgr, Class II	7	4	G	1,106	NA	17.3	NA	64
B	106	Sedan	Compact, Law Enforcement, Class II	3	15	G	193,399	NA	11.9	NA	16,303
B	150	Wagon	Station Wagon, Compact, Class II	7	15	G	147,264	NA	27.6	NA	5,345
B	162	Ambulance	Modular, 4x2	13	3	G	27,443	NA	7.9	NA	3,468
B	163	Ambulance	Modular, 4x4	14	3	G	3,353	NA	8.3	NA	402
B	168	Truck	Panel Truck, 4x2, 6,999 GVW & under	8	31	G	246,599	NA	16.9	NA	14,562
B	177	Truck	Multistop, 4x2, 12,500-16,999 GVW	7	4	G	4,005	NA	12.2	NA	328
B	178	Truck	Multistop, 4x2, 8,500-12,499 GVW	7	1	G	1,555	NA	7.7	NA	201
B	185	Truck	Carryall, 4x2, 6,999 GVW & under	8	25	G	215,696	NA	14.6	NA	14,731
B	188	Truck	Carryall, 4x2, 7 DAX	7	6	G	77,088	NA	20.7	NA	3,719
B	190	Truck	Carryall, 4x4, 7,500 GVW	8	1	G	8,897	NA	14.6	NA	609
B	192	Truck	Carryall, 4x2, Conv, 15 psgr, 7,700 GV	8	3	G	22,818	NA	9.7	NA	2,347
B	193	Truck	Carryall, Low Silhouette, 4x2, 7,100 GV	8	1	G	361	NA	12.4	NA	29
B	198	Truck	Utility, 4x4, 6,000 GVW	8	1	G	888	NA	14.6	NA	61
B	200	Pickup	Compact, 4x2, 4,599 GVW & under	8	95	G	594,727	NA	22.0	NA	27,093
B	204	Pickup	Compact, 4x2, 4,600-5,799 GVW	8	21	G	169,654	NA	16.5	NA	10,296
B	217	Pickup	4 dr cab, 4x2, 5,500 GVW	9	20	G	112,940	NA	12.2	NA	9,231
B	222	Pickup	4 dr cab, 4x4, 7,000-8510 GVW	7	15	G	82,434	NA	10.6	NA	7,777
B	237	Truck	Cargo, 4x4, 12,499 GVW & under	8	5	G	6,115	NA	9.2	NA	663
B	239	Truck	Cargo, 4x4, 17,000-20,999 GVW	9	3	G	6,914	NA	12.9	NA	538
B	261	Truck	Stake, 4x2, 7,000 GVW	9	16	G	98,238	NA	10.0	NA	9,850
B	121	Bus	School, 28-29 psgr, 4x2	14	5	D	31,070	NA	11.8	NA	2,637
B	130	Bus	School, 42-45 psgr, 4x2	14	2	D	13,991	NA	8.8	NA	1,592
B	139	Bus	Intercity, 41-51 psgr, 4x2	12	1	D	8,439	NA	4.6	NA	1,826
B	176	Truck	Multistop, 4x2, 8,499 GVW & under	7	13	D	66,083	NA	11.9	NA	5,566
B	180	Truck	Multistop, 4x2, 1-ton	8	7	D	17,423	NA	10.5	NA	1,666
B	184	Bus	16 psgr, 4x2	8	1	D	7,097	NA	8.9	NA	796
B	191	Truck	Carryall, 4x2, Conv, 9 psgr	9	1	D	7,947	NA	11.9	NA	669
B	211	Pickup	Compact, 4x4, 4,600-5,799 GVW	7	1	D	15,380	NA	40.1	NA	384
B	264	Truck	Stake, 4x2, 12,500-16,999 GVW, 1-1/2 t	9	6	D	23,773	NA	14.0	NA	1,696
B	265	Truck	Stake, 4x2, 10,000 GVW	10	8	D	68,269	NA	14.9	NA	4,578
B	353	Truck	Tractor, 4x2, 24,000-44,500 GVW	11	5	D	45,131	NA	8.9	NA	5,071
B	361	Truck	Tractor, 6x4, 24,000-44,500 GVW	12	4	D	30,297	NA	5.2	NA	5,847
E	801	Tractor	Whse, 4,000-6,999#	11	10	G	NA	2,303	NA	1.1	2,058
E	830	Forklift	2,000-5,999#, ST	11	1	G	NA	141	NA	1.8	79
E	831	Forklift	2,000-5,999#, PT	9	10	G	NA	2,268	NA	1.4	1,639
E	832	Forklift	6,000-9,999#, PT	10	2	G	NA	276	NA	2.3	118
E	816	Forklift	4,000#, PT	8	11	D	NA	4,590	NA	3.1	1,466
E	822	Forklift	6,000-6,200#, PT	10	12	D	NA	4,236	NA	1.9	2,175
E	824	Forklift	15,000#	10	7	D	NA	998	NA	2.6	386
E	940	Lift	Platform, 40K, 463L	8	1	D	NA	296	NA	0.9	319
E	956	Forklift	Huster, 463L, 10K	12	4	D	NA	497	NA	1.3	373
E	957	Forklift	Allis Chalmers, 463L, 10K	12	3	D	NA	496	NA	1.1	462
E	958	Forklift	AT(463L), 10K	10	4	D	NA	829	NA	1.0	805

TABLE 2.32. (contd)

CNG Vehicle Characteristics and Operating Parameters

Cat	Code	Type	Description	Life	Qty	Fuel	Operation (mile/yr)	Operation (h/yr)	Fuel Consumption Gasoline (gal/yr)	Fuel Consumption Diesel (gal/yr)	Fuel Consumption NG (therm/yr)
B	102	Sedan	Compact, 4 psgr, Class II	7	24	NG	272,262	NA	0	NA	9,115
B	103	Sedan	Midsize, 5 psgr, Class II	7	4	NG	1,106	NA	0	NA	65
B	106	Sedan	Compact, Law Enforcement, Class II	3	15	NG	193,399	NA	0	NA	16,678
B	150	Wagon	Station Wagon, Compact, Class II	7	15	NG	147,264	NA	0	NA	5,468
B	162	Ambulance	Modular, 4x2	13	3	NG	27,443	NA	0	NA	3,548
B	163	Ambulance	Modular, 4x4	14	3	NG	3,353	NA	0	NA	411
B	168	Truck	Panel Truck, 4x2, 6,999 GVW & under	8	31	NG	246,599	NA	0	NA	14,897
B	177	Truck	Multistop, 4x2, 12,500-16,999 GVW	7	4	NG	4,005	NA	0	NA	336
B	178	Truck	Multistop, 4x2, 8,500-12,499 GVW	7	1	NG	1,555	NA	0	NA	206
B	185	Truck	Carryall, 4x2, 6,999 GVW & under	8	25	NG	215,696	NA	0	NA	15,070
B	188	Truck	Carryall, 4x2, 7 DAX	7	6	NG	77,088	NA	0	NA	3,805
B	190	Truck	Carryall, 4x4, 7,500 GVW	8	1	NG	8,897	NA	0	NA	623
B	192	Truck	Carryall, 4x2, Conv, 15 psgr, 7,700 GV	8	3	NG	22,818	NA	0	NA	2,401
B	193	Truck	Carryall, Low Silhouette, 4x2, 7,100 GV	8	1	NG	361	NA	0	NA	30
B	198	Truck	Utility, 4x4, 6,000 GVW	8	1	NG	888	NA	0	NA	62
B	200	Pickup	Compact, 4x2, 4,599 GVW & under	8	95	NG	594,727	NA	0	NA	27,716
B	204	Pickup	Compact, 4x2, 4,600-5,799 GVW	8	21	NG	169,654	NA	0	NA	10,533
B	217	Pickup	4 dr cab, 4x2, 5,500 GVW	9	20	NG	112,940	NA	0	NA	9,443
B	222	Pickup	4 dr cab, 4x4, 7,000-8510 GVW	7	15	NG	82,434	NA	0	NA	7,956
B	237	Truck	Cargo, 4x4, 12,499 GVW & under	8	5	NG	6,115	NA	0	NA	678
B	239	Truck	Cargo, 4x4, 17,000-20,999 GVW	9	3	NG	6,914	NA	0	NA	550
B	261	Truck	Stake, 4x2, 7,000 GVW	9	16	NG	98,238	NA	0	NA	10,077
B	121	Bus	School, 28-29 psgr, 4x2	14	5	D,NG	31,070	NA	NA	1,055	1,986
B	130	Bus	School, 42-45 psgr, 4x2	14	2	D,NG	13,991	NA	NA	637	1,199
B	139	Bus	Intercity, 41-51 psgr, 4x2	12	1	D,NG	8,439	NA	NA	730	1,376
B	176	Truck	Multistop, 4x2, 8,499 GVW & under	7	13	D,NG	66,083	NA	NA	2,226	4,193
B	180	Truck	Multistop, 4x2, 1-ton	8	7	D,NG	17,423	NA	NA	666	1,255
B	184	Bus	16 psgr, 4x2	8	1	D,NG	7,097	NA	NA	318	600
B	191	Truck	Carryall, 4x2, Conv, 9 psgr	9	1	D,NG	7,947	NA	NA	268	504
B	211	Pickup	Compact, 4x4, 4,600-5,799 GVW	7	1	D,NG	15,380	NA	NA	154	289
B	264	Truck	Stake, 4x2, 12,500-16,999 GVW, 1-1/2 t	9	6	D,NG	23,773	NA	NA	678	1,278
B	265	Truck	Stake 4x2, 10,000 GVW	10	8	D,NG	68,269	NA	NA	1,831	3,449
B	353	Truck	Tractor, 4x2, 24,000-44,500 GVW	11	5	D,NG	45,131	NA	NA	2,028	3,820
B	361	Truck	Tractor, 6x4, 24,000-44,500 GVW	12	4	D,NG	30,297	NA	NA	2,339	4,405
E	801	Tractor	Whse, 4,000-6,999#	11	10	NG	NA	2,303	0	NA	2,105
E	830	Forklift	2,000-5,999#, ST	11	1	NG	NA	141	0	NA	81
E	831	Forklift	2,000-5,999#, PT	9	10	NG	NA	2,268	0	NA	1,677
E	832	Forklift	6,000-9,999#, PT	10	2	NG	NA	276	0	NA	121
E	816	Forklift	4,000#, PT	8	11	D,NG	NA	4,590	NA	586	1,104
E	822	Forklift	6,000-6,200#, PT	10	12	D,NG	NA	4,236	NA	870	1,638
E	824	Forklift	15,000#	10	7	D,NG	NA	998	NA	154	291
E	940	Lift	Platform, 40K, 463L	8	1	D,NG	NA	296	NA	128	240
E	956	Forklift	Huster, 463L, 10K	12	4	D,NG	NA	497	NA	149	281
E	957	Forklift	Allis Chalmers, 463L, 10K	12	3	D,NG	NA	496	NA	185	348
E	958	Forklift	AT(463L), 10K	10	4	D,NG	NA	829	NA	322	606

TABLE 2.32. (contd)

CNG Vehicle ERO Economics

Cat	Code	Qty	Unit Cost ($/veh)	Total First Cost ($)	Life (yr)	Non-Energy O&M Before ($/yr)	Non-Energy O&M After ($/yr)	Energy Savings ($/yr)	Total Savings ($/yr)	Life Cycle Cost - RI NPV ($)	Life Cycle Cost - RI SIR	Life Cycle Cost - ROF NPV ($)	Life Cycle Cost - ROF SIR
B	102	24	2,000	48,000	7	24,103	18,077	4,050	10,076	89,939	2.87	67,974	2.66
B	103	4	2,000	8,000	7	0	0	29	29	-11,367	-0.42	-9,201	-0.35
B	106	15	2,000	30,000	3	15,450	11,588	7,537	11,399	113,505	4.78	101,138	4.65
B	150	15	3,000	45,000	7	10,227	7,670	2,432	4,989	15,875	1.35	10,428	1.27
B	162	3	3,000	9,000	13	7,339	5,504	1,570	3,405	44,218	5.91	27,065	4.96
B	163	3	3,000	9,000	14	1,488	1,116	139	511	-2,171	0.76	-2,241	0.67
B	168	31	3,000	93,000	8	38,111	28,583	6,699	16,227	133,953	2.44	99,987	2.26
B	177	4	3,000	12,000	7	1,685	1,264	149	570	-8,087	0.33	-6,906	0.33
B	178	1	3,000	3,000	7	440	330	91	201	-1,070	0.64	-972	0.62
B	185	25	3,000	75,000	8	21,747	16,310	6,703	12,140	94,229	2.26	70,622	2.10
B	188	6	3,000	18,000	7	6,730	5,048	1,711	3,394	28,912	2.61	21,836	2.42
B	190	1	3,000	3,000	8	1,819	1,364	272	727	7,533	3.51	5,715	3.23
B	192	3	3,000	9,000	8	3,814	2,861	1,060	2,013	20,200	3.24	15,415	3.00
B	193	1	3,000	3,000	8	142	107	13	48	-3,294	-0.10	-2,714	-0.06
B	198	1	3,000	3,000	8	25	19	27	33	-3,511	-0.17	-2,875	-0.12
B	200	95	3,000	285,000	8	81,264	60,948	12,188	32,504	132,901	1.47	89,363	1.37
B	204	21	3,000	63,000	8	20,827	15,620	4,731	9,938	74,430	2.18	55,298	2.03
B	217	20	3,000	60,000	9	15,124	11,343	3,947	7,728	45,878	1.76	29,930	1.61
B	222	15	3,000	45,000	7	12,661	9,496	3,394	6,560	40,840	1.91	29,989	1.78
B	237	5	3,000	15,000	8	1,994	1,496	296	795	-7,615	0.49	-6,670	0.48
B	239	3	3,000	9,000	9	1,068	801	162	429	-5,043	0.44	-4,265	0.42
B	261	16	3,000	48,000	9	16,271	12,203	4,435	8,503	74,554	2.55	51,696	2.31
B	121	5	4,000	20,000	14	4,396	3,297	347	1,446	1,293	1.06	-1,096	0.93
B	130	2	4,000	8,000	14	7,164	5,373	212	2,003	22,899	3.86	13,431	3.21
B	139	1	4,000	4,000	12	2,673	2,005	509	1,177	13,509	4.38	9,093	3.88
B	176	13	3,000	39,000	7	13,617	10,213	707	4,111	9,940	1.25	5,924	1.18
B	180	7	3,000	21,000	8	9,006	6,755	210	2,462	10,486	1.50	6,942	1.39
B	184	1	4,000	4,000	8	2,145	1,609	98	634	5,056	2.26	3,713	2.09
B	191	1	3,000	3,000	9	572	429	82	225	-192	0.94	-273	0.89
B	211	1	3,000	3,000	7	1,057	793	59	323	832	1.28	508	1.20
B	264	6	3,000	18,000	9	8,352	6,264	203	2,291	12,969	1.72	8,110	1.55
B	265	8	3,000	24,000	10	10,161	7,621	567	3,107	19,797	1.82	12,957	1.66
B	353	5	3,000	15,000	11	5,732	4,299	619	2,052	15,258	2.02	9,519	1.80
B	361	4	3,000	12,000	12	51,367	38,525	725	13,567	199,322	17.61	132,222	14.94
E	801	10	3,000	30,000	11	12,694	9,521	921	4,095	28,480	1.95	16,610	1.70
E	830	1	2,000	2,000	11	1,182	887	36	332	2,745	2.37	1,666	2.05
E	831	10	2,000	20,000	9	12,993	9,745	726	3,974	36,062	2.80	24,636	2.50
E	832	2	2,000	4,000	10	1,934	1,451	53	536	3,315	1.83	2,096	1.64
E	816	11	3,000	33,000	8	17,041	12,781	185	4,445	25,093	1.76	17,355	1.62
E	822	12	3,000	36,000	10	18,954	14,216	277	5,015	33,853	1.94	21,705	1.73
E	824	7	3,000	21,000	10	5,246	3,935	49	1,360	-4,865	0.77	-5,068	0.71
E	940	1	4,000	4,000	8	10,039	7,529	37	2,547	34,803	9.70	26,479	8.74
E	956	4	3,000	12,000	12	2,016	1,512	48	552	-5,437	0.55	-4,663	0.51
E	957	3	3,000	9,000	12	5,546	4,160	58	1,444	12,057	2.34	7,249	2.02
E	958	4	3,000	12,000	10	1,456	1,092	103	467	-7,525	0.37	-6,202	0.37

2.14 ENERGY MANAGEMENT AND CONTROL SYSTEM ERO

2.14.1 Expand Use of EMCS

Description

An energy management and control system (EMCS) is currently used in a limited capacity at Patrick AFB. The system provides on/off control of chillers and/or air-handlers at approximately 49 facilities and monitors the operation of approximately 26 others. Some high-voltage switches in the electrical distribution system are also controlled by the system. This ERO recommends expanding the existing EMCS to control a larger number of facilities.

Assumptions

Technical assumptions are as follows:

- Facilities that are not currently controlled by the EMCS use simple thermostats for on/off control of the chillers and air-handlers, resulting in 24-hour operation of the system to maintain a constant indoor temperature.
- Neither night setback or night shutoff of HVAC equipment is currently practiced in facilities not controlled by the EMCS.
- During occupied hours, the interior temperature is maintained at 65°F.
- Air-conditioning equipment in facilities affected by this ERO is switched on early enough each morning to cool the building to 65°F before the bulk of the occupants arrive. The increased consumption during this recovery period is neglected.
- An estimated 75 control points are required. The required number of points per facility ranges from 2 to 10. An additional 10% are added to account for those facilities that may require more points than initially estimated.

Cost assumption is as follows:

- An average installed cost of $1,000 per control point is assumed.

Results

Complete details of this ERO appear in Table 2.33. The buildings that are affected by this ERO are not currently controlled by the existing EMCS system and have at least 15 tons of chiller capacity. Facilities with small heat pumps of 3 tons or smaller, which amount to more than 15 tons, are not

addressed. The library, Building 576, is not included in this ERO because of the need to maintain humidity control. A total of 19 facilities comprising 305,854 ft^2 qualify for this ERO.

Budget Implications. Implementation of this ERO will cost $75,000.

Energy and Cost Savings. This ERO will save an estimated 777,648 kWh/yr at a value of $42,770/yr at an average electricity cost of $0.055/kWh.

Energy Security. This recommendation will have little impact on energy security. The likelihood of the EMCS system malfunctioning is considered to be no higher than that of the existing thermostatic control system malfunctioning.

Environmental Issues. This ERO will reduce electricity consumption; thus, the environment will be less affected by generating facilities that have environmental impacts.

TABLE 2.33. Expanded EMCS ERO

Existing Chiller/AHU Operation/Characterisics

ID	Equip Code	Building Type	# of Bldgs.	Energy Consumption (kWh) on-peak	Energy Consumption (kWh) off-peak
1	E-1	ADMIN	6	65,846	161,210
2	E-2	COMCATN	8	95,660	234,203
3	E-3	DGR	1	28,548	69,894
4	E-4	MISC	1	6,483	15,872
5	E-5	PLT-BLD	1	2,265	5,545
6	E-6	R&D	2	104,018	254,665
7	E-7	REC	3	18,899	46,270
8	E-8	SHOP-ELC	1	8,159	19,977
9	E-9	WHS	2	7,644	18,714

Chiller/AHU with EMCS Operation/Characterisics

ID	Equip Code	Application: Building Type	Application: # of Bldgs.	# of points	Energy Consumption (kWh) on-peak	Energy Consumption (kWh) off-peak
1	E-1	ADMIN	6	12	74,607	8,290
2	E-2	COMCATN	8	22	108,387	12,043
3	E-3	DGR	1	4	32,346	3,594
4	E-4	MISC	1	2	7,346	816
5	E-5	PLT-BLD	1	6	2,566	285
6	E-6	R&D	2	8	117,857	13,095
7	E-7	REC	3	6	21,413	2,379
8	E-8	SHOP-ELC	1	2	9,245	1,027
9	E-9	WHS	2	6	8,661	962

Chiller/AHU with EMCS Economics

ID	Economic Parameters: First Cost (1993 $)	Economic Parameters: Life (yr)	Energy Savings: Energy (kWh)	Energy Savings: Energy (1992 $)	Life Cycle Cost: NPV ($)	Life Cycle Cost: SIR
1	13,200	20	144,160	7,684	60,273	5.57
2	24,200	20	209,433	11,163	81,790	4.38
3	4,400	20	62,502	3,331	27,653	7.28
4	2,200	20	14,194	757	4,899	3.23
5	6,600	20	4,959	264	-4,991	0.24
6	8,800	20	227,731	12,138	109,069	13.39
7	6,600	20	41,376	2,205	14,068	3.13
8	2,200	20	17,864	952	6,820	4.10
9	6,600	20	16,735	892	1,171	1.18

2.15 GENERATING PLANT ERO

Description

This ERO proposes providing a centralized, on-site standby generation capability for Patrick AFB. The information presented is based on the results of a study by FPL (FPL 1992). The goal of the evaluation was to ascertain the peak electrical demand at the base, determine the capital investment for various sizes of generating plants, determine the projected O&M costs for the variously sized plants, and calculate the savings from FPL's commercial/ industrial load control rate (CALC-1). The various design considerations that were explored include adding the ability to switch the load from the North to the South substation, making sure that rapid block loading and unloading is provided, and also guaranteeing that automated start during control periods or power outages is provided.

Customers with the CALC-1 rate allow the utility to temporarily suspend electric service during times of high system-wide demand. The generators would be required to meet the basewide electric demand during this time. The FPL study examines a range of sizes for the generator plant, from 12.6 MW to 25.2 MW. All of these generators plants are estimated to save approximately $1,378,000 annually, based on the assumption that most of the savings will come from simply switching to the lower CALC-1 rate, and not from the actual operation of the generators.

Patrick AFB would benefit from a centralized standby generator plant in a number of ways. Foremost is the almost 25% cost savings from changing from the existing rate structure to CALC-1. The generator plant would provide more energy security for the base. Because of this generating capability, Patrick AFB could switch over to the plant and produce electricity if required. In addition, improved switching capability between the two substations will be realized.

The FPL study recommends installing a 22-MW generator plant. This plant is large enough to handle 100% of the military operations load during historical peak periods and 100% of all loads during average peak periods. The generator plant would be located between the North and South substations,

providing not only standby power to both substations, but a 13.2-kV connection between the substations as well. This will allow load-switching capability between the two substations. The estimated installed cost, including the new feeder, is $7,080,000 (1992 $). Estimated O&M costs are $54,000 annually. Additional annual operating costs including fuel, paint and muffler costs are estimated to be $65,000 to $162,000, $22,500, and $37,400 respectively. The range of fuel costs is for operating hours from 60 h/yr to 150 h/yr. The FPL study calculates both an SIR and discounted simple payback.

Unfortunately, these results do not comply with federally mandated LCC procedures (10 CFR 436) and, therefore, cannot be compared to other EROs analyzed in this report.

Further research should be conducted to ascertain the LCC effectiveness of building a standby generator plant. The existing and proposed rate structures as they apply to the base should be examined by an independent source. The avoided cost of the generated electricity should be included in the analysis. Also, the possibility of using the system for peak-shaving should be explored. Finally, an LCC analysis using the correct interest rates and time periods should be conducted, and the results weighed against all the other ERO possibilities.

2.16 FUEL-SWITCHING ERO

2.16.1 Install Gas in Family Housing for Water Heaters, Ranges/Ovens and Clothes Dryers

Description

Family housing units at Patrick AFB are currently all-electric. Natural gas can be made available for appliances at a reduced cost per MBtu. This ERO recommends replacing electric appliances, such as water heaters, ranges/ovens, and clothes dryers, with natural gas appliances in family housing. Although clothes dryers are not supplied by Base housing, the units have washer/dryer hook-ups and utilities are provided by the base. Thus, future occupants would have the choice of either electric or gas dryer connections. A basewide

energy management program could then encourage the use of natural gas dryers for present or future occupants, reducing the base's energy expense.

Assumptions

Technical assumptions are as follows:

- This ERO affects 1,556 housing units with a total area of 1,873,722 ft^2.
- Domestic hot water is supplied by 30- and 40-gal electric water heaters. The existing electric water heaters have an average energy factor of 88.5%.
- Stoves/ovens are all electric.
- High-efficiency natural gas water heaters of equivalent size and recovery are available with an energy factor of 70%.
- Electric energy consumption information for domestic hot water and cooking are available from FPL's EUI data. However, because regionwide natural gas EUIs are not available from Florida, natural gas EUIs for these devices from Environmental Protection Agency/Southeastern Electric Reliability Council (EPA/SERC) data are prorated based on the ratio of FPL and EPA/SERC's electric EUIs.
- Energy consumption for electric clothes dryers is based on end-use data collected in the Pacific Northwest (Pratt et al. 1989).
- Energy consumption for natural gas clothes dryers is from City Gas Company, Cocoa, Florida.
- The various EUI values are as follows:

EUI Source	Fuel Type	Cooking EUI	DHW EUI	Clothes Dryer EUI	EUI Units
EPA/SERC	Gas	5.50	13.50	NA	KBtu/ft^2/yr
EPA/SERC	Electric	0.60	2.55	NA	kWh/ft^2/yr
FP&L	Electric	0.31	1.29	NA	kWh/ft^2/yr
Florida Estimate	Gas	2.84	6.83	NA	KBtu/ft^2/yr
ELCAP Data	Electric	NA	NA	918	kWh/unit/yr
City Gas Co.	Gas	NA	NA	60	therm/unit/yr

Cost assumptions are as follows:

- Equipment costs are from various manufacturers of the equipment and efficiencies specified. Installation costs are from MEANS Cost Data (Means 1991).
- The average cost for electricity is $0.053/kWh.

- The average cost for natural gas is $0.3813/therm.

Results

Complete quantitative results of this ERO appear in Table 2.34. Two options are shown, standard efficiency DHW and high efficiency DHW. Results discussed below are for high efficiency DHW.

Budget Implications. The estimated total cost of implementing this ERO is $2,606,300 for equipment and installation within each household for high-efficiency natural gas water heaters, ranges/ovens, and clothes dryers. This estimate does not include the cost of providing natural gas service from the existing distribution system at the base to the individual households. Presently, natural gas service does not extend to the housing areas.

Energy and Cost Savings. Measured at the "point of delivery," this ERO will actually increase energy consumption by 9,985 MBtu because electrical energy is readily converted to heat with little or no losses and natural gas has a conversion efficiency. Measured at the "point of source," energy consumption is actually reduced.

The energy cost reduction resulting from this ERO is estimated to save the base $88,349/yr for domestic hot water, $10,483/yr for cooking, and $40,107/yr for clothes dryers. The total potential savings is $138,939/yr.

Energy Security. This recommendation will have little impact on energy security.

Operations and Maintenance. This recommendation should have minimal impact on O&M.

Environmental Issues. Although natural gas is a clean burning fuel, there will be an increase in local emissions because of combustion. On a larger scale, global emissions may be reduced by replacing electricity with natural gas.

TABLE 2.34. Comparison of Natural Gas and Electricity in Family Housing

Existing Electric Appliance Operating Parameters

ID	Appliance Energy Type			DHW Efficiency (%)	Qty	Energy Consumption			
	DHW	Stove	Dryer			DHW (kWh/yr)	Stove (kWh/yr)	Dryer (kWh/yr)	Total (kWh/yr)
1	Elec	Elec	Elec	88.5	1,556	2,417,101	580,854	1,428,408	4,426,363

Fuel Switching Alternative Appliance Operating Parameters

ID	Appliance Energy Type			DHW Efficiency (%)	Qty	Energy Consumption			
	DHW	Stove	Dryer			DHW (therm/yr)	Stove (therm/yr	Dryer (therm/yr)	Total (therm/yr)
1a	NG	NG	NG	57.0	1,556	128,048	53,245	93,360	274,653
1b	NG	NG	NG	70.0	1,556	104,268	53,245	93,360	250,873

Fuel Switching Appliance ERO Economics

ID	Qty	Appliance Cost				Energy Savings		Life Cycle Cost	
		DHW ($)	Stove ($)	Dryer ($)	Total ($)	(MBtu/yr)	($/yr)	NPV ($)	SIR
1a	1,556	275	510	415	1,867,200	-12,358	129,033	-1,258,811	0.35
1b	1,556	300	490	460	1,945,000	-9,985	138,939	-2,084,414	0.20

2.17 LOAD CONTROL

Another method of reducing energy consumption is direct control of access to the electrical source. Simply put, you can reduce energy consumption to certain appliances such as an AC compressor unit or electric water heater by not allowing access to the resource that is required to operate it. Effective use of this ERO requires that control be limited to short time periods so occupants are not impacted and resort to adding additional loads such as fans.

The load control technique is not a new concept. It is widely used by utilities to manage their system peak demand. Florida Power & Light uses this technique within their service area and offers a specific rate class if large energy users agree to reduce their loads at specified times. Patrick AFB is not on this rate schedule. However, they have responded to requests from FPL to reduce consumption during periods of prolonged periods of high temperatures and humidity.

2.17.1. Direct Load Control

Description

Implementation of the this ERO would require the expanded use of the EMCS system. Using a planned scheduler, electrical service for both the AC compressor units and the water heaters would be interrupted for various portions of the housing areas for short periods of time. The process would cycle during the control period of the day so interruption of service would not occur over extended periods of time.

The system required to implement this ERO consist of the EMCS system and control systems installed in each housing unit to be controlled. The present EMCS system is capable of implementing this function with minimal change. Control systems to be installed in individual units are readily available and installation of the equipment is straightforward.

Assumptions

Technical assumptions are as follows:

- The compressor is controlled for a total of 6 min. during each interruption. The total control period is 2 h/day.

- The water heater is controlled for a total of 12 min. during each interruption. The total control period is 2 h/day.
- Service is interrupted only during a 7-month period of April 1 through October 31 during the period of noon through 9 pm.
- Based on vendor literature, the control system is estimated to cost $100/unit. The estimated cost for the control system and installation is $250/unit.
- Control only occurs in the Capehart housing area.
- The water heaters are 40 gal. based on information obtained during various site visits.
- Primary savings will result from reduced electric demand.

Results

Table 2.35 provides the results of the ERO analysis. Because of the high initial cost and low annual savings, no LCC evaluation was completed for this ERO.

Budget Implication. The initial cost to implement this ERO is $249,750. This cost includes the purchase and installation of the control equipment required to control electrical service to both the AC compressor and the water heater. The current EMCS system is capable of interfacing with control equipment without extensive modifications. The cost to complete the modification is considered to be insignificant.

Energy and Cost Savings. It is estimated that a demand savings of 359 kW-mo will occur as result of controlling the AC compressor unit and 1,049 kW-mo savings by controlling the water heater. This will result in an annual savings of $8,798, with $6,556 attributed to the water heater and $2,242 attributed to the air conditioner.

Energy Security. This ERO has little impact on energy security.

Operations and Maintenance. This ERO should have minimal impact on present O&M activities.

Environmental Issues. Implementing this ERO is estimated to have little direct impact on the environment except for the insignificant amount of pollutants released to the atmosphere resulting from fabrication of the

control units. On the positive side, however, reduction in demand will reduce the amount of electrical generation by FPL resulting in reduced pollutant emissions.

TABLE 2.35. Load-Control ERO

Existing Conditions

ID	Unit Location	Number of Units Controlled	Control Period (hr/day)	Number of Months Affecting Peak	Energy Consumption		Sum Monthly Peak Demand (Cooling)		Sum Monthly Peak Demand (DHW)	
					Cooling (kWh/yr)	DHW (kWh/yr)	On - Peak (kW-mo)	Off - Peak (kW-mo)	On - Peak (kW-mo)	Off - Peak (kW-mo)
1	Capehart	999	0	7	3,616,833	1,529,743	3,588	NA	5,245	NA

Load Control Conditions

ID	Unit Location	Number of Units Controlled	Control Period (hr/day)	Number of Months Affecting Peak	Energy Consumption		Sum Monthly Peak Demand (Cooling)		Sum Monthly Peak Demand (DHW)	
					Cooling (kWh/yr)	DHW (kWh/yr)	On - Peak (kW-mo)	Off - Peak (kW-mo)	On - Peak (kW-mo)	Off - Peak (kW-mo)
1	Capehart	999	2	7	3,616,833	1,529,743	3,229	NA	4,196	NA

Load Control Economics

ID	Unit Location	RI Cost (1993 $)	First Year Savings						
			Energy Cooling (kWh)	Energy DHW (kWh)	Demand Cooling (kW-mo)	Demand DHW (kW-mo)	Demand Cooling ($)	Demand DHW ($)	Total $
1	Capehart	249,750	NA	NA	359	1,049	2,242	6,556	8,798

3.0 ENERGY RESOURCE OPPORTUNITY IMPACT STUDY

All EROs identified in Section 2.0 of this report were subjected to economic analysis to determine their cost-effectiveness. The economic analysis is part of the Facility Energy Decision Screening (FEDS) process for developing fuel neutral assessments of facilities to identify and quantify major efficiency resources, supply alternatives, and fuel switching opportunities. The intent of the assessment is to identify the major resource alternatives available to decision makers. The economic analysis provides an estimate of the magnitude of the cost-effective resource available at a facility using the most realistic assumptions possible. Individual projects should be examined more thoroughly at a project level at the implementation stage.

Section 3.1 discusses the methodology and assumptions used in the economic analysis, and Section 3.2 defines the analysis metrics. Section 3.3 describes the LCC evaluation method. Section 3.4 presents the results of the evaluation. Section 3.5 provides additional notes regarding the analysis.

3.1 ECONOMIC ANALYSIS METHODOLOGY AND ASSUMPTIONS

According to the provisions of 10 CFR Part 436, federal agencies are required to analyze all potential energy investments using a LCC methodology developed by the National Institute of Standards and Technology (NIST). The NIST LCC methodology calculates all relevant costs of a project and discounts them to result in present dollars, and then subtracts that sum from a similarly constructed LCC of baseline, current conditions or technology. This difference is the NPV of the action being considered. Actions are cost-effective if the NPV is positive and greater than the NPV of alternative actions. Following this methodology results in minimizing the LCC of energy services at a site.

This economic analysis is central to the Federal Energy Management Program (FEMP) model approach for federal energy efficiency using the FEDS system to develop a fuel-neutral assessment of facilities to identify and

quantify energy efficiency resources, supply alternatives, and fuel switching opportunities.

All EROs identified by the FEDS assessment and described in this report are therefore subjected to the LCC economic analysis to determine their cost-effectiveness. The purpose of the FEDS assessment is to identify the facility energy efficiency resource alternatives available to decision makers. The economic analysis provides an estimate of the installed cost and energy savings of the cost-effective resource available at a facility using the most current and realistic assumptions possible. Individual projects and actions considered for implementation should be examined and analyzed more thoroughly at a project level prior to design and implementation.

Under the NIST methodology, energy prices are escalated and costs and benefits are discounted using factors taken from the current edition of Energy Prices and Discount Factors for Life-Cycle Cost Analysis (NIST 1992). Costs and benefits are analyzed over a 25-year period, reflecting the average expected remaining life of a typical building. Other key assumptions in the methodology are as follows:

- Prices for all goods and services (e.g., installed cost of a technology) will vary at the same rate as the inflation rate; therefore, the "real" rate of inflation is zero.

- Energy or fuel prices vary at a different rate than the inflation rate. NIST reports the value by which the energy prices vary from the real rate of inflation (the escalation rate).

- All costs and benefits are discounted using the current federal discount rate (4.0% real for CY93).

- All EROs are analyzed for a 25-year period, which does not mean that a 25-year life is assumed for all installed equipment; actual estimates of equipment life are used, and the costs of replacing worn out equipment over a 25-year period are incorporated. The 25-year analysis period also does not mean that all streams of savings from EROs are assumed to endure 25 years; many are assumed to disappear as the existing equipment is replaced with more efficient equipment as part of the baseline.

- The analysis assumes that up-front unconstrained federal financing (at the federal discount rate) is available for all potential energy efficiency improvements and actions.

The last assumption, unconstrained (unlimited) federal financing, is incorporated into the LCC analysis to determine the total cost-effective energy efficiency resource at a site. Therefore, the analysis (under the unconstrained funding assumption) results in a menu of all identified energy project opportunities whose benefits exceed their costs.

In the presence of constraints on the funding available to implement these projects, some method of prioritizing the projects is needed. Therefore, a savings-to-investment ratio (SIR) is calculated to rank order projects starting with the project with the highest SIR. This ranking allows available capital to be allocated to those cost-effective projects in an order that results in the greatest savings per dollar of investment.

For most agencies or facilities, the entire list of cost-effective projects from the LCC analysis is significant and cannot be financed from a single source. Rather, all available funding sources need to be determined. Funding sources include federal funds (MILCON, ECIP, Federal Energy Efficiency Fund); utility financing including utility offered rebates or other financial assistance; and energy services industry-financed projects. Each of these funding sources has its own requirements and costs; therefore, the cost-effectiveness of individual projects needs to be evaluated using the LCC analysis adjusted for each potential funding source's costs and constraints.

Many assumptions in addition to those listed above are required in the course of a FEDS assessment. In every case, the analysis team attempts to make the most realistic and defensible assumption. Where uncertainty exists, the team attempts to err on the side of conservatism. Therefore, the resulting estimate of the total cost-effective energy efficiency resource is a minimum estimate of the total potential resource, given the above assumptions. A more exact estimate and/or the development and design of projects may require a detailed facility audit, which is beyond the scope of a FEDS assessment.

3.2 ECONOMIC ANALYSIS METRICS USED

The EROs described in Section 2.0 were analyzed in several ways with the intent of presenting a variety of analysis metrics. An analysis metric is a numerical measure of the attractiveness of an ERO as an investment. Different analysis metrics are used for different purposes. Some economic metrics commonly used to evaluate ERO effectiveness include NPV, and the SIR.

3.2.1 Net Present Value

The most useful analysis metric is the NPV expressed in dollars. The NPV is the difference between the LCCs of a project and its baseline, which is equivalent to saying that the NPV is the present value of all of the benefits associated with an ERO, less the present value of all of the costs of the ERO. The concept of present value is discussed in more detail in the following paragraphs. The NPV is used to define the cost-effectiveness of an ERO: a negative NPV means that the costs of an ERO outweigh its benefits, while a positive NPV means that the benefits are greater than the costs. The higher the NPV, the better.

The costs and the benefits of an efficiency investment occur at different times, which must be accounted for in the analysis. The timing of the streams of costs and benefits is accounted for in an LCC analysis by converting all streams to present values. Present values account for the fact that a dollar today is worth more than a dollar tomorrow, for two primary reasons: general price inflation and the time value of money. In the face of general price inflation, the purchasing power of a dollar declines over time, and since the true value of money lies in what it is capable of purchasing, inflation causes its value to decline. The time value of money refers to the fact that even in the absence of general price inflation, money received sooner is preferred to money received later.

It is this preference for consuming sooner rather than later that leads to the existence of positive rates of interest, even in the absence of price level inflation. Individuals and firms are willing to pay a premium to obtain goods and services sooner rather than later. The premium they are willing to pay is the "real rate of interest". (Although interest rates are generally

positive, negative rates can exist for short periods of time, but cannot persist.) The market rate of interest, or the "nominal" rate, is the real rate plus the rate of inflation (this is a slight simplification).

3.2.2 Savings-to-Investment Ratio

The SIR is used to prioritize a group of minimum LCC EROs. For example, suppose a total of 100 EROs were evaluated. Of these, suppose 25 had negative NPVs, leaving 75 EROs to consider. Of these, suppose that there are 5 groups of mutually exclusive pairs, and that the highest NPV ERO of each group is selected. This results in the elimination of 5 EROs, for a grand total of 70 EROs to be implemented. Suppose the total cost of implementing all 70 EROs is $5 million, and the facility has an annual budget for energy modernization projects of $1 million. The SIR would be used to determine which of the 70 EROs provide the greatest return on investment, thereby deserving immediate implementation. It is important to note that selection of cost-effective EROs should not be done on the basis of the SIR, which would not minimize the LCC. Rather, it is necessary to select the cost-effective set of EROs on the basis of their NPVs. The SIR should only be used for prioritization.

3.3 LIFE-CYCLE COST EVALUATION METHOD

Federal agencies are required to evaluate energy-related investments on the basis of minimum LCCs (10 CFR Part 436). An LCC evaluation computes the total long-run costs of several potential actions and selects the action that minimizes the long-run costs. The LCC of a potential investment is the present value of all of the costs associated with the investment over time. The first step in calculating the LCC is the identification of the relevant costs, which are listed in Table 3.1.

TABLE 3.1. Cost Elements in a Life-Cycle Cost Analysis

Cost Element	Description	Example
Installed Cost	Cost of materials purchased and the labor required to install them	Price of an energy efficient lighting fixture, plus cost of labor to install it
Energy Cost	Annual expenditures on energy to operate equipment	A lighting fixture that draws 100-W and operates 2,000 h annually requires 200,000-Wh (200 kWh) annually. At an electricity price of $0.10/kWh, this fixture has an annual energy cost of $20
Nonfuel Operations and Maintenance	Annual expenditures on parts and activities required to operate equipment	Replacing burned out light bulbs
Replacement Costs	Expenditures to replace equipment upon failure	Replacing an oil furnace when it is no longer usable

3.3.1 Life-Cycle Cost Calculation

The LCC of an alternative is calculated by summing the present values of the installed cost, the annual energy cost, the annual O&M cost, and the replacement cost, as shown in Equation (3.1).

$$LCC = PV(IC) + PV(EC) + PV(OM) + PV(REP) \tag{3.1}$$

where LCC = life-cycle cost
PV(IC) = present value of installed cost
PV(EC) = present value of annual energy cost
PV(OM) = present value of annual O&M cost
PV(REP) = present value of future replacement cost.

3.3.2 Installed Cost

The installed cost is the one-time first cost of an ERO. Replacement of existing equipment in the baseline case is covered by the replacement cost category. The present value of installed cost is used because not all EROs are RI actions. When the ERO is to be implemented immediately, the present value of the installed cost is equal to the installed cost. When implementation of an ERO is scheduled for some future time, however, as in the case of ROF EROs, the installed cost paid at that time must be discounted back to the present.

The calculation for the present value of installed cost is equal to

$$PV(IC) = \frac{IC}{(1+d)^N} \tag{3.2}$$

where PV(IC) = present value of installed cost
IC = installed cost
d = discount rate
N = number of years until failure or removal of existing equipment.

3.3.3 Energy Cost

The present value of the annual energy cost is composed of both energy and demand costs. Energy costs represent the recurring annual expenditures on energy to operate equipment. These costs include both the fuel costs for consumption and the demand charges. The estimated stream of annual energy and demand costs over the analysis period is adjusted to account for increasing real energy prices, and is discounted to determine the present value of the future cost stream. This adjustment for price escalation and discounting is accomplished through the use of a modified uniform present worth factor (UPW*). The UPW* incorporates the discount rate and the projected energy price rates of change. For ROF measures, the existing stream of costs is assumed to continue until failure of the existing equipment, at which time the ERO cost stream replaces it. The UPW* is calculated using Equation (3.3).

$$UPW*_N = \sum_{n=1}^{N} \frac{I_{(1992+n)}}{(1+d)^n} \tag{3.3}$$

where UPW* = modified uniform present worth factor

n = counter used to designate each year, with n=1 for the year 1993

N = number of periods over which energy costs or savings accrue

$I_{(1992+n)}$ = projected average fuel price index provided by NIST

d = discount rate.

The present value of energy costs is then calculated using Equation (3.4):

$$PV(EC) = AEC \times UPW*_N \tag{3.4}$$

where PV(EC) = present value of energy cost

AEC = annual energy and demand cost

$UPW*_N$ = modified uniform present worth factor.

3.3.4 Operations and Maintenance Cost

The present value of the annual O&M cost is the discounted stream of annual nonfuel expenditures on parts and activities required to operate the equipment. The present value of the stream of expenditures is calculated using the uniform present worth factor (UPW). As with energy costs the existing stream of costs for ROF measures is assumed to continue until failure of the existing equipment, at which time it is replaced by the ERO cost stream. The UPW is calculated using Equation (3.5).

$$UPW_N = \frac{(1 + d)^N - 1}{d\ (1 + d)^N} \tag{3.5}$$

where UPW = uniform present worth factor
d = discount rate
N = number of periods over which the costs or savings accrue.

The present value of O&M savings is then given by Equation (3.6).

$$PV(OM) = OM \times UPW_N \tag{3.6}$$

where PV(OM) = present value of annual O&M costs
OM = annual O&M expenditures
UPW_N = uniform present worth factor.

3.3.5 Replacement Cost

Although the installed cost category covers the first cost of implementing an ERO, subsequent equipment installations fall into the replacement cost category, as do all equipment costs associated with the baseline case. Unlike energy and O&M expenditures, replacement costs are not regular, annual expenses. The present value of the replacement cost is the discounted stream of expenditures to replace equipment upon failure. While the cost to replace a piece of equipment is actually borne in the year in which the equipment is bought, the replacement costs are annualized for this analysis. Any part of the annualized cost that would be borne after the analysis period is then subtracted off of the total, in effect adding a salvage value. If the remaining time in the analysis period is less than the

life of equipment installed for the ERO, the installed cost will overstate the true cost. The replacement cost calculation corrects this overstatement. In this type of situation, the PV (replacement cost) is negative, corresponding to negative replacement costs (salvage value).

Existing equipment is assumed to have no salvage value or disposal cost. While these may not be entirely accurate assumptions, they partially offset each other. If salvage value is to be included for existing equipment, a few requirements must be met. First, it must be likely that the base will actually carry out a salvage process rather than dispose of the equipment. Regardless of value, if the base does not carry out this process, no savings will be accrued. Second, the salvage value should be the actual value of the equipment in its existing condition, less all costs associated with preparing it for sale and selling it. If this resulting net value is not greater than the disposal cost, then it should be ignored for analysis purposes. The replacement cost is annualized as shown in Equation (3.7), and the PV (replacement cost) is calculated using Equation (3.8).

$$REP_A = REP \times \frac{d}{1 - (d + 1)^{-L}} \tag{3.7}$$

$$PV(REP) = REP_A \times UPW_{25-N} \tag{3.8}$$

where REP_A = annualized replacement cost
REP = replacement cost
d = discount rate
L = life of ERO equipment
N = number of periods until replacement
PV(REP) = present value of annualized replacement cost
UPW_N = uniform present worth factor as discussed in Section 3.3.5.

Equation (3.8) yields a present value at the time of replacement, rather than at the beginning of the analysis period. This value must be discounted to current dollars using the single present worth factor (SPW). While the UPW is used to calculate the present value of a stream of annual costs or savings, the SPW is used to find the present value of a single nonannual amount. The

SPW is calculated using Equation (3.9), and the present value of replacement costs in current dollars is represented by Equation (3.10).

$$SPW_N = \frac{1}{(1 + d)^N} \tag{3.9}$$

$$PV_c(REP) = PV(REP) \times SPW_N \tag{3.10}$$

where $PV_c(REP)$ = current dollar present value
REP = replacement cost
d = discount rate
N = number of periods until replacement
SPW_N = single present worth factor.

3.3.6 Net Present Value Calculation

Energy resource opportunities are selected for implementation on the basis of their NPV. The NPV of an ERO is the life-cycle savings of the ERO as compared to not implementing the ERO:

$$NPV = LCC - LCC' \tag{3.11}$$

where NPV = NPV of the ERO
LCC = LCC of the existing situation
LCC′ = LCC if the ERO is implemented.

Most EROs are selected according to a very simple rule: if the NPV is positive, then the project should be undertaken; if the NPV is zero or negative, then the ERO should not be implemented. A positive NPV means the long-run costs of the ERO are less than the long-run costs of the existing situation.

The selection criteria can be complicated by a number of factors. If the ERO is part of a set of mutually exclusive options, then only the option with the highest NPV is selected. For example, in some cases motors can be replaced with energy-efficient models, or a variable speed drive (VSD) can be

added to the existing motor, or the existing motor can be replaced with an energy-efficient model with a VSD. The analysis would proceed by calculating the LCC of the existing motors, the LCC of energy-efficient motors, and the LCC of VSDs added to both the existing and the energy-efficient motors. Depending on the level of operation, any of the EROs may be chosen or it may be optimal to do nothing. If the NPV of two or more EROs considered is positive, then the highest NPV ERO would be selected.

3.3.7 Savings-to-Investment Ratio Calculation

The SIR is equal to the total savings of an ERO divided by the installed cost of that ERO. Any ERO with an SIR greater than one indicates that the savings outweigh the costs. Thus, an SIR of one denotes an NPV of zero. The SIR is only to be used as a prioritization measure, rather than a selection device. The following equation defines the SIR.

$$SIR = \frac{PV(ES) + PV(OMS) + PV(REPS)}{PV(IC)} \tag{3.12}$$

where SIR = savings-to-investment ratio
PV(ES) = present value of energy savings
PV(OMS) = present value of O&M savings
PV(REPS) = present value of replacement savings
PV(IC) = present value of the installed cost.

3.4 SUMMARY OF ERO IMPACT STUDY

Table 3.2 defines the assumptions that are common to all of the EROs analyzed. The rates in effect are straight forward; however, mention should be made as to the calculation of the full cost of energy. In the PNL report entitled Determining Appropriate Energy Costs for Federal Residential Building Standards Analysis (Shankle et al. 1993), the authors note that the appropriate cost of energy to use in determining the correct level of investment in energy-efficient construction should include the following elements:

- energy rates paid to the supplier by the federal facility

- avoidable demand charges
- avoidable distribution system losses
- avoidable distribution system capital costs
- avoidable external costs of energy supply and distribution.

The incorporation of the above elements is referred to as the "full cost" of energy. Current federal life-cycle costing methods do not include the cost of environmental externalities unless they are reflected in some manner within the utility bill. The external cost of energy will increasingly become internalized within the LCC process due to such factors as utility least-cost planning, the 1990 Amendments to the Clean Air Act, and emissions trading. As these costs become internalized, they will be reflected in the actual cost of energy paid by the facility and will no longer need to receive separate consideration.

TABLE 3.2. Assumptions Used in Life-Cycle Cost Analysis

Discount Rate: 4.0% real
Analysis Period: 25 years

Current Fuel Prices and Conversion Factors:

Fuel	Purchase Units	Conversion Factor (Purchase Units/MBtu)	Price (1993 $/ Purchase Unit)	Price (1993 $/MBtu)
Natural Gas	therms	10.0000	0.43289 firm	4.3289
			0.35422 interupt.	3.5422
Unleaded Gasoline	gal	9.0909	See Sec. 3.5	
Diesel	gal	7.4074	See Sec. 3.5	
#2 Fuel Oil	gal	7.1429	0.69	4.93
Electricity	kWh	292.9974	0.03626 on pk.	10.6241
			0.03305 off pk.	9.6836
	kW	none	6.25	NA

Table 3.3 defines the column headings used in the remaining tables in this section. One of the distinctions made is between first-year energy savings and full-implementation energy savings. First-year energy savings are those savings that should be experienced after the first year of the analysis. These savings will be zero for EROs that will not be implemented immediately. Full-implementation energy savings are those savings that should be experienced after the ERO has been fully implemented; either after the first year or sometime in the future. Differences in these numbers can be caused when an ERO is implemented in steps. For example, when a VSD is added immediately to an existing motor, there are immediate savings associated with that action (first-year savings); however, the second part of the ERO is to replace the existing motor when it fails with an energy efficient motor. Once this has been done, the equipment should experience the full savings of the ERO action; that is the full implementation savings.

TABLE 3.3. Description of Column Headings

All Tables (Except Summaries)

Column Heading	Description	Unit
ERO Category	Designates the general end use of an ERO.	End Use
Facility Type	Designates the specific equipment or facility affected.	Facility or Facility Number
Equipment	Equipment that is affected by the ERO.	Equipment
Description of ERO	Describes the ERO. See Section 2 of this document for complete descriptions of each ERO.	Description
RI or ROF	Indicates whether the ERO is to be done now or in the future (replace immediately vs. replace on failure).	RI or ROF
ID	Descriptive field - designates the specific equipment or facility affected.	ID
Existing Fuel	Fuel type used before ERO is implemented.	Existing Fuel
Resulting Fuel	Fuel type used after ERO is implemented.	Resulting Fuel

Annual Energy and Demand Reduction Tables

Column Heading	Description	Unit
First-Year Energy Savings	Energy savings that will be realized in the first year.	MBtu per year
First-Year Demand Savings	Demand savings that will be realized in the first year.	kW-month per year
Full-Implementation Energy Savings	Energy savings that will be realized once the ERO is fully implemented.	MBtu per year
Full-Implementation Demand Savings	Demand Savings that will be realized once the ERO is fully implemented.	kW-month per year
NPV	Reduction in LCC because of ERO. Equals present value of total savings less present value of installed cost.	1993 constant dollars
SIR	Present value of total savings divided by present value of installed cost.	None

TABLE 3.3. (contd)

Present Value of Costs and Savings Tables

Column Heading	Description	Unit
Present Value of Installed Cost	Present value of the labor and materials cost of implementing the ERO. Equals actual cost for immediate EROs, discounted cost for ROF EROs.	1993 constant dollars
Present Value of Energy Savings	Present value of the energy cost savings that will be realized after implementation of ERO.	1993 constant dollars
Present Value of Demand Savings	Present value of the electricity demand cost savings that will be realized after implementation of the ERO.	1993 constant dollars
Present Value of O&M Savings	Present value of the stream of maintenance cost reductions attributable to the ERO. May be negative, indicating ERO has higher maintenance costs than the current equipment.	1993 constant dollars
Present Value of Replacement Cost Savings	Present value of the stream of replacement cost savings attributable to the ERO. May be negative, indicating that the ERO has higher replacement costs than the current equipment.	1993 constant dollars
Present Value of Total Savings	Sum of energy, demand, O&M, and replacement savings associated with the ERO.	1993 constant dollars
NPV	Reduction in LCC because of ERO. Equals present value of total savings less present value of installed cost.	1993 constant dollars
SIR	Present value of total savings divided by present value of installed cost.	None

TABLE 3.3. (contd)

Annualized Values of Costs and Savings Tables

Column Heading	Description	Unit
Annualized Installed Cost	Annualized value of the labor and materials cost of implementing the ERO. Equals actual cost for immediate EROs, discounted cost for ROF EROs. Calculated from the present value.	1993 constant dollars
Annualized Energy Savings	Annualized value of the energy cost savings that will be realized after implementation of ERO. Calculated from the present value.	1993 constant dollars
Annualized Demand Savings	Annualized value of the electricity demand cost savings that will be realized after implementation of the ERO. Calculated from the present value.	1993 constant dollars
Annualized O&M Savings	Annualized value of the stream of maintenance cost reductions attributable to the ERO. May be negative, indicating ERO has higher maintenance costs than the current equipment. Calculated from the present value.	1993 constant dollars
Annualized Replacement Cost Savings	Annualized value of the stream of replacement cost savings attributable to the ERO. May be negative, indicating that the ERO has higher replacement costs than the current equipment. Calculated from the present value.	1993 constant dollars
Annualized Total Savings	Sum of energy, demand, O&M, and replacement savings associated with the ERO.	1993 constant dollars
Annualized Net Savings	Annualized reduction in LCC because of ERO. Equals annualized total savings less annualized installed cost.	1993 constant dollars
SIR	Annualized total savings divided by present value of installed cost.	None

TABLE 3.3. (contd)

Cumulative Annual Energy and Demand Reduction Tables

Column Heading	Description	Unit
Cumulative First-Year Energy Savings	Energy savings that would be realized in the first year if all EROs with equal and higher SIRs were implemented.	MBtu per year
Cumulative First-Year Demand Savings	Demand savings that would be realized in the first year if all EROs with equal and higher SIRs were implemented.	kW-month per year
Cumulative Full-Implementation Energy Savings	Energy savings that would be realized once the ERO is fully implemented, if all EROs with equal and higher SIRs were implemented.	MBtu per year
Cumulative Full-Implementation Demand Savings	Demand Savings that would be realized once the ERO is fully implemented, if all EROs with equal and higher SIRs were implemented.	kW-month per year
Cumulative NPV	Reduction in LCC if all EROs with equal and higher SIRs were implemented. Equals cumulative value of total savings less cumulative value of installed cost.	1993 constant dollars
Cumulative SIR	SIR of entire project if all EROs with equal and higher SIRs were implemented. Equals cumulative value of total savings divided by cumulative value of installed cost.	None
Individual ERO SIR	Present value of total savings divided by present value of installed cost for individual ERO.	None

TABLE 3.3. (contd)

Cumulative Present Value of Costs and Savings Tables

Column Heading	Description	Unit
Cumulative Present Value of Installed Cost	Present value of the labor and materials cost of implementing entire project if all EROs with equal and higher SIRs were implemented	1993 constant dollars
Cumulative Present Value of Energy Savings	Present value of the energy cost savings that would be realized after implementation of ERO if all EROs with equal and higher SIRs were implemented.	1993 constant dollars
Cumulative Present Value of Demand Savings	Present value of the electricity demand cost savings that would be realized after implementation of the ERO if all EROs with equal and higher SIRs were implemented.	1993 constant dollars
Cumulative Present Value of O&M Savings	Present value of the stream-of-maintenance cost reductions if all EROs with equal and higher SIRs were implemented.	1993 constant dollars
Cumulative Present Value of Replacement Cost Savings	Present value of the stream-of-replacement cost savings if all EROs with equal and higher SIRs were implemented.	1993 constant dollars
Cumulative Present Value of Total Savings	Sum of energy, demand, O&M, and replacement savings if all EROs with equal and higher SIRs were implemented.	1993 constant dollars
Cumulative NPV	Reduction in LCC if all EROs with equal and higher SIRs were implemented. Equals cumulative value of total savings less cumulative value of installed cost.	1993 constant dollars
Cumulative SIR	SIR of entire project if all EROs with equal and higher SIRs were implemented. Equals cumulative value of total savings divided by cumulative value of installed cost.	None
Individual ERO SIR	Present value of total savings divided by present value of installed cost for individual ERO.	None

The annual energy and demand reductions and the present values of costs and savings for all EROs for each building type are presented in Tables 3.4 and 3.5, respectively. Many EROs have negative NPVs, and so are not cost-effective. Many others are cost effective, but are inferior to an alternative ERO. Tables 3.6 and 3.7 present the annual energy and demand reductions and the present values of costs and savings for all cost-effective EROs that are not excluded by an ERO with a higher NPV. The annualized values of the costs and savings for these EROs are given in Table 3.8. Tables 3.9 and 3.10 present cumulative values for the energy and demand reductions and the costs and savings for the cost-effective EROs. The cumulative values are calculated by sorting the EROs by their SIRs, and then summing the values over the EROs. The resulting table allows the reader to compare the total energy, demand, and dollar savings available for any given level of total investment. A cumulative SIR is calculated as well. The cumulative SIR shows the SIR of all EROs up to that point if all were implemented as a single project. The SIR of each individual ERO is shown as well to illustrate how the EROs were sorted.

The cost-effective ERO results have been aggregated by ERO category. The ERO category results are presented in Table 3.11, and the annualized values are in Table 3.12. Two ERO categories, lighting and envelope improvements, are responsible for over 74,000 MBtu in savings out of a total savings of 98,141 MBtu. The lighting and envelope results are

- Lighting: The lighting resource represents an NPV of over $8 million, annual energy savings of over 44,000 MBtu, and annual demand savings of over 22,000 kW-months. The overall SIR for lighting is 3.33.
- Envelope: The building envelope resource represents an NPV of over $3.7 million, and annual energy savings of over 30,000 MBtu. The overall SIR for envelope is 3.69.

The total energy, demand, and dollar savings, as well as the overall NPV and SIR, are presented in Table 3.13. The total cost-effective efficiency resource at Patrick AFB is estimated to be roughly 92,000 MBtu during the first year, and 98,000 MBtu upon full implementation of all EROs. Annual demand savings are estimated to be approximately 96,000 kW-months during the first year and 97,000 kW-months upon full implementation. The energy-use

reduction is equivalent to over 19% of typical annual total energy consumption, and the demand reduction is equivalent to 39% of typical annual demand in kW-months (see Section 2.0 in Volume 2: Baseline Detail report for annual totals) (Wahlstrom et al. 1993).

The total cost-effective resource would require an investment with a present value of nearly $16.7 million, generate energy and demand savings with a present value of over $23.3 million, and produce overall savings with a present value of over $34.1 million. The NPV of the investment would be over $17.4 million with an overall SIR of 2.05. On an annualized basis, the energy and demand savings would be worth nearly $1.5 million annually, equivalent to 23% of current expenditures. 1991 expenditures from the Volume II Baseline Detail Report, adjusted with prices used in the LCC analysis, were used to calculate this percentage (Wahlstrom et al. 1993). (See Section 3.5 of this report for an explanation of this adjustment process.)

The LCC results have also been combined into a fuel balance table, which is presented in Table 3.14. This table shows the existing energy use, conservation, new load, resulting use, and net conservation for each fuel. Similar figures are also provided for demand. The new load columns are necessary because of the fuel-switch to natural gas. As a result of the vehicle EROs, natural gas consumption nearly doubles. Experience at other bases has shown increased natural gas use to be a common result of minimum LCC analyses. The net conservation columns are the difference between conservation and new load. The resulting use columns are derived by subtracting net conservation from existing use.

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
AC	Commercial	WAC-0.5	Eff. Win. AC	RI	1a	Elect.	Elect.	25	47	25	47	-$2,906	0.68
AC	Commercial	WAC-0.5	Eff. Win. AC	RI	1b	Elect.	Elect.	28	51	28	51	-$4,137	0.65
AC	Commercial	WAC-1.0	Eff. Win. AC	RI	2a	Elect.	Elect.	73	134	73	134	-$630	0.95
AC	Commercial	WAC-1.0	Eff. Win. AC	RI	2b	Elect.	Elect.	85	156	85	156	-$845	0.94
AC	Commercial	WAC-1.0	Eff. Win. AC	RI	2c	Elect.	Elect.	52	96	52	96	-$2,987	0.78
AC	Commercial	WAC-1.5	Eff. Win. AC	RI	3a	Elect.	Elect.	43	79	43	79	-$153	0.98
AC	Commercial	WAC-1.5	Eff. Win. AC	RI	3b	Elect.	Elect.	37	68	37	68	-$388	0.94
AC	100	Chiller	Eff. Chiller	RI	1	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	102	Chiller	Eff. Chiller	RI	2	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	104	Chiller	Eff. Chiller	RI	3	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	106	Chiller	Eff. Chiller	RI	4	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	204	Chiller	Eff. Chiller	RI	5	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	205	Chiller	Eff. Chiller	RI	6	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	206	Chiller	Eff. Chiller	RI	7	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	250	Chiller	Eff. Chiller	RI	8	Elect.	Elect.	4	7	4	7	-$635	0.75
AC	250	Chiller	Eff. Chiller	RI	9	Elect.	Elect.	90	148	90	148	-$20,916	0.71
AC	251	Chiller	Eff. Chiller	RI	10	Elect.	Elect.	22	23	22	23	-$1,793	0.79
AC	263	Chiller	Eff. Chiller	RI	11	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	265	Chiller	Eff. Chiller	RI	12	Elect.	Elect.	74	77	74	77	-$9,580	0.74
AC	310	Chiller	Eff. Chiller	RI	13	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	312	Chiller	Eff. Chiller	RI	14	Elect.	Elect.	49	80	49	80	-$1,803	0.88
AC	313	Chiller	Eff. Chiller	RI	15	Elect.	Elect.	126	208	126	208	-$29,427	0.71
AC	317	Chiller	Eff. Chiller	RI	16	Elect.	Elect.	4	7	4	7	-$635	0.75
AC	318	Chiller	Eff. Chiller	RI	17	Elect.	Elect.	31	51	31	51	-$7,212	0.71
AC	321	Chiller	Eff. Chiller	RI	18	Elect.	Elect.	19	20	19	20	-$1,582	0.79
AC	329	Chiller	Eff. Chiller	RI	19	Elect.	Elect.	31	52	31	52	-$1,163	0.88
AC	330	Chiller	Eff. Chiller	RI	20	Elect.	Elect.	31	51	31	51	-$7,212	0.71
AC	330	Chiller	Eff. Chiller	RI	21	Elect.	Elect.	94	155	94	155	-$3,490	0.88
AC	330	Chiller	Eff. Chiller	RI	22	Elect.	Elect.	300	494	300	494	-$20,933	0.83
AC	335	Chiller	Eff. Chiller	RI	23	Elect.	Elect.	12	12	12	12	-$949	0.79
AC	345	Chiller	Eff. Chiller	RI	24	Elect.	Elect.	9	9	9	9	-$738	0.79
AC	400	Chiller	Eff. Chiller	RI	25	Elect.	Elect.	9	9	9	9	-$738	0.79
AC	400	Chiller	Eff. Chiller	RI	26	Elect.	Elect.	79	82	79	82	-$10,219	0.74
AC	401	Chiller	Eff. Chiller	RI	27	Elect.	Elect.	19	20	19	20	-$1,582	0.79
AC	402	Chiller	Eff. Chiller	RI	28	Elect.	Elect.	50	52	50	52	-$325	0.97
AC	404	Chiller	Eff. Chiller	RI	29	Elect.	Elect.	9	9	9	9	-$11,343	0.62
AC	408	Chiller	Eff. Chiller	RI	30	Elect.	Elect.	25	41	25	41	-$5,770	0.71
AC	415	Chiller	Eff. Chiller	RI	31	Elect.	Elect.	110	181	110	181	-$7,676	0.83
AC	423	Chiller	Eff. Chiller	RI	32	Elect.	Elect.	989	1,627	989	1,627	-$8,434	0.97
AC	424	Chiller	Eff. Chiller	RI	33	Elect.	Elect.	50	52	50	52	-$325	0.97
AC	425	Chiller	Eff. Chiller	RI	34	Elect.	Elect.	39	65	39	65	-$1,454	0.88
AC	425	Chiller	Eff. Chiller	RI	35	Elect.	Elect.	34	56	34	56	-$7,934	0.71
AC	425	Chiller	Eff. Chiller	RI	36	Elect.	Elect.	481	791	481	791	-$33,493	0.83
AC	430	Chiller	Eff. Chiller	RI	37	Elect.	Elect.	25	41	25	41	-$5,770	0.71
AC	431	Chiller	Eff. Chiller	RI	38	Elect.	Elect.	215	353	215	353	-$652	0.99
AC	440	Chiller	Eff. Chiller	RI	39	Elect.	Elect.	7	12	7	12	-$9,364	0.63
AC	501	Chiller	Eff. Chiller	RI	40	Elect.	Elect.	192	198	192	198	$2,035	1.07
AC	502	Chiller	Eff. Chiller	RI	41	Elect.	Elect.	192	198	192	198	$2,035	1.07
AC	503	Chiller	Eff. Chiller	RI	42	Elect.	Elect.	192	198	192	198	$2,035	1.07
AC	505	Chiller	Eff. Chiller	RI	43	Elect.	Elect.	440	453	440	453	-$11,854	0.89
AC	510	Chiller	Eff. Chiller	RI	44	Elect.	Elect.	13	13	13	13	-$1,054	0.79
AC	523	Chiller	Eff. Chiller	RI	45	Elect.	Elect.	0	0	0	0	-$6,006	0.60
AC	530	Chiller	Eff. Chiller	RI	46	Elect.	Elect.	37	61	37	61	-$8,655	0.71
AC	533	Chiller	Eff. Chiller	RI	47	Elect.	Elect.	160	165	160	165	$3,297	1.16
AC	533	Chiller	Eff. Chiller	RI	48	Elect.	Elect.	173	179	173	179	-$22,354	0.74
AC	534	Chiller	Eff. Chiller	RI	49	Elect.	Elect.	107	177	107	177	-$326	0.99
AC	535	Chiller	Eff. Chiller	RI	50	Elect.	Elect.	96	99	96	99	$1,418	1.10
AC	535	Chiller	Eff. Chiller	RI	51	Elect.	Elect.	171	177	171	177	$2,532	1.10
AC	536	Chiller	Eff. Chiller	RI	52	Elect.	Elect.	150	247	150	247	-$457	0.99

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
AC	537	Chiller	Eff. Chiller	RI	53	Elect.	Elect.	117	121	117	121	-$5,430	0.84
AC	545	Chiller	Eff. Chiller	RI	54	Elect.	Elect.	19	20	19	20	-$1,582	0.79
AC	546	Chiller	Eff. Chiller	RI	55	Elect.	Elect.	0	0	0	0	-$16,016	0.60
AC	548	Chiller	Eff. Chiller	RI	56	Elect.	Elect.	10	11	10	11	-$844	0.79
AC	556	Chiller	Eff. Chiller	RI	57	Elect.	Elect.	0	0	0	0	-$6,006	0.60
AC	557	Chiller	Eff. Chiller	RI	58	Elect.	Elect.	0	0	0	0	-$2,002	0.60
AC	558	Chiller	Eff. Chiller	RI	59	Elect.	Elect.	79	82	79	82	-$10,219	0.74
AC	559	Chiller	Eff. Chiller	RI	60	Elect.	Elect.	37	61	37	61	-$8,655	0.71
AC	560	Chiller	Eff. Chiller	RI	61	Elect.	Elect.	31	51	31	51	-$7,212	0.71
AC	561	Chiller	Eff. Chiller	RI	62	Elect.	Elect.	87	142	87	142	-$3,199	0.88
AC	562	Chiller	Eff. Chiller	RI	63	Elect.	Elect.	87	142	87	142	-$3,199	0.88
AC	575	Chiller	Eff. Chiller	RI	64	Elect.	Elect.	46	77	46	77	-$10,819	0.71
AC	576	Chiller	Eff. Chiller	RI	65	Elect.	Elect.	50	51	50	51	-$6,387	0.74
AC	600	Chiller	Eff. Chiller	RI	66	Elect.	Elect.	16	16	16	16	-$1,265	0.79
AC	624	Chiller	Eff. Chiller	RI	67	Elect.	Elect.	17	17	17	17	-$1,371	0.79
AC	629	Chiller	Eff. Chiller	RI	68	Elect.	Elect.	8	13	8	13	-$1,270	0.75
AC	629	Chiller	Eff. Chiller	RI	69	Elect.	Elect.	22	36	22	36	-$5,049	0.71
AC	630	Chiller	Eff. Chiller	RI	70	Elect.	Elect.	13	13	13	13	-$1,054	0.79
AC	655	Chiller	Eff. Chiller	RI	71	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	659	Chiller	Eff. Chiller	RI	72	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	673	Chiller	Eff. Chiller	RI	73	Elect.	Elect.	19	31	19	31	-$4,327	0.71
AC	685	Chiller	Eff. Chiller	RI	74	Elect.	Elect.	9	9	9	9	-$738	0.79
AC	703	Chiller	Eff. Chiller	RI	75	Elect.	Elect.	19	20	19	20	-$1,582	0.79
AC	710	Chiller	Eff. Chiller	RI	76	Elect.	Elect.	5	5	5	5	-$422	0.79
AC	710	Chiller	Eff. Chiller	RI	77	Elect.	Elect.	22	36	22	36	-$5,049	0.71
AC	722	Chiller	Eff. Chiller	RI	78	Elect.	Elect.	43	71	43	71	-$10,097	0.71
AC	727	Chiller	Eff. Ch[illegible]	RI	79	Elect.	Elect.	59	61	59	61	-$7,664	0.74
AC	732	Chiller	Eff. C[illegible]	RI	80	Elect.	Elect.	30	50	30	50	-$7,068	0.71
AC	734	Chiller	Eff. [illegible]	RI	81	Elect.	Elect.	31	32	31	32	-$3,960	0.74
AC	735	Chiller	Eff. [illegible]	RI	82	Elect.	Elect.	10	11	10	11	-$844	0.79
AC	736	Chiller	Eff. C[illegible]	RI	83	Elect.	Elect.	14	15	14	15	-$1,160	0.79
AC	738	Chiller	Eff. Chille[illegible]	RI	84	Elect.	Elect.	108	32	108	32	-$534	0.97
AC	750	Chiller	Eff. Chiller	RI	85	Elect.	Elect.	77	128	77	128	-$18,031	0.71
AC	751	Chiller	Eff. Chiller	RI	86	Elect.	Elect.	40	66	40	66	-$9,376	0.71
AC	800	Chiller	Eff. Chiller	RI	87	Elect.	Elect.	142	233	142	233	-$5,235	0.88
AC	800	Chiller	Eff. Chiller	RI	88	Elect.	Elect.	112	184	112	184	-$25,965	0.71
AC	810	Chiller	Eff. Chiller	RI	89	Elect.	Elect.	50	52	50	52	-$325	0.97
AC	900	Chiller	Eff. Chiller	RI	90	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	912	Chiller	Eff. Chiller	RI	91	Elect.	Elect.	10	11	10	11	-$844	0.79
AC	925	Chiller	Eff. Chiller	RI	92	Elect.	Elect.	880	906	880	906	-$23,708	0.89
AC	926	Chiller	Eff. Chiller	RI	93	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	929	Chiller	Eff. Chiller	RI	94	Elect.	Elect.	384	395	384	395	-$10,345	0.89
AC	943	Chiller	Eff. Chiller	RI	95	Elect.	Elect.	19	20	19	20	-$1,582	0.79
AC	945	Chiller	Eff. Chiller	RI	96	Elect.	Elect.	37	61	37	61	-$8,655	0.71
AC	946	Chiller	Eff. Chiller	RI	97	Elect.	Elect.	62	102	62	102	-$14,425	0.71
AC	957	Chiller	Eff. Chiller	RI	98	Elect.	Elect.	50	52	50	52	-$325	0.97
AC	958	Chiller	Eff. Chiller	RI	99	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	965	Chiller	Eff. Chiller	RI	100	Elect.	Elect.	126	129	126	129	-$813	0.97
AC	967	Chiller	Eff. Chiller	RI	101	Elect.	Elect.	31	52	31	52	-$1,163	0.88
AC	967	Chiller	Eff. Chiller	RI	102	Elect.	Elect.	55	90	55	90	-$12,694	0.71
AC	969	Chiller	Eff. Chiller	RI	103	Elect.	Elect.	32	33	32	33	-$4,088	0.74
AC	984	Chiller	Eff. Chiller	RI	104	Elect.	Elect.	37	61	37	61	-$8,655	0.71
AC	986	Chiller	Eff. Chiller	RI	105	Elect.	Elect.	320	330	320	330	-$8,621	0.89
AC	989	Chiller	Eff. Chiller	RI	106	Elect.	Elect.	277	285	277	285	-$1,788	0.97
AC	989	Chiller	Eff. Chiller	RI	107	Elect.	Elect.	525	541	525	541	-$67,701	0.74
AC	989	Chiller	Eff. Chiller	RI	108	Elect.	Elect.	2,130	2,193	2,130	2,193	-$16,378	0.96
AC	990	Chiller	Eff. Chiller	RI	109	Elect.	Elect.	75	78	75	78	-$488	0.97
AC	990	Chiller	Eff. Chiller	RI	110	Elect.	Elect.	50	51	50	51	-$6,387	0.74
AC	991	Chiller	Eff. Chiller	RI	111	Elect.	Elect.	60	62	60	62	-$390	0.97

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
AC	992	Chiller	Eff. Chiller	RI	112	Elect.	Elect.	5	5	5	5	-$1,245	0.69
AC	992	Chiller	Eff. Chiller	RI	113	Elect.	Elect.	30	31	30	31	-$3,832	0.74
AC	996	Chiller	Eff. Chiller	RI	114	Elect.	Elect.	23	24	23	24	-$1,898	0.79
AC	996	Chiller	Eff. Chiller	RI	115	Elect.	Elect.	40	41	40	41	-$5,110	0.74
AC	998	Chiller	Eff. Chiller	RI	116	Elect.	Elect.	13	13	13	13	-$1,054	0.79
AC	998	Chiller	Eff. Chiller	RI	117	Elect.	Elect.	248	255	248	255	-$2,705	0.95
AC	1316	Chiller	Eff. Chiller	RI	118	Elect.	Elect.	40	41	40	41	-$5,110	0.74
AC	1353	Chiller	Eff. Chiller	RI	119	Elect.	Elect.	40	41	40	41	-$5,110	0.74
AC	1360	Chiller	Eff. Chiller	RI	120	Elect.	Elect.	10	11	10	11	-$844	0.79
AC	1364	Chiller	Eff. Chiller	RI	121	Elect.	Elect.	13	13	13	13	-$1,054	0.79
AC	1364	Chiller	Eff. Chiller	RI	122	Elect.	Elect.	346	356	346	356	-$9,311	0.89
AC	1365	Chiller	Eff. Chiller	RI	123	Elect.	Elect.	158	163	158	163	-$20,438	0.74
AC	1369	Chiller	Eff. Chiller	RI	124	Elect.	Elect.	75	78	75	78	-$488	0.97
AC	1380	Chiller	Eff. Chiller	RI	125	Elect.	Elect.	634	653	634	653	-$4,875	0.96
AC	1391	Chiller	Eff. Chiller	RI	126	Elect.	Elect.	19	20	19	20	-$1,582	0.79
AC	1491	Chiller	Eff. Chiller	RI	127	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	1492	Chiller	Eff. Chiller	RI	128	Elect.	Elect.	6	7	6	7	-$527	0.79
AC	1492	Chiller	Eff. Chiller	RI	129	Elect.	Elect.	30	31	30	31	-$3,832	0.74
AC	1493	Chiller	Eff. Chiller	RI	130	Elect.	Elect.	70	73	70	73	-$455	0.97
AC	1524	Chiller	Eff. Chiller	RI	131	Elect.	Elect.	13	13	13	13	-$1,054	0.79
AC	3655	Chiller	Eff. Chiller	RI	132	Elect.	Elect.	50	51	50	51	-$6,387	0.74
AC	3656	Chiller	Eff. Chiller	RI	133	Elect.	Elect.	63	65	63	65	-$406	0.97
AC	3658	Chiller	Eff. Chiller	RI	134	Elect.	Elect.	10	11	10	11	-$844	0.79
AC	3659	Chiller	Eff. Chiller	RI	135	Elect.	Elect.	14	24	14	24	-$14,725	0.63
AC	250	Chiller	Eff. Chiller&TES	RI	9	Elect.	Elect.	-136	1,138	-136	1,138	$42,257	1.45
AC	265	Chiller	Eff. Chiller&TES	RI	12	Elect.	Elect.	-112	589	-112	589	$13,398	1.27
AC	312	Chiller	Eff. Chiller&TES	RI	14	Elect.	Elect.	1	292	1	292	$11,703	1.58
AC	313	Chiller	Eff. Chiller&TES	RI	15	Elect.	Elect.	-191	1,601	-191	1,601	$59,451	1.45
AC	318	Chiller	Eff. Chiller&TES	RI	17	Elect.	Elect.	-47	392	-47	392	$14,571	1.45
AC	329	Chiller	Eff. Chiller&TES	RI	19	Elect.	Elect.	0	188	0	188	$7,550	1.58
AC	330	Chiller	Eff. Chiller&TES	RI	20	Elect.	Elect.	-47	392	-47	392	$14,571	1.45
AC	330	Chiller	Eff. Chiller&TES	RI	21	Elect.	Elect.	1	565	1	565	$22,650	1.58
AC	330	Chiller	Eff. Chiller&TES	RI	22	Elect.	Elect.	-43	2,001	-43	2,001	$30,741	1.16
AC	400	Chiller	Eff. Chiller&TES	RI	26	Elect.	Elect.	-120	628	-120	628	$14,291	1.27
AC	402	Chiller	Eff. Chiller&TES	RI	28	Elect.	Elect.	1	188	1	188	$5,802	1.45
AC	404	Chiller	Eff. Chiller&TES	RI	29	Elect.	Elect.	-140	419	-140	419	$7,040	1.18
AC	408	Chiller	Eff. Chiller&TES	RI	30	Elect.	Elect.	-37	314	-37	314	$11,657	1.45
AC	415	Chiller	Eff. Chiller&TES	RI	31	Elect.	Elect.	-16	734	-16	734	$11,272	1.16
AC	423	Chiller	Eff. Chiller&TES	RI	32	Elect.	Elect.	291	4,691	291	4,691	$96,637	1.24
AC	424	Chiller	Eff. Chiller&TES	RI	33	Elect.	Elect.	1	188	1	188	$5,802	1.45
AC	425	Chiller	Eff. Chiller&TES	RI	34	Elect.	Elect.	0	235	0	235	$9,438	1.58
AC	425	Chiller	Eff. Chiller&TES	RI	35	Elect.	Elect.	-51	432	-51	432	$16,028	1.45
AC	425	Chiller	Eff. Chiller&TES	RI	36	Elect.	Elect.	-69	3,202	-69	3,202	$49,186	1.16
AC	430	Chiller	Eff. Chiller&TES	RI	37	Elect.	Elect.	-37	314	-37	314	$11,657	1.45
AC	431	Chiller	Eff. Chiller&TES	RI	38	Elect.	Elect.	59	1,036	59	1,036	$42,915	1.66
AC	440	Chiller	Eff. Chiller&TES	RI	39	Elect.	Elect.	-71	353	-71	353	$12,419	1.38
AC	501	Chiller	Eff. Chiller&TES	RI	40	Elect.	Elect.	43	607	43	607	$20,417	1.52
AC	502	Chiller	Eff. Chiller&TES	RI	41	Elect.	Elect.	43	607	43	607	$20,417	1.52
AC	503	Chiller	Eff. Chiller&TES	RI	42	Elect.	Elect.	43	607	43	607	$20,417	1.52
AC	505	Chiller	Eff. Chiller&TES	RI	43	Elect.	Elect.	-63	1,834	-63	1,834	$9,358	1.05
AC	523	Chiller	Eff. Chiller&TES	RI	45	Elect.	Elect.	-45	198	-45	198	$6,583	1.34
AC	530	Chiller	Eff. Chiller&TES	RI	46	Elect.	Elect.	-56	471	-56	471	$17,485	1.45
AC	533	Chiller	Eff. Chiller&TES	RI	47	Elect.	Elect.	56	452	56	452	$16,165	1.59
AC	533	Chiller	Eff. Chiller&TES	RI	48	Elect.	Elect.	-262	1,373	-262	1,373	$31,262	1.27
AC	534	Chiller	Eff. Chiller&TES	RI	49	Elect.	Elect.	30	518	30	518	$21,458	1.66
AC	535	Chiller	Eff. Chiller&TES	RI	50	Elect.	Elect.	26	290	26	290	$9,996	1.55
AC	535	Chiller	Eff. Chiller&TES	RI	51	Elect.	Elect.	47	518	47	518	$17,851	1.55
AC	536	Chiller	Eff. Chiller&TES	RI	52	Elect.	Elect.	41	725	41	725	$30,041	1.66
AC	537	Chiller	Eff. Chiller&TES	RI	53	Elect.	Elect.	-57	599	-57	599	$16,017	1.35

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
AC	546	Chiller	Eff. Chiller&TES	RI	55	Elect.	Elect.	-145	636	-145	636	$10,294	1.16
AC	556	Chiller	Eff. Chiller&TES	RI	57	Elect.	Elect.	-72	198	-72	198	$2,838	1.15
AC	557	Chiller	Eff. Chiller&TES	RI	58	Elect.	Elect.	-23	63	-23	63	$792	1.12
AC	558	Chiller	Eff. Chiller&TES	RI	59	Elect.	Elect.	-120	628	-120	628	$14,291	1.27
AC	559	Chiller	Eff. Chiller&TES	RI	60	Elect.	Elect.	-56	471	-56	471	$17,485	1.45
AC	560	Chiller	Eff. Chiller&TES	RI	61	Elect.	Elect.	-47	392	-47	392	$14,571	1.45
AC	561	Chiller	Eff. Chiller&TES	RI	62	Elect.	Elect.	1	518	1	518	$20,763	1.58
AC	562	Chiller	Eff. Chiller&TES	RI	63	Elect.	Elect.	1	518	1	518	$20,763	1.58
AC	575	Chiller	Eff. Chiller&TES	RI	64	Elect.	Elect.	-70	589	-70	589	$21,857	1.45
AC	576	Chiller	Eff. Chiller&TES	RI	65	Elect.	Elect.	-75	392	-75	392	$8,932	1.27
AC	629	Chiller	Eff. Chiller&TES	RI	69	Elect.	Elect.	-33	275	-33	275	$10,200	1.45
AC	673	Chiller	Eff. Chiller&TES	RI	73	Elect.	Elect.	-28	235	-28	235	$8,743	1.45
AC	710	Chiller	Eff. Chiller&TES	RI	77	Elect.	Elect.	-33	275	-33	275	$10,200	1.45
AC	722	Chiller	Eff. Chiller&TES	RI	78	Elect.	Elect.	-66	549	-66	549	$20,400	1.45
AC	727	Chiller	Eff. Chiller&TES	RI	79	Elect.	Elect.	-90	471	-90	471	$10,719	1.27
AC	732	Chiller	Eff. Chiller&TES	RI	80	Elect.	Elect.	-46	384	-46	384	$14,280	1.45
AC	734	Chiller	Eff. Chiller&TES	RI	81	Elect.	Elect.	-46	243	-46	243	$5,538	1.27
AC	738	Chiller	Eff. Chiller&TES	RI	84	Elect.	Elect.	-46	243	-46	243	-$3,340	0.83
AC	750	Chiller	Eff. Chiller&TES	RI	85	Elect.	Elect.	-117	981	-117	981	$36,428	1.45
AC	751	Chiller	Eff. Chiller&TES	RI	86	Elect.	Elect.	-61	510	-61	510	$18,943	1.45
AC	800	Chiller	Eff. Chiller&TES	RI	87	Elect.	Elect.	2	847	2	847	$33,975	1.58
AC	800	Chiller	Eff. Chiller&TES	RI	88	Elect.	Elect.	-168	1,412	-168	1,412	$52,456	1.45
AC	810	Chiller	Eff. Chiller&TES	RI	89	Elect.	Elect.	1	188	1	188	$5,802	1.45
AC	925	Chiller	Eff. Chiller&TES	RI	92	Elect.	Elect.	-126	3,668	-126	3,668	$18,716	1.05
AC	929	Chiller	Eff. Chiller&TES	RI	94	Elect.	Elect.	-55	1,601	-55	1,601	$8,167	1.05
AC	945	Chiller	Eff. Chiller&TES	RI	96	Elect.	Elect.	-56	471	-56	471	$17,485	1.45
AC	946	Chiller	Eff. Chiller&TES	RI	97	Elect.	Elect.	-94	785	-94	785	$29,142	1.45
AC	957	Chiller	Eff. Chiller&TES	RI	98	Elect.	Elect.	1	188	1	188	$5,802	1.45
AC	985	Chiller	Eff. Chiller&TES	RI	100	Elect.	Elect.	1	471	1	471	$14,506	1.45
AC	987	Chiller	Eff. Chiller&TES	RI	101	Elect.	Elect.	0	188	0	188	$7,550	1.58
AC	987	Chiller	Eff. Chiller&TES	RI	102	Elect.	Elect.	-82	691	-82	691	$25,645	1.45
AC	989	Chiller	Eff. Chiller&TES	RI	103	Elect.	Elect.	-48	251	-48	251	$5,717	1.27
AC	984	Chiller	Eff. Chiller&TES	RI	104	Elect.	Elect.	-56	471	-56	471	$17,485	1.45
AC	986	Chiller	Eff. Chiller&TES	RI	105	Elect.	Elect.	-46	1,334	-46	1,334	$6,806	1.05
AC	989	Chiller	Eff. Chiller&TES	RI	106	Elect.	Elect.	3	1,036	3	1,036	$31,914	1.45
AC	989	Chiller	Eff. Chiller&TES	RI	107	Elect.	Elect.	-793	4,159	-793	4,159	$94,680	1.27
AC	989	Chiller	Eff. Chiller&TES	RI	108	Elect.	Elect.	164	7,592	164	7,592	$66,542	1.10
AC	990	Chiller	Eff. Chiller&TES	RI	109	Elect.	Elect.	1	282	1	282	$8,704	1.45
AC	990	Chiller	Eff. Chiller&TES	RI	110	Elect.	Elect.	-75	392	-75	392	$8,932	1.27
AC	991	Chiller	Eff. Chiller&TES	RI	111	Elect.	Elect.	1	226	1	226	$6,963	1.45
AC	992	Chiller	Eff. Chiller&TES	RI	113	Elect.	Elect.	-45	235	-45	235	$5,359	1.27
AC	996	Chiller	Eff. Chiller&TES	RI	115	Elect.	Elect.	-60	314	-60	314	$7,146	1.27
AC	998	Chiller	Eff. Chiller&TES	RI	117	Elect.	Elect.	25	867	25	867	$5,316	1.06
AC	1316	Chiller	Eff. Chiller&TES	RI	118	Elect.	Elect.	-60	314	-60	314	$7,146	1.27
AC	1353	Chiller	Eff. Chiller&TES	RI	119	Elect.	Elect.	-60	314	-60	314	$7,146	1.27
AC	1364	Chiller	Eff. Chiller&TES	RI	122	Elect.	Elect.	-49	1,441	-49	1,441	$7,350	1.05
AC	1365	Chiller	Eff. Chiller&TES	RI	123	Elect.	Elect.	-239	1,256	-239	1,256	$28,583	1.27
AC	1369	Chiller	Eff. Chiller&TES	RI	124	Elect.	Elect.	1	282	1	282	$8,704	1.45
AC	1380	Chiller	Eff. Chiller&TES	RI	125	Elect.	Elect.	49	2,260	49	2,260	$19,808	1.10
AC	1492	Chiller	Eff. Chiller&TES	RI	129	Elect.	Elect.	-45	235	-45	235	$5,359	1.27
AC	1493	Chiller	Eff. Chiller&TES	RI	130	Elect.	Elect.	1	264	1	264	$8,123	1.45
AC	3655	Chiller	Eff. Chiller&TES	RI	132	Elect.	Elect.	-75	392	-75	392	$8,932	1.27
AC	3656	Chiller	Eff. Chiller&TES	RI	133	Elect.	Elect.	1	235	1	235	$7,253	1.45
AC	3659	Chiller	Eff. Chiller&TES	RI	135	Elect.	Elect.	-141	706	-141	706	$14,792	1.23
AC	5[illegible]	Chiller	Gas Chiller/Cogen.	RI	40	Elect.	NG	-746	607	-746	607	-$36,702	0.28
AC	502	Chiller	Gas Chiller/Cogen.	RI	41	Elect.	NG	-746	607	-746	607	-$36,702	0.28
AC	503	Chiller	Gas Chiller/Cogen.	RI	42	Elect.	NG	-746	607	-746	607	-$36,702	0.28
AC	504/505/506	Chiller	Gas Chiller/Cogen.	RI	43	Elect.	NG	-3,513	1,834	-3,513	1,834	-$309,522	-0.32
AC	989	Chiller	Gas Chiller/Cogen.	RI	108	Elect.	NG	-9,180	7,592	-9,180	7,592	-$712,060	0.22

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
AC	1364	Chiller	Gas Chiller/Cogen.	RI	122	Elect.	NG	1,489	1,441	1,489	1,441	$97,991	1.53
Boilers	Multiple	Steam Boilers	Tune-up 18	RI	1	NG,F.Oil	NG,F.Oil	378	0	378	0	$9,264	1.98
Boilers	Multiple	Hot-Water Boilers	Tune-up 32	RI	2	NG,F.Oil	NG,F.Oil	245	0	245	0	-$6,972	0.46
Boilers	Multiple	All Boilers	Tune-up 50	RI	3	NG,F.Oil	NG,F.Oil	623	0	623	0	$19,734	2.13
Boilers	430	Hot-Water Boilers	Pulse Boilers	RI	5a	F.Oil	NG	13	0	13	0	-$8,527	0.40
Boilers	440	Hot-Water Boilers	Pulse Boilers	RI	5b	F.Oil	NG	10	0	10	0	-$6,427	0.42
Boilers	629	Hot-Water Boilers	Pulse Boilers	RI	5c	F.Oil	NG	6	0	6	0	-$4,475	0.35
Boilers	632	Hot-Water Boilers	Pulse Boilers	RI	5d	F.Oil	NG	18	0	18	0	-$8,095	0.60
Boilers	650	Hot-Water Boilers	Pulse Boilers	RI	5e	F.Oil	NG	5	0	5	0	-$3,608	0.42
Boilers	672	Hot-Water Boilers	Pulse Boilers	RI	5f	F.Oil	NG	15	0	15	0	-$9,522	0.44
Boilers	673	Hot-Water Boilers	Pulse Boilers	RI	5g	F.Oil	NG	6	0	6	0	-$3,247	0.49
Boilers	681	Hot-Water Boilers	Pulse Boilers	RI	5h	F.Oil	NG	2	0	2	0	-$1,206	0.44
Boilers	691	Hot-Water Boilers	Pulse Boilers	RI	5i	F.Oil	NG	7	0	7	0	-$4,981	0.35
Boilers	703	Hot-Water Boilers	Pulse Boilers	RI	5j	F.Oil	NG	3	0	3	0	-$1,768	0.44
Boilers	810	Hot-Water Boilers	Pulse Boilers	RI	5k	F.Oil	NG	6	0	6	0	-$4,570	0.36
Boilers	925	Hot-Water Boilers	Pulse Boilers	RI	5l	NG	NG	147	0	147	0	-$30,520	0.54
Boilers	945	Hot-Water Boilers	Pulse Boilers	RI	5m	NG	NG	48	0	48	0	-$13,672	0.36
Boilers	957	Hot-Water Boilers	Pulse Boilers	RI	5n	F.Oil	NG	5	0	5	0	-$2,574	0.54
Boilers	984	Hot-Water Boilers	Pulse Boilers	RI	5o	F.Oil	NG	25	0	25	0	-$13,934	0.51
Boilers	988	Hot-Water Boilers	Pulse Boilers	RI	5p	NG	NG	22	0	22	0	-$6,485	0.33
Boilers	989	Hot-Water Boilers	Pulse Boilers	RI	5q	NG	NG	1,564	0	1,564	0	-$83,260	0.64
Boilers	990	Hot-Water Boilers	Pulse Boilers	RI	5r	F.Oil	NG	4	0	4	0	-$1,475	0.70
Boilers	992	Hot-Water Boilers	Pulse Boilers	RI	5s	F.Oil	NG	5	0	5	0	-$3,260	0.46
Boilers	998	Hot-Water Boilers	Pulse Boilers	RI	5t	NG	NG	15	0	15	0	-$23,317	0.18
Boilers	1316	Hot-Water Boilers	Pulse Boilers	RI	5u	F.Oil	NG	16	0	16	0	-$9,325	0.48
Boilers	1364	Hot-Water Boilers	Pulse Boilers	RI	5v	NG,F.Oil	NG	80	0	80	0	-$20,685	0.43
Boilers	1492	Hot-Water Boilers	Pulse Boilers	RI	5w	F.Oil	NG	4	0	4	0	-$1,597	0.68
Boilers	1497	Hot-Water Boilers	Pulse Boilers	RI	5x	F.Oil	NG	5	0	5	0	-$3,608	0.42
Boilers	3695	Hot-Water Boilers	Pulse Boilers	RI	5y	F.Oil	NG	6	0	6	0	-$4,570	0.36
Controls	ADMIN	E-1	EMCS(exist. chill.)	RI	1	Elect.	Elect.	492	NA (a)	492	NA	$60,273	5.57
Controls	COMCATN	E-2	EMCS(exist. chill.)	RI	2	Elect.	Elect.	715	NA	715	NA	$81,790	4.38
Controls	DGR	E-3	EMCS(exist. chill.)	RI	3	Elect.	Elect.	213	NA	213	NA	$27,653	7.28
Controls	MISC	E-4	EMCS(exist. chill.)	RI	4	Elect.	Elect.	48	NA	48	NA	$4,899	3.23
Controls	PLT-BLD	E-5	EMCS(exist. chill.)	RI	5	Elect.	Elect.	17	NA	17	NA	-$4,991	0.24
Controls	R&D	E-6	EMCS(exist. chill.)	RI	6	Elect.	Elect.	777	NA	777	NA	$109,069	13.39
Controls	REC	E-7	EMCS(exist. chill.)	RI	7	Elect.	Elect.	141	NA	141	NA	$14,068	3.13
Controls	SHOP-ELC	E-8	EMCS(exist. chill.)	RI	8	Elect.	Elect.	61	NA	61	NA	$6,820	4.10
Controls	WHS	E-9	EMCS(exist. chill.)	RI	9	Elect.	Elect.	57	NA	57	NA	$1,171	1.18
Dishwasher	Fam. Hsg	DW-1	Eff. Dshwshr	RI	1	Elect.	Elect.	1,525	NA	1,525	NA	-$303,378	0.55
Envelope	989	Heating/Cooling	Ceiling Insulation	RI	1a	Elect.	Elect.	53	NA	53	NA	-$5,898	0.60
Envelope	Wherry	Heating/Cooling	Ceiling Insulation	RI	1b	Elect.	Elect.	11,498	NA	11,498	NA	$1,529,257	4.67
Envelope	TLF	Heating/Cooling	Refl. Window Trtmnt	RI	2a	Elect.	Elect.	2,337	NA	2,337	NA	$229,582	2.38
Envelope	FAM HSG	Heating/Cooling	Refl. Window Trtmnt	RI	2b	Elect.	Elect.	12,220	NA	12,220	NA	$1,619,221	4.61
Envelope	ADMIN	Heating/Cooling	Multi-Glazed Windows	RI	3a	Elect.	Elect.	1,849	NA	1,849	NA	-$310,656	0.50
Envelope	BRK/ADM	Heating/Cooling	Multi-Glazed Windows	RI	3b	Elect.	Elect.	1,388	NA	1,388	NA	-$139,566	0.63
Envelope	HOTEL	Heating/Cooling	Multi-Glazed Windows	RI	3c	Elect.	Elect.	615	NA	615	NA	-$61,871	0.63
Envelope	FAM HSG	Heating/Cooling	Multi-Glazed Windows	RI	3d	Elect.	Elect.	3,217	NA	3,217	NA	$95,505	1.21
Envelope	TRAING	Heating/Cooling	Multi-Glazed Windows	RI	3e	Elect.	Elect.	528	NA	528	NA	-$40,868	0.69
Envelope	ADMIN	Heating/Cooling	Weath. Package	RI	4a	Elect.	Elect.	1,437	NA	1,437	NA	$143,750	2.45
Envelope	BRK/ADM	Heating/Cooling	Weath. Package	RI	4b	Elect.	Elect.	604	NA	604	NA	$66,285	2.85
Envelope	CLUB	Heating/Cooling	Weath. Package	RI	4c	Elect.	Elect.	121	NA	121	NA	$17,895	7.96
Envelope	TRAING	Heating/Cooling	Weath. Package	RI	4d	Elect.	Elect.	44	NA	44	NA	$3,068	1.71
Envelope	FAM HSG	Heating/Cooling	Weath. Package	RI	4e	Elect.	Elect.	2,005	NA	2,005	NA	$126,182	1.59
Envelope	Wherry	Heating/Cooling	Radiant Barriers	RI	5	Elect.	Elect.	1,163	NA	1,163	NA	-$520,587	0.27
Fuel-Switch	Family Housing	W.Htrs,Stoves,Dryers	Eff. NG Replacements	RI	1	Elect.	NG	-9,980	NA	-9,980	NA	-$2,084,414	0.20
Fuel-Switch	Family Housing	W.Htrs,Stoves,Dryers	Std. NG Replacements	RI	2	Elect.	NG	-12,358	NA	-12,358	NA	-$1,258,811	0.35
HVAC	Family Housing	Air Source Ht. Pump	Grnd-Cpld Ht. Pump	RI	1	Elect.	Elect.	1,833	NA	1,833	NA	-$966,469	0.60
HVAC	Family Housing	Air Source Ht. Pump	Grnd-Cpld Ht. Pump	ROF	1	Elect.	Elect.	0	NA	1,833	NA	$1,296,699	1.80
Lighting	3	1F40 STD	None	RI	1	Elect.	Elect.	0	0	0	0	$0	(b)

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ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Lighting	1	1F40ES STD	1F32T8 ELC	RI	1	Elect.	Elect.	7	4	7	4	$835	1.70
Lighting	2	1F40ES STD	1F32T8 ELC	RI	1	Elect.	Elect.	202	184	202	184	$19,480	1.38
Lighting	4	2F40ES STD	2F32T8 ELC	RI	1	Elect.	Elect.	56	37	56	37	$4,826	1.32
Lighting	5	INC 3-60	None	RI	1	Elect.	Elect.	0	0	0	0	$0	(b)
Lighting	2	EXIT 2xPL9	LED	RI	10	Elect.	Elect.	210	84	210	84	$124,019	3.25
Lighting	3	INC 2x60 ceil	CFL 2-11 CEIL FIXT	RI	10	Elect.	Elect.	9,779	3,211	9,779	3,211	$2,193,024	12.38
Lighting	2	EXIT INC (2x15)	LED	RI	11	Elect.	Elect.	27	11	27	11	$21,981	5.51
Lighting	3	INC 50 MR spot	None	RI	11	Elect.	Elect.	0	0	0	0	$0	(b)
Lighting	2	EXIT INC (2x20)	LED	RI	12	Elect.	Elect.	55	22	55	22	$12,568	2.80
Lighting	3	INC 75 Ceil	CFL 2-9 + BLST	RI	12	Elect.	Elect.	4,260	1,399	4,260	1,399	$672,388	6.05
Lighting	2	INC 2x60 Ceil	CFL 2-11 CEIL FIXT	RI	13	Elect.	Elect.	94	28	94	28	$20,895	13.34
Lighting	2	INC 2x75 lamp	None	RI	14	Elect.	Elect.	0	0	0	0	$0	(b)
Lighting	2	INC 60 Ceil	CFL 11 CEIL FIXT	RI	15	Elect.	Elect.	737	266	737	266	$165,899	7.30
Lighting	2	INC 75 Ceil	CFL 2-9 + BLST	RI	16	Elect.	Elect.	89	32	89	32	$14,230	5.64
Lighting	2	INC 75 spot	None	RI	17	Elect.	Elect.	0	0	0	0	$0	(b)
Lighting	2	1F40 STD	1F32T8 ELC REF	RI	2	Elect.	Elect.	481	174	481	174	$17,491	1.21
Lighting	4	2F40 STD	None	RI	2	Elect.	Elect.	0	0	0	0	$0	(b)
Lighting	5	INC 2-60	CFL 2-15 CEIL	RI	2	Elect.	Elect.	2,756	2,241	2,756	2,241	$729,393	5.19
Lighting	3	2F40 STD	2F40ES ELC REF	RI	2a	Elect.	Elect.	1,499	519	1,499	519	$164,615	1.98
Lighting	1	2F40ES STD	2F32T8 ELC	RI	2a	Elect.	Elect.	309	174	309	174	$31,220	1.43
Lighting	3	2F40 STD	2F40ES ELC REF	RI	2b	Elect.	Elect.	57	20	57	20	$6,294	1.98
Lighting	3	2F40 STD	SENS	RI	2b	Elect.	Elect.	40	14	40	14	$10,116	11.63
Lighting	3	2F40 STD	2F40ES ELC REF SENS	RI	2b	Elect.	Elect.	83	29	83	29	$11,932	2.61
Lighting	1	2F40ES STD	SENS	RI	2b	Elect.	Elect.	252	142	252	142	$74,545	7.23
Lighting	1	2F40ES STD	2F32T8 ELC	RI	2b	Elect.	Elect.	179	101	179	101	$18,045	1.43
Lighting	1	2F40ES STD	2F32T8 ELC SENS	RI	2b	Elect.	Elect.	386	218	386	218	$61,524	2.14
Lighting	1	2F40 STD	None	RI	3	Elect.	Elect.	0	0	0	0	$0	(b)
Lighting	3	2F96 STD	2F96ES ELC REF	RI	3	Elect.	Elect.	1,628	1,346	1,628	1,346	$131,717	1.42
Lighting	4	3F40ES STD	2F40ES ELC REF	RI	3	Elect.	Elect.	145	175	145	175	$19,160	1.62
Lighting	5	INC 1-60	CFL 15 CEIL	RI	3	Elect.	Elect.	1,308	560	1,308	560	$251,910	4.44
Lighting	2	2F40ES STD	2F32T8 ELC	RI	3a	Elect.	Elect.	514	170	514	170	$65,417	1.93
Lighting	2	2F40ES STD	SENS	RI	3b	Elect.	Elect.	258	85	258	85	$69,704	10.67
Lighting	2	2F40ES STD	2F32T8 ELC	RI	3b	Elect.	Elect.	183	61	183	61	$23,313	1.93
Lighting	2	2F40ES STD	2F32T8 ELC SENS	RI	3b	Elect.	Elect.	396	131	396	131	$70,751	3.19
Lighting	2	2F40 STD	2F40ES ELC REF	RI	4	Elect.	Elect.	29	26	29	26	$707	1.08
Lighting	4	4F40ES STD	3F40ES ELC REF	RI	4	Elect.	Elect.	81	62	81	62	$10,093	1.72
Lighting	1	4F40ES STD	3F40ES ELC REF	RI	4	Elect.	Elect.	295	154	295	154	$42,470	2.23
Lighting	3	3F40 STD	2F40 STD REF	RI	4a	Elect.	Elect.	10	11	10	11	$1,543	1.99
Lighting	3	3F40 STD	SENS	RI	4b	Elect.	Elect.	8	9	8	9	-$25,112	0.09
Lighting	3	3F40 STD	2F40 STD REF SENS	RI	4b	Elect.	Elect.	15	17	15	17	-$24,615	0.16
Lighting	3	3F40 STD	2F40 STD REF	RI	4b	Elect.	Elect.	10	11	10	11	$1,544	1.99
Lighting	2	2F96 STD	2F96ES ELC REF	RI	5	Elect.	Elect.	51	43	51	43	$4,214	1.42
Lighting	3	4F40ES STD	3F40ES ELC REF	RI	5	Elect.	Elect.	383	316	383	316	$46,068	1.65
Lighting	4	6F40 STD	None	RI	5	Elect.	Elect.	0	0	0	0	$0	(b)
Lighting	1	3F40ES STD	2F40ES ELC REF	RI	5a	Elect.	Elect.	5,707	3,424	5,707	3,424	$983,435	2.61
Lighting	1	3F40ES STD	2F40ES ELC REF SENS	RI	5b	Elect.	Elect.	4,691	2,814	4,691	2,814	$841,312	2.83
Lighting	1	3F40ES STD	SENS	RI	5b	Elect.	Elect.	1,867	1,120	1,867	1,120	$626,160	11.67
Lighting	1	3F40ES STD	2F40ES ELC REF	RI	5b	Elect.	Elect.	3,764	2,258	3,764	2,258	$648,612	2.61
Lighting	2	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	170	62	170	62	$26,580	3.66
Lighting	1	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	1,820	779	1,820	779	$281,604	3.22
Lighting	3	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	7	7	7	7	$896	1.74
Lighting	1	6F40 STD	None	RI	7	Elect.	Elect.	0	0	0	0	$0	(b)
Lighting	3	EXIT INC(2x20)	LED	RI	7	Elect.	Elect.	28	11	28	11	$6,500	2.80
Lighting	2	3F40ES STD	2F40ES ELC REF	RI	7a	Elect.	Elect.	363	109	363	109	$67,793	4.49
Lighting	2	3F40ES STD	2F40ES ELC REF SENS	RI	7b	Elect.	Elect.	274	83	274	83	$53,225	4.95
Lighting	2	3F40ES STD	2F40ES ELC REF	RI	7b	Elect.	Elect.	220	66	220	66	$41,056	4.49
Lighting	2	3F40ES STD	SENS	RI	7b	Elect.	Elect.	109	33	109	33	$34,002	21.00
Lighting	1	EXIT INC(2x15)	LED	RI	8	Elect.	Elect.	408	164	408	164	$328,429	5.51
Lighting	3	INC 100 Ceil	CFL 2-11 CEIL FIXT	RI	8	Elect.	Elect.	41	46	41	46	$7,781	3.20

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Lighting	2	4F40ES STD	3F40ES ELC REF	RI	8a	Elect.	Elect.	2,417	1,849	2,417	1,849	$305,099	1.73
Lighting	2	4F40ES STD	SENS	RI	8b	Elect.	Elect.	40	31	40	31	$13,502	11.45
Lighting	2	4F40ES STD	3F40ES ELC REF SENS	RI	8b	Elect.	Elect.	90	69	90	69	$13,738	2.09
Lighting	2	4F40ES STD	3F40ES ELC REF	RI	8b	Elect.	Elect.	66	50	66	50	$8,268	1.73
Lighting	2	4F40 STD	3F32T8 ELC REF	RI	9	Elect.	Elect.	1,520	461	1,520	461	$237,624	4.17
Lighting	3	INC 150	None	RI	9	Elect.	Elect.	0	0	0	0	$0	(b)
Lighting	1	INC 75 Can	CFL 20 + BLST	RI	9	Elect.	Elect.	985	590	985	590	$206,458	4.87
Motors	ADMIN	Fan Motor	Eff. Motor	RI	1a	Elect.	Elect.	986	462	986	462	$114,321	1.94
Motors	BRK/ADM	Fan Motor	Eff. Motor	RI	2a	Elect.	Elect.	257	120	257	120	$29,765	1.94
Motors	CHAPEL	Fan Motor	Eff. Motor	RI	3a	Elect.	Elect.	13	6	13	6	$1,530	1.94
Motors	CLINIC	Fan Motor	Eff. Motor	RI	4a	Elect.	Elect.	8	4	8	4	$885	1.94
Motors	CLUB	Fan Motor	Eff. Motor	RI	5a	Elect.	Elect.	17	8	17	8	$1,938	1.95
Motors	COMCATN	Fan Motor	Eff. Motor	RI	6a	Elect.	Elect.	93	43	93	43	$10,745	1.94
Motors	DGR	Fan Motor	Eff. Motor	RI	7a	Elect.	Elect.	167	78	167	78	$19,357	1.94
Motors	DINING	Fan Motor	Eff. Motor	RI	8a	Elect.	Elect.	91	43	91	43	$10,612	1.94
Motors	GROCERY	Fan Motor	Eff. Motor	RI	9a	Elect.	Elect.	94	44	94	44	$10,903	1.94
Motors	HANGER	Fan Motor	Eff. Motor	RI	10a	Elect.	Elect.	129	60	129	60	$14,963	1.94
Motors	HOSPITL	Fan Motor	Eff. Motor	RI	11a	Elect.	Elect.	82	38	82	38	$9,524	1.94
Motors	HSG-FAM	Fan Motor	Eff. Motor	RI	12a	Elect.	Elect.	14	6	14	6	$1,595	1.94
Motors	MISC	Fan Motor	Eff. Motor	RI	13a	Elect.	Elect.	5	2	5	2	$544	1.94
Motors	MTRPOOL	Fan Motor	Eff. Motor	RI	14a	Elect.	Elect.	57	27	57	27	$6,638	1.94
Motors	MWR	Fan Motor	Eff. Motor	RI	15a	Elect.	Elect.	128	60	128	60	$14,867	1.94
Motors	PLT-BLD	Fan Motor	Eff. Motor	RI	16a	Elect.	Elect.	5	2	5	2	$599	1.94
Motors	R&D	Fan Motor	Eff. Motor	RI	17a	Elect.	Elect.	61	29	61	29	$7,112	1.94
Motors	REC	Fan Motor	Eff. Motor	RI	18a	Elect.	Elect.	48	22	48	22	$5,565	1.94
Motors	RESTRNT	Fan Motor	Eff. Motor	RI	19a	Elect.	Elect.	4	2	4	2	$422	1.94
Motors	SECURITY	Fan Motor	Eff. Motor	RI	20a	Elect.	Elect.	43	20	43	20	$4,980	1.94
Motors	SHOP	Fan Motor	Eff. Motor	RI	21a	Elect.	Elect.	38	18	38	18	$4,370	1.94
Motors	SHOP-ELEC	Fan Motor	Eff. Motor	RI	22a	Elect.	Elect.	186	87	186	87	$21,632	1.94
Motors	STOR-UH	Fan Motor	Eff. Motor	RI	23a	Elect.	Elect.	47	22	47	22	$5,468	1.94
Motors	TERMINL	Fan Motor	Eff. Motor	RI	24a	Elect.	Elect.	97	45	97	45	$11,208	1.94
Motors	TRAING	Fan Motor	Eff. Motor	RI	25a	Elect.	Elect.	44	20	44	20	$5,066	1.94
Motors	WHS	Fan Motor	Eff. Motor	RI	26a	Elect.	Elect.	351	164	351	164	$40,665	1.94
Motors	ADMIN	Fan Motor	Eff. Motor	ROF	1b	Elect.	Elect.	0	0	986	462	$103,765	2.12
Motors	BRK/ADM	Fan Motor	Eff. Motor	ROF	2b	Elect.	Elect.	0	0	257	120	$27,017	2.12
Motors	CHAPEL	Fan Motor	Eff. Motor	ROF	3b	Elect.	Elect.	0	0	13	6	$1,388	2.12
Motors	CLINIC	Fan Motor	Eff. Motor	ROF	4b	Elect.	Elect.	0	0	8	4	$803	2.12
Motors	CLUB	Fan Motor	Eff. Motor	ROF	5b	Elect.	Elect.	0	0	17	8	$1,749	2.13
Motors	COMCATN	Fan Motor	Eff. Motor	ROF	6b	Elect.	Elect.	0	0	93	43	$9,753	2.12
Motors	DGR	Fan Motor	Eff. Motor	ROF	7b	Elect.	Elect.	0	0	167	78	$17,569	2.12
Motors	DINING	Fan Motor	Eff. Motor	ROF	8b	Elect.	Elect.	0	0	91	43	$9,633	2.12
Motors	GROCERY	Fan Motor	Eff. Motor	ROF	9b	Elect.	Elect.	0	0	94	44	$9,896	2.12
Motors	HANGER	Fan Motor	Eff. Motor	ROF	10b	Elect.	Elect.	0	0	129	60	$13,582	2.12
Motors	HOSPITL	Fan Motor	Eff. Motor	ROF	11b	Elect.	Elect.	0	0	82	38	$8,644	2.12
Motors	HSG-FAM	Fan Motor	Eff. Motor	ROF	12b	Elect.	Elect.	0	0	14	6	$1,448	2.12
Motors	MISC	Fan Motor	Eff. Motor	ROF	13b	Elect.	Elect.	0	0	5	2	$494	2.12
Motors	MTRPOOL	Fan Motor	Eff. Motor	ROF	14b	Elect.	Elect.	0	0	57	27	$6,025	2.12
Motors	MWR	Fan Motor	Eff. Motor	ROF	15b	Elect.	Elect.	0	0	128	60	$13,494	2.12
Motors	PLT-BLD	Fan Motor	Eff. Motor	ROF	16b	Elect.	Elect.	0	0	5	2	$543	2.12
Motors	R&D	Fan Motor	Eff. Motor	ROF	17b	Elect.	Elect.	0	0	61	29	$6,456	2.12
Motors	REC	Fan Motor	Eff. Motor	ROF	18b	Elect.	Elect.	0	0	48	22	$5,051	2.12
Motors	RESTRNT	Fan Motor	Eff. Motor	ROF	19b	Elect.	Elect.	0	0	4	2	$383	2.12
Motors	SECURITY	Fan Motor	Eff. Motor	ROF	20b	Elect.	Elect.	0	0	43	20	$4,521	2.12
Motors	SHOP	Fan Motor	Eff. Motor	ROF	21b	Elect.	Elect.	0	0	38	18	$3,967	2.12
Motors	SHOP-ELEC	Fan Motor	Eff. Motor	ROF	22b	Elect.	Elect.	0	0	186	87	$19,635	2.12
Motors	STOR-UH	Fan Motor	Eff. Motor	ROF	23b	Elect.	Elect.	0	0	47	22	$4,963	2.12
Motors	TERMINL	Fan Motor	Eff. Motor	ROF	24b	Elect.	Elect.	0	0	97	45	$10,173	2.12
Motors	TRAING	Fan Motor	Eff. Motor	ROF	25b	Elect.	Elect.	0	0	44	20	$4,598	2.12
Motors	WHS	Fan Motor	Eff. Motor	ROF	26b	Elect.	Elect.	0	0	351	164	$36,910	2.12

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Motors	ADMIN	Chilled Water Pump	Eff. Motor	RI	27a	Elect.	Elect.	281	NA	281	NA	$19,141	1.52
Motors	BRK/ADM	Chilled Water Pump	Eff. Motor	RI	28a	Elect.	Elect.	65	NA	65	NA	$4,433	1.52
Motors	CHAPEL	Chilled Water Pump	Eff. Motor	RI	29a	Elect.	Elect.	9	NA	9	NA	$583	1.52
Motors	CLINIC	Chilled Water Pump	Eff. Motor	RI	30a	Elect.	Elect.	3	NA	3	NA	$233	1.52
Motors	CLUB	Chilled Water Pump	Eff. Motor	RI	31a	Elect.	Elect.	3	NA	3	NA	$174	1.51
Motors	COMCATN	Chilled Water Pump	Eff. Motor	RI	32a	Elect.	Elect.	6	NA	6	NA	$408	1.52
Motors	DGR	Chilled Water Pump	Eff. Motor	RI	33a	Elect.	Elect.	36	NA	36	NA	$2,482	1.52
Motors	DINING	Chilled Water Pump	Eff. Motor	RI	34a	Elect.	Elect.	27	NA	27	NA	$1,823	1.52
Motors	GROCERY	Chilled Water Pump	Eff. Motor	RI	35a	Elect.	Elect.	14	NA	14	NA	$932	1.52
Motors	HANGER	Chilled Water Pump	Eff. Motor	RI	36a	Elect.	Elect.	16	NA	16	NA	$1,107	1.52
Motors	HOSPITL	Chilled Water Pump	Eff. Motor	RI	37a	Elect.	Elect.	27	NA	27	NA	$1,863	1.52
Motors	MISC	Chilled Water Pump	Eff. Motor	RI	38a	Elect.	Elect.	3	NA	3	NA	$233	1.52
Motors	MWR	Chilled Water Pump	Eff. Motor	RI	39a	Elect.	Elect.	36	NA	36	NA	$2,446	1.52
Motors	PLT-BLD	Chilled Water Pump	Eff. Motor	RI	40a	Elect.	Elect.	68	NA	68	NA	$4,602	1.52
Motors	R&D	Chilled Water Pump	Eff. Motor	RI	41a	Elect.	Elect.	20	NA	20	NA	$1,352	1.52
Motors	REC	Chilled Water Pump	Eff. Motor	RI	42a	Elect.	Elect.	4	NA	4	NA	$286	1.52
Motors	SECURITY	Chilled Water Pump	Eff. Motor	RI	43a	Elect.	Elect.	6	NA	6	NA	$437	1.52
Motors	SHOP-ELEC	Chilled Water Pump	Eff. Motor	RI	44a	Elect.	Elect.	17	NA	17	NA	$1,189	1.52
Motors	STOR-UH	Chilled Water Pump	Eff. Motor	RI	45a	Elect.	Elect.	3	NA	3	NA	$203	1.52
Motors	TERMINL	Chilled Water Pump	Eff. Motor	RI	46a	Elect.	Elect.	15	NA	15	NA	$1,048	1.52
Motors	TRAING	Chilled Water Pump	Eff. Motor	RI	47a	Elect.	Elect.	15	NA	15	NA	$1,048	1.52
Motors	WHS	Chilled Water Pump	Eff. Motor	RI	48a	Elect.	Elect.	49	NA	49	NA	$3,320	1.52
Motors	ADMIN	Chilled Water Pump	Eff. Motor	ROF	27b	Elect.	Elect.	0	NA	281	NA	$21,752	1.77
Motors	BRK/ADM	Chilled Water Pump	Eff. Motor	ROF	28b	Elect.	Elect.	0	NA	65	NA	$5,037	1.77
Motors	CHAPEL	Chilled Water Pump	Eff. Motor	ROF	29b	Elect.	Elect.	0	NA	9	NA	$662	1.77
Motors	CLINIC	Chilled Water Pump	Eff. Motor	ROF	30b	Elect.	Elect.	0	NA	3	NA	$265	1.77
Motors	CLUB	Chilled Water Pump	Eff. Motor	ROF	31b	Elect.	Elect.	0	NA	3	NA	$198	1.77
Motors	COMCATN	Chilled Water Pump	Eff. Motor	ROF	32b	Elect.	Elect.	0	NA	6	NA	$463	1.77
Motors	DGR	Chilled Water Pump	Eff. Motor	ROF	33b	Elect.	Elect.	0	NA	36	NA	$2,820	1.77
Motors	DINING	Chilled Water Pump	Eff. Motor	ROF	34b	Elect.	Elect.	0	NA	27	NA	$2,072	1.77
Motors	GROCERY	Chilled Water Pump	Eff. Motor	ROF	35b	Elect.	Elect.	0	NA	14	NA	$1,059	1.77
Motors	HANGER	Chilled Water Pump	Eff. Motor	ROF	36b	Elect.	Elect.	0	NA	16	NA	$1,253	1.77
Motors	HOSPITL	Chilled Water Pump	Eff. Motor	ROF	37b	Elect.	Elect.	0	NA	27	NA	$2,118	1.77
Motors	MISC	Chilled Water Pump	Eff. Motor	ROF	38b	Elect.	Elect.	0	NA	3	NA	$265	1.77
Motors	MWR	Chilled Water Pump	Eff. Motor	ROF	39b	Elect.	Elect.	0	NA	36	NA	$2,780	1.77
Motors	PLT-BLD	Chilled Water Pump	Eff. Motor	ROF	40b	Elect.	Elect.	0	NA	68	NA	$5,230	1.77
Motors	R&D	Chilled Water Pump	Eff. Motor	ROF	41b	Elect.	Elect.	0	NA	20	NA	$1,536	1.77
Motors	REC	Chilled Water Pump	Eff. Motor	ROF	42b	Elect.	Elect.	0	NA	4	NA	$324	1.77
Motors	SECURITY	Chilled Water Pump	Eff. Motor	ROF	43b	Elect.	Elect.	0	NA	6	NA	$497	1.77
Motors	SHOP-ELEC	Chilled Water Pump	Eff. Motor	ROF	44b	Elect.	Elect.	0	NA	17	NA	$1,351	1.77
Motors	STOR-UH	Chilled Water Pump	Eff. Motor	ROF	45b	Elect.	Elect.	0	NA	3	NA	$231	1.77
Motors	TERMINL	Chilled Water Pump	Eff. Motor	ROF	46b	Elect.	Elect.	0	NA	15	NA	$1,191	1.77
Motors	TRAING	Chilled Water Pump	Eff. Motor	ROF	47b	Elect.	Elect.	0	NA	15	NA	$1,191	1.77
Motors	WHS	Chilled Water Pump	Eff. Motor	ROF	48b	Elect.	Elect.	0	NA	49	NA	$3,773	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	RI	49a	Elect.	Elect.	52	NA	52	NA	$3,553	1.52
Motors	ADMIN	Condenser Pump	Eff. Motor	RI	50a	Elect.	Elect.	41	NA	41	NA	$2,796	1.52
Motors	ADMIN	Condenser Pump	Eff. Motor	RI	51a	Elect.	Elect.	6	NA	6	NA	$408	1.52
Motors	ADMIN	Condenser Pump	Eff. Motor	RI	52a	Elect.	Elect.	5	NA	5	NA	$349	1.52
Motors	ADMIN	Condenser Pump	Eff. Motor	RI	53a	Elect.	Elect.	92	NA	92	NA	$6,262	1.52
Motors	BRK/ADM	Condenser Pump	Eff. Motor	RI	54a	Elect.	Elect.	39	NA	39	NA	$2,650	1.52
Motors	BRK/ADM	Condenser Pump	Eff. Motor	RI	55a	Elect.	Elect.	5	NA	5	NA	$349	1.52
Motors	BRK/ADM	Condenser Pump	Eff. Motor	RI	56a	Elect.	Elect.	5	NA	5	NA	$349	1.52
Motors	BRK/ADM	Condenser Pump	Eff. Motor	RI	57a	Elect.	Elect.	5	NA	5	NA	$349	1.52
Motors	DGR	Condenser Pump	Eff. Motor	RI	58a	Elect.	Elect.	9	NA	9	NA	$641	1.52
Motors	DINING	Condenser Pump	Eff. Motor	RI	59a	Elect.	Elect.	7	NA	7	NA	$466	1.52
Motors	HOSPITL	Condenser Pump	Eff. Motor	RI	60a	Elect.	Elect.	27	NA	27	NA	$1,864	1.52
Motors	MWR	Condenser Pump	Eff. Motor	RI	61a	Elect.	Elect.	9	NA	9	NA	$582	1.52
Motors	TRAING	Condenser Pump	Eff. Motor	RI	62a	Elect.	Elect.	4	NA	4	NA	$291	1.52
Motors	WHS	Condenser Pump	Eff. Motor	RI	63a	Elect.	Elect.	5	NA	5	NA	$349	1.52

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	49b	Elect.	Elect.	0	NA	52	NA	$4,038	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	50b	Elect.	Elect.	0	NA	41	NA	$3,177	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	51b	Elect.	Elect.	0	NA	6	NA	$463	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	52b	Elect.	Elect.	0	NA	5	NA	$397	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	53b	Elect.	Elect.	0	NA	92	NA	$7,116	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	54b	Elect.	Elect.	0	NA	39	NA	$3,012	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	55b	Elect.	Elect.	0	NA	5	NA	$397	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	56b	Elect.	Elect.	0	NA	5	NA	$397	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	57b	Elect.	Elect.	0	NA	5	NA	$397	1.77
Motors	DGR	Condenser Pump	Eff. Motor	ROF	58b	Elect.	Elect.	0	NA	9	NA	$728	1.77
Motors	DINING	Condenser Pump	Eff. Motor	ROF	59b	Elect.	Elect.	0	NA	7	NA	$530	1.77
Motors	HOSPITL	Condenser Pump	Eff. Motor	ROF	60b	Elect.	Elect.	0	NA	27	NA	$2,118	1.77
Motors	MWR	Condenser Pump	Eff. Motor	ROF	61b	Elect.	Elect.	0	NA	9	NA	$662	1.77
Motors	TRAING	Condenser Pump	Eff. Motor	ROF	62b	Elect.	Elect.	0	NA	4	NA	$331	1.77
Motors	WHS	Condenser Pump	Eff. Motor	ROF	63b	Elect.	Elect.	0	NA	5	NA	$397	1.77
Motors	Irrigation	Irrigation Pump	Eff. Motor	RI	64a	Elect.	Elect.	0	NA	0	NA	-$57	0.49
Motors	Irrigation	Irrigation Pump	Eff. Motor	RI	65a	Elect.	Elect.	0	NA	0	NA	-$171	0.49
Motors	Irrigation	Irrigation Pump	Eff. Motor	RI	66a	Elect.	Elect.	1	NA	1	NA	-$456	0.49
Motors	Irrigation	Irrigation Pump	Eff. Motor	RI	67a	Elect.	Elect.	2	NA	2	NA	-$855	0.49
Motors	Irrigation	Irrigation Pump	Eff. Motor	RI	68a	Elect.	Elect.	29	NA	29	NA	-$10,257	0.49
Motors	Irrigation	Irrigation Pump	Eff. Motor	RI	69a	Elect.	Elect.	18	NA	18	NA	-$6,411	0.49
Motors	Irrigation	Irrigation Pump	Eff. Motor	RI	70a	Elect.	Elect.	6	NA	6	NA	-$2,279	0.49
Motors	South Plant	Sewage Pump	Eff. Motor	RI	71a	Elect.	Elect.	1	NA	1	NA	$88	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	72a	Elect.	Elect.	2	NA	2	NA	$177	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	73a	Elect.	Elect.	0	NA	0	NA	-$137	0.39
Motors	South Plant	Sewage Pump	Eff. Motor	RI	74a	Elect.	Elect.	0	NA	0	NA	-$205	0.39
Motors	South Plant	Sewage Pump	Eff. Motor	RI	75a	Elect.	Elect.	0	NA	0	NA	-$342	0.39
Motors	South Plant	Sewage Pump	Eff. Motor	RI	76a	Elect.	Elect.	8	NA	8	NA	$663	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	77a	Elect.	Elect.	11	NA	11	NA	$884	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	78a	Elect.	Elect.	3	NA	3	NA	-$2,394	0.39
Motors	South Plant	Sewage Pump	Eff. Motor	RI	79a	Elect.	Elect.	37	NA	37	NA	$3,095	1.79
Motors	North Plant	Sewage Pump	Eff. Motor	RI	80a	Elect.	Elect.	5	NA	5	NA	-$798	0.65
Motors	North Plant	Sewage Pump	Eff. Motor	RI	81a	Elect.	Elect.	7	NA	7	NA	-$117	0.93
Motors	North Plant	Sewage Pump	Eff. Motor	RI	82a	Elect.	Elect.	21	NA	21	NA	$1,769	1.79
Motors	North Plant	Sewage Pump	Eff. Motor	RI	83a	Elect.	Elect.	5	NA	5	NA	$442	1.79
Motors	North Plant	Sewage Pump	Eff. Motor	RI	84a	Elect.	Elect.	1	NA	1	NA	-$648	0.42
Motors	North Plant	Sewage Pump	Eff. Motor	RI	85a	Elect.	Elect.	3	NA	3	NA	-$327	0.71
Motors	North Plant	Sewage Pump	Eff. Motor	RI	86a	Elect.	Elect.	14	NA	14	NA	-$1,025	0.77
Motors	North Plant	Sewage Pump	Eff. Motor	RI	87a	Elect.	Elect.	21	NA	21	NA	-$3,190	0.65
Motors	Lift Station	Lift Station Pump	Eff. Motor	RI	88a	Elect.	Elect.	17	NA	17	NA	-$1,691	0.72
Motors	Lift Station	Lift Station Pump	Eff. Motor	RI	89a	Elect.	Elect.	22	NA	22	NA	-$2,193	0.72
Motors	Lift Station	Lift Station Pump	Eff. Motor	RI	90a	Elect.	Elect.	10	NA	10	NA	-$940	0.72
Motors	Lift Station	Lift Station Pump	Eff. Motor	RI	91a	Elect.	Elect.	33	NA	33	NA	-$3,289	0.72
Motors	Irrigation	Irrigation Pump	Eff. Motor	ROF	64b	Elect.	Elect.	0	NA	0	NA	-$6	0.93
Motors	Irrigation	Irrigation Pump	Eff. Motor	ROF	65b	Elect.	Elect.	0	NA	0	NA	-$18	0.93
Motors	Irrigation	Irrigation Pump	Eff. Motor	ROF	66b	Elect.	Elect.	0	NA	1	NA	-$47	0.93
Motors	Irrigation	Irrigation Pump	Eff. Motor	ROF	67b	Elect.	Elect.	0	NA	2	NA	-$88	0.93
Motors	Irrigation	Irrigation Pump	Eff. Motor	ROF	68b	Elect.	Elect.	0	NA	29	NA	-$1,053	0.93
Motors	Irrigation	Irrigation Pump	Eff. Motor	ROF	69b	Elect.	Elect.	0	NA	18	NA	-$658	0.93
Motors	Irrigation	Irrigation Pump	Eff. Motor	ROF	70b	Elect.	Elect.	0	NA	6	NA	-$234	0.93
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	71b	Elect.	Elect.	0	NA	1	NA	$85	1.99
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	72b	Elect.	Elect.	0	NA	2	NA	$170	1.99
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	73b	Elect.	Elect.	0	NA	0	NA	-$26	0.85
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	74b	Elect.	Elect.	0	NA	0	NA	-$39	0.85
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	75b	Elect.	Elect.	0	NA	0	NA	-$65	0.85
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	76b	Elect.	Elect.	0	NA	8	NA	$638	1.99
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	77b	Elect.	Elect.	0	NA	11	NA	$851	1.99
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	78b	Elect.	Elect.	0	NA	3	NA	-$454	0.85
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	79b	Elect.	Elect.	0	NA	37	NA	$2,977	1.99

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	80b	Elect.	Elect.	0	NA	5	NA	$97	1.06
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	81b	Elect.	Elect.	0	NA	7	NA	$373	1.29
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	82b	Elect.	Elect.	0	NA	21	NA	$1,701	1.99
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	83b	Elect.	Elect.	0	NA	5	NA	$425	1.99
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	84b	Elect.	Elect.	0	NA	1	NA	-$107	0.87
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	85b	Elect.	Elect.	0	NA	3	NA	$93	1.11
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	86b	Elect.	Elect.	0	NA	14	NA	$550	1.16
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	87b	Elect.	Elect.	0	NA	21	NA	$388	1.06
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	88b	Elect.	Elect.	0	NA	17	NA	$550	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	89b	Elect.	Elect.	0	NA	22	NA	$714	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	90b	Elect.	Elect.	0	NA	10	NA	$306	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	91b	Elect.	Elect.	0	NA	33	NA	$1,070	1.12
Refrigerator	APPR PFY50	RF-1	Eff. Refrig.	RI	1	Elect.	Elect.	7	4	7	4	-$566	0.68
Refrigerator	Capehart Hsg	RF-2	Eff. Refrig.	RI	2	Elect.	Elect.	2,270	1,184	2,270	1,184	-$188,420	0.68
Refrigerator	Wherry Hsg	RF-3	Eff. Refrig.	RI	3	Elect.	Elect.	1,259	657	1,259	657	-$104,489	0.68
Refrigerator	Temp.Lod.Fac.	RF-4	Eff. Refrig.	RI	4	Elect.	Elect.	132	69	132	69	-$10,939	0.68
Refrigerator	Dormitories	RF-5	Eff. Refrig.	RI	5	Elect.	Elect.	527	275	527	275	-$32,822	0.72
Refrigerator	VOQ	RF-6	Eff. Refrig.	RI	6	Elect.	Elect.	161	84	161	84	-$10,007	0.72
Transport.	Sedan	Compact, 4 psgr, Class II	CNG Vehicle	RI	B102	Gas	NG	69	0	69	0	$89,939	2.87
Transport.	Sedan	Midsize, 5 psgr, Class II (See Note 1)	CNG Vehicle	RI	B103	Gas	NG	0	0	0	0	-$11,367	-0.42
Transport.	Sedan	Compact, Law Enforcement, Class II	CNG Vehicle	RI	B106	Gas	NG	126	0	126	0	$113,505	4.78
Transport.	Wagon	Station Wagon, Compact, Class II	CNG Vehicle	RI	B150	Gas	NG	41	0	41	0	$15,875	1.35
Transport.	Ambulance	Modular, 4x2	CNG Vehicle	RI	B162	Gas	NG	27	0	27	0	$44,218	5.91
Transport.	Ambulance	Modular, 4x4	CNG Vehicle	RI	B163	Gas	NG	3	0	3	0	-$2,171	0.76
Transport.	Truck	Panel Truck, 4x2, 6,999 GVW & under	CNG Vehicle	RI	B168	Gas	NG	112	0	112	0	$133,953	2.44
Transport.	Truck	Multistop, 4x2, 12,500-16,999 GVW	CNG Vehicle	RI	B177	Gas	NG	3	0	3	0	-$8,087	0.33
Transport.	Truck	Multistop, 4x2, 8,500-12,499 GVW	CNG Vehicle	RI	B178	Gas	NG	2	0	2	0	-$1,070	0.64
Transport.	Truck	Carryall, 4x2, 6,999 GVW & under	CNG Vehicle	RI	B185	Gas	NG	113	0	113	0	$94,229	2.26
Transport.	Truck	Carryall, 4x2, 7 DAX	CNG Vehicle	RI	B188	Gas	NG	29	0	29	0	$28,912	2.61
Transport.	Truck	Carryall, 4x4, 7,500 GVW	CNG Vehicle	RI	B190	Gas	NG	5	0	5	0	$7,533	3.51
Transport.	Truck	Carryall, 4x2, Conv, 15 psgr, 7,700 GVW	CNG Vehicle	RI	B192	Gas	NG	18	0	18	0	$20,200	3.24
Transport.	Truck	Carryall, Low Silhouette, 4x2, 7,100 GVW	CNG Vehicle	RI	B193	Gas	NG	0	0	0	0	-$3,294	-0.10
Transport.	Truck	Utility, 4x4, 6,000 GVW	CNG Vehicle	RI	B198	Gas	NG	0	0	0	0	-$3,511	-0.17
Transport.	Pickup	Compact, 4x2, 4,599 GVW & under	CNG Vehicle	RI	B200	Gas	NG	209	0	209	0	$132,901	1.47
Transport.	Pickup	Compact, 4x2, 4,600-5,799 GVW	CNG Vehicle	RI	B204	Gas	NG	79	0	79	0	$74,430	2.18
Transport.	Pickup	4 dr cab, 4x2, 5,500 GVW	CNG Vehicle	RI	B217	Gas	NG	71	0	71	0	$45,878	1.76
Transport.	Pickup	4 dr cab, 4x4, 7,000-8510 GVW	CNG Vehicle	RI	B222	Gas	NG	60	0	60	0	$40,840	1.91
Transport.	Truck	Cargo, 4x4, 12,499 GVW & under	CNG Vehicle	RI	B237	Gas	NG	5	0	5	0	-$7,615	0.49
Transport.	Truck	Cargo, 4x4, 17,000-20,999 GVW	CNG Vehicle	RI	B239	Gas	NG	4	0	4	0	-$5,043	0.44
Transport.	Truck	Stake, 4x2, 7,000 GVW	CNG Vehicle	RI	B261	Gas	NG	76	0	76	0	$74,554	2.55
Transport.	Bus	School, 28-29 psgr, 4x2	CNG Vehicle	RI	B121	Diesel	NG,Dies	15	0	15	0	$1,293	1.06
Transport.	Bus	School, 42-45 psgr, 4x2	CNG Vehicle	RI	B130	Diesel	NG,Dies	9	0	9	0	$22,899	3.86
Transport.	Bus	Intercity, 41-51 psgr, 4x2	CNG Vehicle	RI	B139	Diesel	NG,Dies	10	0	10	0	$13,509	4.38
Transport.	Truck	Multistop, 4x2, 8,499 GVW & under	CNG Vehicle	RI	B176	Diesel	NG,Dies	32	0	32	0	$9,940	1.25
Transport.	Truck	Multistop, 4x2, 1-ton	CNG Vehicle	RI	B180	Diesel	NG,Dies	9	0	9	0	$10,486	1.50
Transport.	Bus	16 psgr, 4x2	CNG Vehicle	RI	B184	Diesel	NG,Dies	5	0	5	0	$5,056	2.26
Transport.	Truck	Carryall, 4x2, Conv, 9 psgr	CNG Vehicle	RI	B191	Diesel	NG,Dies	4	0	4	0	-$192	0.94
Transport.	Pickup	Compact, 4x4, 4,600-5,799 GVW	CNG Vehicle	RI	B211	Diesel	NG,Dies	2	0	2	0	$832	1.28
Transport.	Truck	Stake, 4x2, 12,500-16,999 GVW, 1-1/2 ton	CNG Vehicle	RI	B264	Diesel	NG,Dies	10	0	10	0	$12,969	1.72
Transport.	Truck	Stake, 4x2, 10,000 GVW	CNG Vehicle	RI	B265	Diesel	NG,Dies	26	0	26	0	$19,797	1.82
Transport.	Truck	Tractor, 4x2, 24,000-44,500 GVW	CNG Vehicle	RI	B353	Diesel	NG,Dies	29	0	29	0	$15,258	2.02
Transport.	Truck	Tractor, 6x4, 24,000-44,500 GVW	CNG Vehicle	RI	B361	Diesel	NG,Dies	33	0	33	0	$199,322	17.61
Transport.	Tractor	Whse, 4,000-6,999#	CNG Vehicle	RI	E801	Gas	NG	16	0	16	0	$28,480	1.95
Transport.	Forklift	2,000-5,999#, ST	CNG Vehicle	RI	E830	Gas	NG	1	0	1	0	$2,745	2.37
Transport.	Forklift	2,000-5,999#, PT	CNG Vehicle	RI	E831	Gas	NG	13	0	13	0	$36,062	2.80
Transport.	Forklift	6,000-9,999#, PT	CNG Vehicle	RI	E832	Gas	NG	1	0	1	0	$3,315	1.83
Transport.	Forklift	4,000#, PT	CNG Vehicle	RI	E816	Diesel	NG,Dies	8	0	8	0	$25,093	1.76
Transport.	Forklift	6,000-6,200#, PT	CNG Vehicle	RI	E822	Diesel	NG,Dies	12	0	12	0	$33,853	1.94
Transport.	Forklift	15,000#	CNG Vehicle	RI	E824	Diesel	NG,Dies	2	0	2	0	-$4,865	0.77

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Transport.	Lift	Platform, 40K, 463L	CNG Vehicle	RI	E940	Diesel	NG,Dies	2	0	2	0	$34,803	9.70
Transport.	Forklift	Huster, 463L, 10K	CNG Vehicle	RI	E956	Diesel	NG,Dies	2	0	2	0	-$5,437	0.55
Transport.	Forklift	Allis Chalmers, 463L, 10K	CNG Vehicle	RI	E957	Diesel	NG,Dies	3	0	3	0	$12,057	2.34
Transport.	Forklift	AT(463L), 10K	CNG Vehicle	RI	E958	Diesel	NG,Dies	5	0	5	0	-$7,525	0.37
Transport.	Sedan	Compact, 4 psgr, Class II	CNG Vehicle	ROF	B102	Gas	NG	0	0	69	0	$67,974	2.66
Transport.	Sedan	Midsize, 5 psgr, Class II (See Note 1)	CNG Vehicle	ROF	B103	Gas	NG	0	0	0	0	-$9,201	-0.35
Transport.	Sedan	Compact, Law Enforcement, Class II	CNG Vehicle	ROF	B106	Gas	NG	0	0	126	0	$101,138	4.65
Transport.	Wagon	Station Wagon, Compact, Class II	CNG Vehicle	ROF	B150	Gas	NG	0	0	41	0	$10,428	1.27
Transport.	Ambulance	Modular, 4x2	CNG Vehicle	ROF	B162	Gas	NG	0	0	27	0	$27,065	4.96
Transport.	Ambulance	Modular, 4x4	CNG Vehicle	ROF	B163	Gas	NG	0	0	3	0	-$2,241	0.67
Transport.	Truck	Panel Truck, 4x2, 6,999 GVW & under	CNG Vehicle	ROF	B168	Gas	NG	0	0	112	0	$99,987	2.26
Transport.	Truck	Multistop, 4x2, 12,500-16,999 GVW	CNG Vehicle	ROF	B177	Gas	NG	0	0	3	0	-$6,906	0.33
Transport.	Truck	Multistop, 4x2, 8,500-12,499 GVW	CNG Vehicle	ROF	B178	Gas	NG	0	0	2	0	-$972	0.62
Transport.	Truck	Carryall, 4x2, 6,999 GVW & under	CNG Vehicle	ROF	B185	Gas	NG	0	0	113	0	$70,622	2.10
Transport.	Truck	Carryall, 4x2, 7 DAX	CNG Vehicle	ROF	B188	Gas	NG	0	0	29	0	$21,836	2.42
Transport.	Truck	Carryall, 4x4, 7,500 GVW	CNG Vehicle	ROF	B190	Gas	NG	0	0	5	0	$5,715	3.23
Transport.	Truck	Carryall, 4x2, Conv, 15 psgr, 7,700 GVW	CNG Vehicle	ROF	B192	Gas	NG	0	0	18	0	$15,415	3.00
Transport.	Truck	Carryall, Low Silhouette, 4x2, 7,100 GVW	CNG Vehicle	ROF	B193	Gas	NG	0	0	0	0	-$2,714	-0.06
Transport.	Truck	Utility, 4x4, 6,000 GVW	CNG Vehicle	ROF	B198	Gas	NG	0	0	0	0	-$2,875	-0.12
Transport.	Pickup	Compact, 4x2, 4,599 GVW & under	CNG Vehicle	ROF	B200	Gas	NG	0	0	209	0	$89,363	1.37
Transport.	Pickup	Compact, 4x2, 4,600-5,799 GVW	CNG Vehicle	ROF	B204	Gas	NG	0	0	79	0	$55,298	2.03
Transport.	Pickup	4 dr cab, 4x2, 5,500 GVW	CNG Vehicle	ROF	B217	Gas	NG	0	0	71	0	$29,930	1.61
Transport.	Pickup	4 dr cab, 4x4, 7,000-8510 GVW	CNG Vehicle	ROF	B222	Gas	NG	0	0	60	0	$29,989	1.78
Transport.	Truck	Cargo, 4x4, 12,499 GVW & under	CNG Vehicle	ROF	B237	Gas	NG	0	0	5	0	-$6,670	0.48
Transport.	Truck	Cargo, 4x4, 17,000-20,999 GVW	CNG Vehicle	ROF	B239	Gas	NG	0	0	4	0	-$4,265	0.42
Transport.	Truck	Stake, 4x2, 7,000 GVW	CNG Vehicle	ROF	B261	Gas	NG	0	0	76	0	$51,696	2.31
Transport.	Bus	School, 28-29 psgr, 4x2	CNG Vehicle	ROF	B121	Diesel	NG,Dies	0	0	15	0	-$1,096	0.93
Transport.	Bus	School, 42-45 psgr, 4x2	CNG Vehicle	ROF	B130	Diesel	NG,Dies	0	0	9	0	$13,431	3.21
Transport.	Bus	Intercity, 41-51 psgr, 4x2	CNG Vehicle	ROF	B139	Diesel	NG,Dies	0	0	10	0	$9,093	3.88
Transport.	Truck	Multistop, 4x2, 8,499 GVW & under	CNG Vehicle	ROF	B176	Diesel	NG,Dies	0	0	32	0	$5,924	1.18
Transport.	Truck	Multistop, 4x2, 1-ton	CNG Vehicle	ROF	B180	Diesel	NG,Dies	0	0	9	0	$6,942	1.39
Transport.	Bus	16 psgr, 4x2	CNG Vehicle	ROF	B184	Diesel	NG,Dies	0	0	5	0	$3,713	2.09
Transport.	Truck	Carryall, 4x2, Conv, 9 psgr	CNG Vehicle	ROF	B191	Diesel	NG,Dies	0	0	4	0	-$273	0.89
Transport.	Pickup	Compact, 4x4, 4,600-5,799 GVW	CNG Vehicle	ROF	B211	Diesel	NG,Dies	0	0	2	0	$508	1.20
Transport.	Truck	Stake, 4x2, 12,500-16,999 GVW, 1-1/2 ton	CNG Vehicle	ROF	B264	Diesel	NG,Dies	0	0	10	0	$8,110	1.55
Transport.	Truck	Stake, 4x2, 10,000 GVW	CNG Vehicle	ROF	B265	Diesel	NG,Dies	0	0	26	0	$12,957	1.66
Transport.	Truck	Tractor, 4x2, 24,000-44,500 GVW	CNG Vehicle	ROF	B353	Diesel	NG,Dies	0	0	29	0	$9,519	1.80
Transport.	Truck	Tractor, 6x4, 24,000-44,500 GVW	CNG Vehicle	ROF	B361	Diesel	NG,Dies	0	0	33	0	$132,222	14.94
Transport.	Tractor	Whse, 4,000-6,999#	CNG Vehicle	ROF	E801	Gas	NG	0	0	16	0	$16,610	1.70
Transport.	Forklift	2,000-5,999#, ST	CNG Vehicle	ROF	E830	Gas	NG	0	0	1	0	$1,666	2.05
Transport.	Forklift	2,000-5,999#, PT	CNG Vehicle	ROF	E831	Gas	NG	0	0	13	0	$24,636	2.50
Transport.	Forklift	6,000-9,999#, PT	CNG Vehicle	ROF	E832	Gas	NG	0	0	1	0	$2,096	1.64
Transport.	Forklift	4,000#, PT	CNG Vehicle	ROF	E816	Diesel	NG,Dies	0	0	8	0	$17,355	1.62
Transport.	Forklift	6,000-6,200#, PT	CNG Vehicle	ROF	E822	Diesel	NG,Dies	0	0	12	0	$21,705	1.73
Transport.	Forklift	15,000#	CNG Vehicle	ROF	E824	Diesel	NG,Dies	0	0	2	0	-$5,068	0.71
Transport.	Lift	Platform, 40K, 463L	CNG Vehicle	ROF	E940	Diesel	NG,Dies	0	0	2	0	$26,479	8.74
Transport.	Forklift	Huster, 463L, 10K	CNG Vehicle	ROF	E956	Diesel	NG,Dies	0	0	2	0	-$4,663	0.51
Transport.	Forklift	Allis Chalmers, 463L, 10K	CNG Vehicle	ROF	E957	Diesel	NG,Dies	0	0	3	0	$7,249	2.02
Transport.	Forklift	AT(463L), 10K	CNG Vehicle	ROF	E958	Diesel	NG,Dies	0	0	5	0	-$6,202	0.37
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	1	Elect.	Elect.	1	0	1	0	-$1,069	0.11
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	2	Elect.	Elect.	1	0	1	0	-$214	0.82
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	3	Elect.	Elect.	1	1	1	1	-$565	0.81
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	4	Elect.	Elect.	1	0	1	0	-$1,351	0.10
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	5	Elect.	Elect.	3	1	3	1	-$1,114	0.82
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	6	Elect.	Elect.	3	1	3	1	-$3,369	0.44
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	7	Elect.	Elect.	7	3	7	3	-$2,666	0.82
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	8	Elect.	Elect.	4	1	4	1	-$6,499	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	9	Elect.	Elect.	8	3	8	3	-$3,250	0.82
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	10	Elect.	Elect.	4	2	4	2	-$4,943	0.44

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Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	11	Elect.	Elect.	1	1	1	1	-$2,629	0.11
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	12	Elect.	Elect.	4	2	4	2	-$1,219	0.84
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	13	Elect.	Elect.	28	11	28	11	-$25,969	0.46
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	14	Elect.	Elect.	13	5	13	5	-$13,470	0.40
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	15	Elect.	Elect.	13	5	13	5	-$19,371	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	16	Elect.	Elect.	8	3	8	3	-$2,081	0.84
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	17	Elect.	Elect.	34	14	34	14	-$30,227	0.47
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	18	Elect.	Elect.	16	6	16	6	-$20,828	0.21
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	19	Elect.	Elect.	24	10	24	10	-$33,948	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	20	Elect.	Elect.	5	2	5	2	-$7,351	0.16
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	21	Elect.	Elect.	19	8	19	8	-$25,394	0.37
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	22	Elect.	Elect.	4	2	4	2	-$8,394	0.13
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	23	Elect.	Elect.	1	0	1	0	-$674	0.44
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	24	Elect.	Elect.	1	0	1	0	-$1,247	0.17
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	25	Elect.	Elect.	1	0	1	0	-$1,087	0.28
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	26	Elect.	Elect.	1	0	1	0	-$1,351	0.10
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	27	Elect.	Elect.	1	0	1	0	-$127	0.92
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	28	Elect.	Elect.	5	2	5	2	-$10,472	0.13
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	29	Elect.	Elect.	3	1	3	1	-$495	0.92
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	30	Elect.	Elect.	1	0	1	0	-$165	0.92
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	31	Elect.	Elect.	1	0	1	0	-$1,495	0.26
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	32	Elect.	Elect.	1	0	1	0	-$186	0.93
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	33	Elect.	Elect.	1	0	1	0	-$444	0.82
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	34	Elect.	Elect.	15	6	15	6	-$25,994	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	35	Elect.	Elect.	4	2	4	2	-$715	0.92
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	36	Elect.	Elect.	4	2	4	2	-$7,275	0.18
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	37	Elect.	Elect.	22	9	22	9	-$41,014	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	38	Elect.	Elect.	10	4	10	4	-$11,534	0.44
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	39	Elect.	Elect.	13	5	13	5	-$18,880	0.16
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	40	Elect.	Elect.	2	1	2	1	-$847	0.81
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	41	Elect.	Elect.	4	2	4	2	-$7,690	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	42	Elect.	Elect.	4	2	4	2	-$7,886	0.11
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	43	Elect.	Elect.	8	3	8	3	-$7,420	0.44
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	44	Elect.	Elect.	8	3	8	3	-$11,027	0.16
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	45	Elect.	Elect.	11	4	11	4	-$17,034	0.41
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	46	Elect.	Elect.	19	8	19	8	-$25,394	0.37
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	47	Elect.	Elect.	4	1	4	1	-$1,333	0.82
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	48	Elect.	Elect.	1	0	1	0	-$119	0.94
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	49	Elect.	Elect.	2	1	2	1	-$1,479	0.47
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	50	Elect.	Elect.	2	1	2	1	-$2,343	0.16
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	51	Elect.	Elect.	5	2	5	2	-$3,771	0.49
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	52	Elect.	Elect.	5	2	5	2	-$6,233	0.17
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	53	Elect.	Elect.	4	2	4	2	-$5,500	0.32
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	54	Elect.	Elect.	8	3	8	3	-$10,451	0.43
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	55	Elect.	Elect.	4	2	4	2	-$5,530	0.40
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	56	Elect.	Elect.	4	2	4	2	-$7,999	0.13
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	57	Elect.	Elect.	4	2	4	2	-$8,197	0.11
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	58	Elect.	Elect.	7	3	7	3	-$6,033	0.46
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	59	Elect.	Elect.	7	3	7	3	-$6,757	0.40
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	60	Elect.	Elect.	7	3	7	3	-$9,633	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	61	Elect.	Elect.	8	3	8	3	-$2,201	0.83
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	62	Elect.	Elect.	24	9	24	9	-$20,559	0.46
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	63	Elect.	Elect.	8	3	8	3	-$10,978	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	64	Elect.	Elect.	9	4	9	4	-$7,286	0.47
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	65	Elect.	Elect.	3	1	3	1	-$1,886	0.49
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	66	Elect.	Elect.	8	3	8	3	-$10,704	0.16
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	67	Elect.	Elect.	4	2	4	2	-$4,497	0.44
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	68	Elect.	Elect.	8	3	8	3	-$10,451	0.43
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	69	Elect.	Elect.	7	3	7	3	-$6,033	0.46

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	70	Elect.	Elect.	7	3	7	3	-$9,633	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	71	Elect.	Elect.	8	3	8	3	-$2,201	0.83
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	72	Elect.	Elect.	8	3	8	3	-$6,853	0.46
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	73	Elect.	Elect.	8	3	8	3	-$7,682	0.40
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	74	Elect.	Elect.	8	3	8	3	-$10,121	0.21
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	75	Elect.	Elect.	8	3	8	3	-$10,704	0.16
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	76	Elect.	Elect.	24	10	24	10	-$25,006	0.23
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	77	Elect.	Elect.	13	5	13	5	-$15,648	0.31
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	78	Elect.	Elect.	81	32	81	32	-$116,761	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	79	Elect.	Elect.	16	6	16	6	-$19,106	0.22
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	80	Elect.	Elect.	26	10	26	10	-$22,968	0.20
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	81	Elect.	Elect.	31	13	31	13	-$25,994	0.21
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	82	Elect.	Elect.	1	0	1	0	-$90	0.93
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	83	Elect.	Elect.	1	0	1	0	-$2,084	0.13
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	84	Elect.	Elect.	1	0	1	0	-$127	0.92
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	85	Elect.	Elect.	1	0	1	0	-$849	0.44
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	86	Elect.	Elect.	3	1	3	1	-$5,236	0.13
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	87	Elect.	Elect.	4	1	4	1	-$1,699	0.78
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	88	Elect.	Elect.	7	3	7	3	-$12,997	0.14
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	89	Elect.	Elect.	4	2	4	2	-$1,625	0.82
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	90	Elect.	Elect.	4	2	4	2	-$2,467	0.72
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	91	Elect.	Elect.	4	2	4	2	-$5,813	0.35
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	92	Elect.	Elect.	2	1	2	1	-$610	0.84
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	93	Elect.	Elect.	6	3	6	3	-$2,367	0.79
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	94	Elect.	Elect.	9	3	9	3	-$12,586	0.16
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	95	Elect.	Elect.	8	3	8	3	-$2,714	0.79
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	96	Elect.	Elect.	13	5	13	5	-$11,626	0.47
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	97	Elect.	Elect.	8	3	8	3	-$8,259	0.37
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	98	Elect.	Elect.	19	8	19	8	-$33,082	0.18
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	99	Elect.	Elect.	0	0	0	0	-$722	0.12
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	100	Elect.	Elect.	2	1	2	1	-$2,023	0.44
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	101	Elect.	Elect.	3	1	3	1	-$6,296	0.13
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	102	Elect.	Elect.	3	1	3	1	-$5,271	0.13
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	103	Elect.	Elect.	2	1	2	1	-$330	0.92
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	104	Elect.	Elect.	11	4	11	4	-$20,944	0.13
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	105	Elect.	Elect.	29	11	29	11	-$49,822	0.14
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	106	Elect.	Elect.	83	33	83	33	-$153,802	0.14
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	107	Elect.	Elect.	2	1	2	1	-$2,973	0.20
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	108	Elect.	Elect.	102	41	102	41	-$151,038	0.16
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	109	Elect.	Elect.	2	1	2	1	-$3,229	0.14
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	110	Elect.	Elect.	19	7	19	7	-$25,730	0.16
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	111	Elect.	Elect.	4	1	4	1	-$8,596	0.11
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	112	Elect.	Elect.	1	0	1	0	-$165	0.92
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	113	Elect.	Elect.	4	1	4	1	-$1,699	0.78
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	114	Elect.	Elect.	19	8	19	8	-$33,082	0.18
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	115	Elect.	Elect.	2	1	2	1	-$2,212	0.21
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	116	Elect.	Elect.	3	1	3	1	-$1,886	0.49
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	117	Elect.	Elect.	3	1	3	1	-$2,362	0.37
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	118	Elect.	Elect.	3	1	3	1	-$2,470	0.34
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	119	Elect.	Elect.	3	1	3	1	-$3,035	0.19
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	120	Elect.	Elect.	5	2	5	2	-$6,233	0.17
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	121	Elect.	Elect.	4	2	4	2	-$5,946	0.26
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	122	Elect.	Elect.	4	2	4	2	-$6,552	0.19
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	123	Elect.	Elect.	4	2	4	2	-$7,091	0.12
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	124	Elect.	Elect.	8	3	8	3	-$12,208	0.34
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	125	Elect.	Elect.	4	2	4	2	-$6,885	0.25
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	126	Elect.	Elect.	8	3	8	3	-$15,998	0.13
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	127	Elect.	Elect.	7	3	7	3	-$6,757	0.40
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	128	Elect.	Elect.	13	5	13	5	-$17,770	0.21

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	129	Elect.	Elect.	13	5	13	5	-$19,266	0.14
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	130	Elect.	Elect.	13	5	13	5	-$12,864	0.45
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	131	Elect.	Elect.	13	5	13	5	-$15,100	0.36
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	132	Elect.	Elect.	16	6	16	6	-$22,381	0.14
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	133	Elect.	Elect.	43	17	43	17	-$51,716	0.16
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	134	Elect.	Elect.	3	1	3	1	-$4,685	0.16
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	135	Elect.	Elect.	4	2	4	2	-$7,091	0.12
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	136	Elect.	Elect.	4	2	4	2	-$7,357	0.20
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	137	Elect.	Elect.	4	2	4	2	-$7,580	0.18
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	138	Elect.	Elect.	7	3	7	3	-$7,096	0.36
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	139	Elect.	Elect.	7	3	7	3	-$8,616	0.23
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	1	Elect.	Elect.	2	1	2	1	-$1,005	0.25
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	2	Elect.	Elect.	2	1	2	1	-$151	0.89
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	3	Elect.	Elect.	4	1	4	1	-$453	0.86
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	4	Elect.	Elect.	2	1	2	1	-$1,295	0.23
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	5	Elect.	Elect.	7	3	7	3	-$859	0.87
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	6	Elect.	Elect.	7	3	7	3	-$3,114	0.54
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	7	Elect.	Elect.	21	8	21	8	-$1,771	0.90
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	8	Elect.	Elect.	10	4	10	4	-$6,051	0.28
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	9	Elect.	Elect.	23	9	23	9	-$2,389	0.88
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	10	Elect.	Elect.	12	5	12	5	-$4,513	0.55
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	11	Elect.	Elect.	4	2	4	2	-$2,485	0.25
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	12	Elect.	Elect.	12	5	12	5	-$593	0.93
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	13	Elect.	Elect.	78	31	78	31	-$21,896	0.60
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	14	Elect.	Elect.	36	14	36	14	-$11,590	0.54
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	15	Elect.	Elect.	36	14	36	14	-$17,491	0.30
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	16	Elect.	Elect.	22	9	22	9	-$837	0.94
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	17	Elect.	Elect.	97	39	97	39	-$24,834	0.61
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	18	Elect.	Elect.	45	18	45	18	-$18,339	0.38
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	19	Elect.	Elect.	67	27	67	27	-$30,214	0.32
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	20	Elect.	Elect.	15	6	15	6	-$6,522	0.34
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	21	Elect.	Elect.	53	21	53	21	-$24,348	0.47
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	22	Elect.	Elect.	11	5	11	5	-$7,996	0.25
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	23	Elect.	Elect.	1	1	1	1	-$625	0.53
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	24	Elect.	Elect.	2	1	2	1	-$1,191	0.29
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	25	Elect.	Elect.	2	1	2	1	-$1,031	0.39
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	26	Elect.	Elect.	2	1	2	1	-$1,295	0.23
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	27	Elect.	Elect.	2	1	2	1	-$71	0.96
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	28	Elect.	Elect.	15	6	15	6	-$9,962	0.26
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	29	Elect.	Elect.	7	3	7	3	-$240	0.96
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	30	Elect.	Elect.	2	1	2	1	-$80	0.96
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	31	Elect.	Elect.	2	1	2	1	-$1,410	0.37
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	32	Elect.	Elect.	3	1	3	1	-$37	0.99
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	33	Elect.	Elect.	3	1	3	1	-$295	0.90
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	34	Elect.	Elect.	42	17	42	17	-$24,204	0.28
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	35	Elect.	Elect.	12	5	12	5	-$284	0.97
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	36	Elect.	Elect.	12	5	12	5	-$6,844	0.31
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	37	Elect.	Elect.	62	25	62	25	-$38,717	0.27
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	38	Elect.	Elect.	27	11	27	11	-$10,529	0.55
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	39	Elect.	Elect.	36	14	36	14	-$17,000	0.32
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	40	Elect.	Elect.	5	2	5	2	-$680	0.86
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	41	Elect.	Elect.	12	5	12	5	-$7,259	0.27
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	42	Elect.	Elect.	12	5	12	5	-$7,455	0.25
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	43	Elect.	Elect.	22	9	22	9	-$6,176	0.58
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	44	Elect.	Elect.	22	9	22	9	-$9,782	0.34
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	45	Elect.	Elect.	29	12	29	12	-$17,372	0.48
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	46	Elect.	Elect.	53	21	53	21	-$24,348	0.47
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	47	Elect.	Elect.	10	4	10	4	-$886	0.90
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	48	Elect.	Elect.	3	1	3	1	$50	1.02

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	49	Elect.	Elect.	5	2	5	2	-$1,212	0.61
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	50	Elect.	Elect.	5	2	5	2	-$2,075	0.34
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	51	Elect.	Elect.	15	6	15	6	-$2,742	0.67
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	52	Elect.	Elect.	15	6	15	6	-$5,204	0.38
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	53	Elect.	Elect.	11	4	11	4	-$5,214	0.43
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	54	Elect.	Elect.	23	9	23	9	-$10,051	0.52
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	55	Elect.	Elect.	12	5	12	5	-$5,330	0.49
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	56	Elect.	Elect.	12	5	12	5	-$7,799	0.26
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	57	Elect.	Elect.	12	5	12	5	-$7,997	0.24
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	58	Elect.	Elect.	18	7	18	7	-$5,252	0.59
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	59	Elect.	Elect.	18	7	18	7	-$5,975	0.53
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	60	Elect.	Elect.	18	7	18	7	-$8,852	0.31
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	61	Elect.	Elect.	22	9	22	9	-$1,196	0.92
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	62	Elect.	Elect.	66	26	66	26	-$17,544	0.60
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	63	Elect.	Elect.	22	9	22	9	-$9,973	0.32
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	64	Elect.	Elect.	25	10	25	10	-$6,048	0.62
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	65	Elect.	Elect.	8	3	8	3	-$1,371	0.67
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	66	Elect.	Elect.	22	9	22	9	-$9,699	0.34
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	67	Elect.	Elect.	11	4	11	4	-$4,211	0.54
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	68	Elect.	Elect.	23	9	23	9	-$10,051	0.52
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	69	Elect.	Elect.	18	7	18	7	-$5,252	0.59
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	70	Elect.	Elect.	18	7	18	7	-$8,852	0.31
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	71	Elect.	Elect.	22	9	22	9	-$1,196	0.92
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	72	Elect.	Elect.	22	9	22	9	-$5,848	0.60
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	73	Elect.	Elect.	22	9	22	9	-$6,677	0.54
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	74	Elect.	Elect.	22	9	22	9	-$9,116	0.38
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	75	Elect.	Elect.	22	9	22	9	-$9,699	0.34
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	76	Elect.	Elect.	67	27	67	27	-$21,043	0.44
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	77	Elect.	Elect.	38	15	38	15	-$14,096	0.46
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	78	Elect.	Elect.	226	91	226	91	-$107,448	0.31
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	79	Elect.	Elect.	44	18	44	18	-$16,973	0.39
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	80	Elect.	Elect.	0	0	0	0	-$32,241	0.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	81	Elect.	Elect.	0	0	0	0	-$36,997	0.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	82	Elect.	Elect.	2	1	2	1	-$26	0.96
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	83	Elect.	Elect.	3	1	3	1	-$1,957	0.27
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	84	Elect.	Elect.	2	1	2	1	-$71	0.96
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	85	Elect.	Elect.	2	1	2	1	-$793	0.53
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	86	Elect.	Elect.	7	3	7	3	-$4,981	0.26
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	87	Elect.	Elect.	10	4	10	4	-$1,251	0.85
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	88	Elect.	Elect.	21	8	21	8	-$12,102	0.28
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	89	Elect.	Elect.	12	5	12	5	-$1,194	0.88
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	90	Elect.	Elect.	12	5	12	5	-$2,036	0.80
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	91	Elect.	Elect.	12	5	12	5	-$5,383	0.46
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	92	Elect.	Elect.	6	2	6	2	-$296	0.93
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	93	Elect.	Elect.	18	7	18	7	-$1,427	0.89
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	94	Elect.	Elect.	24	10	24	10	-$11,333	0.32
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	95	Elect.	Elect.	22	9	22	9	-$1,469	0.90
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	96	Elect.	Elect.	37	15	37	15	-$9,551	0.61
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	97	Elect.	Elect.	22	9	22	9	-$7,014	0.53
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	98	Elect.	Elect.	53	21	53	21	-$32,036	0.31
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	99	Elect.	Elect.	1	0	1	0	-$899	0.23
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	100	Elect.	Elect.	4	2	4	2	-$1,874	0.53
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	101	Elect.	Elect.	9	3	9	3	-$5,997	0.25
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	102	Elect.	Elect.	7	3	7	3	-$5,048	0.25
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	103	Elect.	Elect.	5	2	5	2	-$160	0.96
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	104	Elect.	Elect.	30	12	30	12	-$19,923	0.26
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	105	Elect.	Elect.	80	32	80	32	-$46,391	0.28
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	106	Elect.	Elect.	232	93	232	93	-$145,190	0.27
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	107	Elect.	Elect.	6	2	6	2	-$2,659	0.36

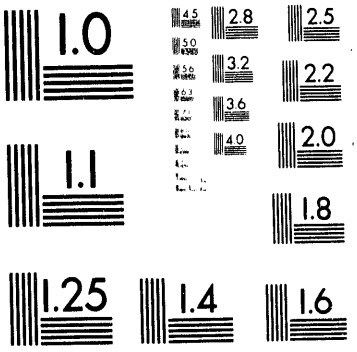
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Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	108	Elect.	Elect.	286	115	286	115	-$135,998	0.32
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	109	Elect.	Elect.	6	2	6	2	-$2,915	0.30
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	110	Elect.	Elect.	52	21	52	21	-$22,826	0.34
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	111	Elect.	Elect.	10	4	10	4	-$8,709	0.21
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	112	Elect.	Elect.	2	1	2	1	-$80	0.96
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	113	Elect.	Elect.	10	4	10	4	-$1,251	0.85
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	114	Elect.	Elect.	53	21	53	21	-$32,036	0.31
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	115	Elect.	Elect.	5	2	5	2	-$1,945	0.38
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	116	Elect.	Elect.	8	3	8	3	-$1,371	0.67
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	117	Elect.	Elect.	8	3	8	3	-$1,847	0.56
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	118	Elect.	Elect.	8	3	8	3	-$1,955	0.53
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	119	Elect.	Elect.	8	3	8	3	-$2,520	0.40
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	120	Elect.	Elect.	15	6	15	6	-$5,204	0.38
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	121	Elect.	Elect.	11	4	11	4	-$5,659	0.38
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	122	Elect.	Elect.	11	4	11	4	-$6,265	0.32
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	123	Elect.	Elect.	11	4	11	4	-$6,804	0.26
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	124	Elect.	Elect.	23	9	23	9	-$11,808	0.44
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	125	Elect.	Elect.	12	5	12	5	-$6,685	0.36
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	126	Elect.	Elect.	23	9	23	9	-$15,598	0.26
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	127	Elect.	Elect.	18	7	18	7	-$5,975	0.53
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	128	Elect.	Elect.	37	15	37	15	-$16,208	0.36
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	129	Elect.	Elect.	37	15	37	15	-$17,704	0.31
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	130	Elect.	Elect.	38	15	38	15	-$11,476	0.58
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	131	Elect.	Elect.	38	15	38	15	-$13,712	0.49
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	132	Elect.	Elect.	44	18	44	18	-$20,529	0.31
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	133	Elect.	Elect.	0	0	0	0	-$69,306	0.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	134	Elect.	Elect.	9	4	9	4	-$4,150	0.34
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	135	Elect.	Elect.	11	4	11	4	-$6,804	0.26
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	136	Elect.	Elect.	12	5	12	5	-$7,157	0.32
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	137	Elect.	Elect.	12	5	12	5	-$7,380	0.30
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	138	Elect.	Elect.	18	7	18	7	-$6,316	0.50
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	139	Elect.	Elect.	18	7	18	7	-$7,834	0.39
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	1	Elect.	Elect.	0	0	1	0	$0	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	2	Elect.	Elect.	0	0	1	0	-$19	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	3	Elect.	Elect.	0	0	1	1	-$72	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	4	Elect.	Elect.	0	0	1	0	-$1	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	5	Elect.	Elect.	0	0	3	1	-$136	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	6	Elect.	Elect.	0	0	3	1	-$61	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	7	Elect.	Elect.	0	0	7	3	-$236	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	8	Elect.	Elect.	0	0	4	1	-$5	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	9	Elect.	Elect.	0	0	8	3	-$376	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	10	Elect.	Elect.	0	0	4	2	-$83	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	11	Elect.	Elect.	0	0	1	1	-$1	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	12	Elect.	Elect.	0	0	4	2	-$41	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	13	Elect.	Elect.	0	0	28	11	-$75	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	14	Elect.	Elect.	0	0	13	5	-$24	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	15	Elect.	Elect.	0	0	13	5	$0	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	16	Elect.	Elect.	0	0	8	3	-$16	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	17	Elect.	Elect.	0	0	34	14	$34	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	18	Elect.	Elect.	0	0	16	6	$14	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	19	Elect.	Elect.	0	0	24	10	$6	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	20	Elect.	Elect.	0	0	5	2	$2	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	21	Elect.	Elect.	0	0	19	8	-$593	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	22	Elect.	Elect.	0	0	4	2	-$10	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	23	Elect.	Elect.	0	0	1	0	-$11	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	24	Elect.	Elect.	0	0	1	0	-$4	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	25	Elect.	Elect.	0	0	1	0	-$9	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	26	Elect.	Elect.	0	0	1	0	-$1	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	27	Elect.	Elect.	0	0	1	0	-$42	0.97

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	28	Elect.	Elect.	0	0	5	2	-$13	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	29	Elect.	Elect.	0	0	3	1	-$156	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	30	Elect.	Elect.	0	0	1	0	-$52	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	31	Elect.	Elect.	0	0	1	0	-$9	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	32	Elect.	Elect.	0	0	1	0	-$46	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	33	Elect.	Elect.	0	0	1	0	-$39	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	34	Elect.	Elect.	0	0	15	6	-$19	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	35	Elect.	Elect.	0	0	4	2	-$217	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	36	Elect.	Elect.	0	0	4	2	-$19	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	37	Elect.	Elect.	0	0	22	9	-$47	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	38	Elect.	Elect.	0	0	10	4	-$194	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	39	Elect.	Elect.	0	0	13	5	$0	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	40	Elect.	Elect.	0	0	2	1	-$109	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	41	Elect.	Elect.	0	0	4	2	-$9	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	42	Elect.	Elect.	0	0	4	2	-$4	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	43	Elect.	Elect.	0	0	8	3	$9	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	44	Elect.	Elect.	0	0	8	3	$4	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	45	Elect.	Elect.	0	0	11	4	-$781	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	46	Elect.	Elect.	0	0	19	8	-$593	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	47	Elect.	Elect.	0	0	4	1	-$118	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	48	Elect.	Elect.	0	0	1	0	-$9	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	49	Elect.	Elect.	0	0	2	1	$4	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	50	Elect.	Elect.	0	0	2	1	$1	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	51	Elect.	Elect.	0	0	5	2	$80	1.02
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	52	Elect.	Elect.	0	0	5	2	$6	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	53	Elect.	Elect.	0	0	4	2	-$80	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	54	Elect.	Elect.	0	0	8	3	-$355	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	55	Elect.	Elect.	0	0	4	2	-$159	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	56	Elect.	Elect.	0	0	4	2	-$20	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	57	Elect.	Elect.	0	0	4	2	-$10	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	58	Elect.	Elect.	0	0	7	3	-$92	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	59	Elect.	Elect.	0	0	7	3	-$72	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	60	Elect.	Elect.	0	0	7	3	-$4	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	61	Elect.	Elect.	0	0	8	3	-$199	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	62	Elect.	Elect.	0	0	24	9	-$243	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	63	Elect.	Elect.	0	0	8	3	-$3	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	64	Elect.	Elect.	0	0	9	4	-$52	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	65	Elect.	Elect.	0	0	3	1	$40	1.02
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	66	Elect.	Elect.	0	0	8	3	-$7	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	67	Elect.	Elect.	0	0	4	2	-$129	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	68	Elect.	Elect.	0	0	8	3	-$355	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	69	Elect.	Elect.	0	0	7	3	-$92	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	70	Elect.	Elect.	0	0	7	3	-$4	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	71	Elect.	Elect.	0	0	8	3	-$199	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	72	Elect.	Elect.	0	0	8	3	-$81	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	73	Elect.	Elect.	0	0	8	3	-$63	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	74	Elect.	Elect.	0	0	8	3	-$16	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	75	Elect.	Elect.	0	0	8	3	-$7	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	76	Elect.	Elect.	0	0	24	10	$43	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	77	Elect.	Elect.	0	0	13	5	-$106	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	78	Elect.	Elect.	0	0	81	32	-$59	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	79	Elect.	Elect.	0	0	16	6	-$19	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	80	Elect.	Elect.	0	0	26	10	$33	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	81	Elect.	Elect.	0	0	31	13	$47	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	82	Elect.	Elect.	0	0	1	0	-$22	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	83	Elect.	Elect.	0	0	1	0	-$2	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	84	Elect.	Elect.	0	0	1	0	-$42	0.97
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	85	Elect.	Elect.	0	0	1	0	-$16	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	86	Elect.	Elect.	0	0	3	1	-$7	1.00

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	87	Elect.	Elect.	0	0	4	1	-$109	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	88	Elect.	Elect.	0	0	7	3	-$10	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	89	Elect.	Elect.	0	0	4	2	-$188	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	90	Elect.	Elect.	0	0	4	2	-$160	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	91	Elect.	Elect.	0	0	4	2	-$58	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	92	Elect.	Elect.	0	0	2	1	-$21	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	93	Elect.	Elect.	0	0	6	3	-$55	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	94	Elect.	Elect.	0	0	9	3	$0	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	95	Elect.	Elect.	0	0	8	3	-$12	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	96	Elect.	Elect.	0	0	13	5	$13	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	97	Elect.	Elect.	0	0	8	3	$10	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	98	Elect.	Elect.	0	0	19	8	-$177	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	99	Elect.	Elect.	0	0	0	0	-$1	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	100	Elect.	Elect.	0	0	2	1	-$34	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	101	Elect.	Elect.	0	0	3	1	-$7	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	102	Elect.	Elect.	0	0	3	1	-$7	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	103	Elect.	Elect.	0	0	2	1	-$104	0.97
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	104	Elect.	Elect.	0	0	11	4	-$26	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	105	Elect.	Elect.	0	0	29	11	-$37	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	106	Elect.	Elect.	0	0	83	33	-$175	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	107	Elect.	Elect.	0	0	2	1	$0	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	108	Elect.	Elect.	0	0	102	41	$1	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	109	Elect.	Elect.	0	0	2	1	$0	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	110	Elect.	Elect.	0	0	19	7	$9	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	111	Elect.	Elect.	0	0	4	1	-$31	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	112	Elect.	Elect.	0	0	1	0	-$52	0.97
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	113	Elect.	Elect.	0	0	4	1	-$109	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	114	Elect.	Elect.	0	0	19	8	-$177	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	115	Elect.	Elect.	0	0	2	1	$2	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	116	Elect.	Elect.	0	0	3	1	$40	1.02
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	117	Elect.	Elect.	0	0	3	1	$27	1.01
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	118	Elect.	Elect.	0	0	3	1	$24	1.01
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	119	Elect.	Elect.	0	0	3	1	$6	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	120	Elect.	Elect.	0	0	5	2	$6	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	121	Elect.	Elect.	0	0	4	2	-$58	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	122	Elect.	Elect.	0	0	4	2	-$31	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	123	Elect.	Elect.	0	0	4	2	-$7	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	124	Elect.	Elect.	0	0	8	3	-$252	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	125	Elect.	Elect.	0	0	4	2	-$81	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	126	Elect.	Elect.	0	0	8	3	-$41	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	127	Elect.	Elect.	0	0	7	3	-$72	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	128	Elect.	Elect.	0	0	13	5	-$39	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	129	Elect.	Elect.	0	0	13	5	-$9	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	130	Elect.	Elect.	0	0	13	5	-$272	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	131	Elect.	Elect.	0	0	13	5	-$190	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	132	Elect.	Elect.	0	0	16	6	-$11	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	133	Elect.	Elect.	0	0	43	17	$8	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	134	Elect.	Elect.	0	0	3	1	$2	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	135	Elect.	Elect.	0	0	4	2	-$7	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	136	Elect.	Elect.	0	0	4	2	-$55	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	137	Elect.	Elect.	0	0	4	2	-$43	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	138	Elect.	Elect.	0	0	7	3	-$63	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	139	Elect.	Elect.	0	0	7	3	-$26	0.99
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	1	Elect.	Elect.	0	0	2	1	$1	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	2	Elect.	Elect.	0	0	2	1	$33	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	3	Elect.	Elect.	0	0	4	1	$21	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	4	Elect.	Elect.	0	0	2	1	$1	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	5	Elect.	Elect.	0	0	7	3	$78	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	6	Elect.	Elect.	0	0	7	3	$52	1.01

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	7	Elect.	Elect.	0	0	21	8	$509	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	8	Elect.	Elect.	0	0	10	4	$21	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	9	Elect.	Elect.	0	0	23	9	$343	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	10	Elect.	Elect.	0	0	12	5	$106	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	11	Elect.	Elect.	0	0	4	2	$3	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	12	Elect.	Elect.	0	0	12	5	$479	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	13	Elect.	Elect.	0	0	78	31	$1,666	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	14	Elect.	Elect.	0	0	36	14	$636	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	15	Elect.	Elect.	0	0	36	14	$53	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	16	Elect.	Elect.	0	0	22	9	$1,017	1.08
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	17	Elect.	Elect.	0	0	97	39	$2,330	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	18	Elect.	Elect.	0	0	45	18	$302	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	19	Elect.	Elect.	0	0	67	27	$110	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	20	Elect.	Elect.	0	0	15	6	$49	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	21	Elect.	Elect.	0	0	53	21	-$179	0.99
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	22	Elect.	Elect.	0	0	11	5	$14	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	23	Elect.	Elect.	0	0	1	1	$11	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	24	Elect.	Elect.	0	0	2	1	$3	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	25	Elect.	Elect.	0	0	2	1	$6	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	26	Elect.	Elect.	0	0	2	1	$1	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	27	Elect.	Elect.	0	0	2	1	$11	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	28	Elect.	Elect.	0	0	15	6	$18	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	29	Elect.	Elect.	0	0	7	3	$84	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	30	Elect.	Elect.	0	0	2	1	$28	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	31	Elect.	Elect.	0	0	2	1	$10	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	32	Elect.	Elect.	0	0	3	1	$95	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	33	Elect.	Elect.	0	0	3	1	$85	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	34	Elect.	Elect.	0	0	42	17	$85	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	35	Elect.	Elect.	0	0	12	5	$189	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	36	Elect.	Elect.	0	0	12	5	$34	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	37	Elect.	Elect.	0	0	62	25	$91	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	38	Elect.	Elect.	0	0	27	11	$248	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	39	Elect.	Elect.	0	0	36	14	$107	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	40	Elect.	Elect.	0	0	5	2	$31	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	41	Elect.	Elect.	0	0	12	5	$17	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	42	Elect.	Elect.	0	0	12	5	$9	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	43	Elect.	Elect.	0	0	22	9	$491	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	44	Elect.	Elect.	0	0	22	9	$74	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	45	Elect.	Elect.	0	0	29	12	-$873	0.96
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	46	Elect.	Elect.	0	0	53	21	-$179	0.99
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	47	Elect.	Elect.	0	0	10	4	$255	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	48	Elect.	Elect.	0	0	3	1	$150	1.07
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	49	Elect.	Elect.	0	0	5	2	$118	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	50	Elect.	Elect.	0	0	5	2	$16	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	51	Elect.	Elect.	0	0	15	6	$514	1.10
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	52	Elect.	Elect.	0	0	15	6	$34	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	53	Elect.	Elect.	0	0	11	4	$8	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	54	Elect.	Elect.	0	0	23	9	-$160	0.99
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	55	Elect.	Elect.	0	0	12	5	-$70	0.99
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	56	Elect.	Elect.	0	0	12	5	-$6	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	57	Elect.	Elect.	0	0	12	5	-$3	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	58	Elect.	Elect.	0	0	18	7	$247	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	59	Elect.	Elect.	0	0	18	7	$207	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	60	Elect.	Elect.	0	0	18	7	$18	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	61	Elect.	Elect.	0	0	22	9	$638	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	62	Elect.	Elect.	0	0	66	26	$1,059	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	63	Elect.	Elect.	0	0	22	9	$25	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	64	Elect.	Elect.	0	0	25	10	$479	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	65	Elect.	Elect.	0	0	8	3	$257	1.10

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	66	Elect.	Elect.	0	0	22	9	$51	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	67	Elect.	Elect.	0	0	11	4	$2	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	68	Elect.	Elect.	0	0	23	9	-$160	0.99
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	69	Elect.	Elect.	0	0	18	7	$247	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	70	Elect.	Elect.	0	0	18	7	$18	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	71	Elect.	Elect.	0	0	22	9	$638	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	72	Elect.	Elect.	0	0	22	9	$353	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	73	Elect.	Elect.	0	0	22	9	$294	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	74	Elect.	Elect.	0	0	22	9	$104	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	75	Elect.	Elect.	0	0	22	9	$51	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	76	Elect.	Elect.	0	0	67	27	$499	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	77	Elect.	Elect.	0	0	38	15	$285	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	78	Elect.	Elect.	0	0	226	91	$212	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	79	Elect.	Elect.	0	0	44	18	$232	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	80	Elect.	Elect.	0	0	0	0	-$198	0.98
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	81	Elect.	Elect.	0	0	0	0	-$227	0.98
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	82	Elect.	Elect.	0	0	2	1	$37	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	83	Elect.	Elect.	0	0	3	1	$6	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	84	Elect.	Elect.	0	0	2	1	$11	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	85	Elect.	Elect.	0	0	2	1	$8	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	86	Elect.	Elect.	0	0	7	3	$9	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	87	Elect.	Elect.	0	0	10	4	$241	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	88	Elect.	Elect.	0	0	21	8	$43	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	89	Elect.	Elect.	0	0	12	5	$171	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	90	Elect.	Elect.	0	0	12	5	$157	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	91	Elect.	Elect.	0	0	12	5	$82	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	92	Elect.	Elect.	0	0	6	2	$240	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	93	Elect.	Elect.	0	0	18	7	$678	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	94	Elect.	Elect.	0	0	24	10	$71	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	95	Elect.	Elect.	0	0	22	9	$957	1.08
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	96	Elect.	Elect.	0	0	37	15	$896	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	97	Elect.	Elect.	0	0	22	9	$399	1.05
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	98	Elect.	Elect.	0	0	53	21	-$30	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	99	Elect.	Elect.	0	0	1	0	$0	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	100	Elect.	Elect.	0	0	4	2	$32	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	101	Elect.	Elect.	0	0	9	3	$11	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	102	Elect.	Elect.	0	0	7	3	$7	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	103	Elect.	Elect.	0	0	5	2	$56	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	104	Elect.	Elect.	0	0	30	12	$36	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	105	Elect.	Elect.	0	0	80	32	$163	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	106	Elect.	Elect.	0	0	232	93	$340	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	107	Elect.	Elect.	0	0	6	2	$36	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	108	Elect.	Elect.	0	0	286	115	$853	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	109	Elect.	Elect.	0	0	6	2	$9	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	110	Elect.	Elect.	0	0	52	21	$172	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	111	Elect.	Elect.	0	0	10	4	-$32	0.99
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	112	Elect.	Elect.	0	0	2	1	$28	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	113	Elect.	Elect.	0	0	10	4	$241	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	114	Elect.	Elect.	0	0	53	21	-$30	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	115	Elect.	Elect.	0	0	5	2	$33	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	116	Elect.	Elect.	0	0	8	3	$257	1.10
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	117	Elect.	Elect.	0	0	8	3	$168	1.08
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	118	Elect.	Elect.	0	0	6	3	$147	1.07
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	119	Elect.	Elect.	0	0	8	3	$34	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	120	Elect.	Elect.	0	0	15	6	$34	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	121	Elect.	Elect.	0	0	11	4	$9	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	122	Elect.	Elect.	0	0	11	4	$7	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	123	Elect.	Elect.	0	0	11	4	$2	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	124	Elect.	Elect.	0	0	23	9	-$104	0.99

Table 3.4
All EROs: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	125	Elect.	Elect.	0	0	12	5	-$29	0.99
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	126	Elect.	Elect.	0	0	23	9	-$12	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	127	Elect.	Elect.	0	0	18	7	$207	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	128	Elect.	Elect.	0	0	37	15	$149	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	129	Elect.	Elect.	0	0	37	15	$37	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	130	Elect.	Elect.	0	0	38	15	$338	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	131	Elect.	Elect.	0	0	38	15	$262	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	132	Elect.	Elect.	0	0	44	18	$43	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	133	Elect.	Elect.	0	0	0	0	-$429	0.98
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	134	Elect.	Elect.	0	0	9	4	$32	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	135	Elect.	Elect.	0	0	11	4	$2	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	136	Elect.	Elect.	0	0	12	5	-$18	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	137	Elect.	Elect.	0	0	12	5	-$13	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	138	Elect.	Elect.	0	0	18	7	$187	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	139	Elect.	Elect.	0	0	18	7	$93	1.02
Wtr. Heating	Capehart Hsg	Water Heater	Desuperheater	RI	1	Elect.	Elect.	6,710	NA	6,710	NA	$252,964	1.72
Wtr. Heating	APPR PFY50	WH-1	Solar Water Heater	RI	1	Elect.	Elect.	22	NA	22	NA	$500	1.24
Wtr. Heating	Capehart Hsg	WH-1	Solar Water Heater	RI	2	Elect.	Elect.	7,227	NA	7,227	NA	$166,485	1.24
Wtr. Heating	Wherry Hsg	WH-1	Solar Water Heater	RI	3	Elect.	Elect.	4,008	NA	4,008	NA	$92,325	1.24
Wtr. Heating	Temp.Lod.Fac.	WH-1	Solar Water Heater	RI	4	Elect.	Elect.	362	NA	362	NA	$8,333	1.24
Wtr. Heating	501	Water Heater	Solar Water Heater	RI	1a	Elect.	Elect.	204	NA	204	NA	$4,216	1.21
Wtr. Heating	502	Water Heater	Solar Water Heater	RI	1b	Elect.	Elect.	204	NA	204	NA	$4,216	1.21
Wtr. Heating	503	Water Heater	Solar Water Heater	RI	1c	Elect.	Elect.	204	NA	204	NA	$4,216	1.21
Wtr. Heating	504	Water Heater	Solar Water Heater	RI	1d	Elect.	Elect.	204	NA	204	NA	$4,250	1.21
Wtr. Heating	505	Water Heater	Solar Water Heater	RI	1e	Elect.	Elect.	184	NA	184	NA	$3,387	1.18
Wtr. Heating	506	Water Heater	Solar Water Heater	RI	1f	Elect.	Elect.	184	NA	184	NA	$3,387	1.18
Wtr. Heating	Family Housing	Elec. Wtr. Htrs	Eff. Elec. Wtr. Htrs	RI	1	Elect.	Elect.	605	NA	605	NA	-$489,926	0.23
Wtr. Heating	Family Housing	Elec. Wtr. Htrs	Elec. Heat Pump	RI	2	Elect.	Elect.	5,894	NA	5,894	NA	-$2,182,646	0.03
Wtr. Heating	Family Housing	Elec. Wtr. Htrs	Eff. Elec. Wtr. Htrs	ROF	1	Elect.	Elect.	0	NA	605	NA	-$142,409	0.71
Wtr. Heating	Family Housing	Elec. Wtr. Htrs	Elec. Heat Pump	ROF	2	Elect.	Elect.	0	NA	5,894	NA	-$1,176,864	0.31

(a): NA denotes EROs where demand reductions were not considered because of uncertainty about contribution to the monthly peak.
(b): Optimal choice was not retrofit. Therefore, no SIR can be calculated.

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	*Present* Value of Installed Cost (1993 $)	*Present* Value of Energy Savings (1993 $)	*Present* Value of Demand Savings (1993 $)	*Present* Value of O&M Savings (1993 $)	Present *Value of* Replacement Cost Savings (1993 $)	*Present* Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
AC	Commercial	WAC-0.5	Eff. Win. AC	RI	1a	Elect.	Elect.	$9,176	$977	$1,064	$0	$4,229	$6,270	-$2,906	0.68
AC	Commercial	WAC-0.5	Eff. Win. AC	RI	1b	Elect.	Elect.	$11,780	$1,060	$1,154	$0	$5,429	$7,643	-$4,137	0.65
AC	Commercial	WAC-1.0	Eff. Win. AC	RI	2a	Elect.	Elect.	$12,032	$2,824	$3,033	$0	$5,545	$11,402	-$630	0.95
AC	Commercial	WAC-1.0	Eff. Win. AC	RI	2b	Elect.	Elect.	$14,208	$3,285	$3,531	$0	$6,548	$13,363	-$845	0.94
AC	Commercial	WAC-1.0	Eff. Win. AC	RI	2c	Elect.	Elect.	$13,312	$2,017	$2,173	$0	$6,135	$10,325	-$2,987	0.78
AC	Commercial	WAC-1.5	Eff. Win. AC	RI	3a	Elect.	Elect.	$6,695	$1,668	$1,788	$0	$3,085	$6,542	-$153	0.98
AC	Commercial	WAC-1.5	Eff. Win. AC	RI	3b	Elect.	Elect.	$6,240	$1,437	$1,539	$0	$2,876	$5,852	-$388	0.94
AC	100	Chiller	Eff. Chiller	RI	1	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	102	Chiller	Eff. Chiller	RI	2	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	104	Chiller	Eff. Chiller	RI	3	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	106	Chiller	Eff. Chiller	RI	4	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	204	Chiller	Eff. Chiller	RI	5	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	205	Chiller	Eff. Chiller	RI	6	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	208	Chiller	Eff. Chiller	RI	7	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	250	Chiller	Eff. Chiller	RI	8	Elect.	Elect.	$2,500	$181	$185	$0	$1,499	$1,865	-$635	0.75
AC	250	Chiller	Eff. Chiller	RI	9	Elect.	Elect.	$72,500	$4,013	$4,100	$0	$43,471	$51,584	-$20,916	0.71
AC	251	Chiller	Eff. Chiller	RI	10	Elect.	Elect.	$8,500	$982	$629	$0	$5,097	$6,707	-$1,793	0.79
AC	263	Chiller	Eff. Chiller	RI	11	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	265	Chiller	Eff. Chiller	RI	12	Elect.	Elect.	$37,500	$3,314	$2,121	$0	$22,485	$27,920	-$9,580	0.74
AC	310	Chiller	Eff. Chiller	RI	13	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	312	Chiller	Eff. Chiller	RI	14	Elect.	Elect.	$15,500	$2,178	$2,225	$0	$9,294	$13,697	-$1,803	0.88
AC	313	Chiller	Eff. Chiller	RI	15	Elect.	Elect.	$102,000	$5,646	$5,768	$0	$61,159	$72,573	-$29,427	0.71
AC	317	Chiller	Eff. Chiller	RI	16	Elect.	Elect.	$2,500	$181	$185	$0	$1,499	$1,865	-$635	0.75
AC	318	Chiller	Eff. Chiller	RI	17	Elect.	Elect.	$25,000	$1,384	$1,414	$0	$14,990	$17,788	-$7,212	0.71
AC	321	Chiller	Eff. Chiller	RI	18	Elect.	Elect.	$7,500	$867	$555	$0	$4,497	$5,918	-$1,582	0.79
AC	329	Chiller	Eff. Chiller	RI	19	Elect.	Elect.	$10,000	$1,405	$1,436	$0	$5,996	$8,837	-$1,163	0.88
AC	330	Chiller	Eff. Chiller	RI	20	Elect.	Elect.	$25,000	$1,384	$1,414	$0	$14,990	$17,788	-$7,212	0.71
AC	330	Chiller	Eff. Chiller	RI	21	Elect.	Elect.	$30,000	$4,215	$4,307	$0	$17,988	$26,510	-$3,490	0.88
AC	330	Chiller	Eff. Chiller	RI	22	Elect.	Elect.	$120,000	$13,412	$13,703	$0	$71,952	$99,067	-$20,933	0.83
AC	335	Chiller	Eff. Chiller	RI	23	Elect.	Elect.	$4,500	$520	$333	$0	$2,698	$3,551	-$949	0.79
AC	345	Chiller	Eff. Chiller	RI	24	Elect.	Elect.	$3,500	$404	$259	$0	$2,099	$2,762	-$738	0.79
AC	400	Chiller	Eff. Chiller	RI	25	Elect.	Elect.	$3,500	$404	$259	$0	$2,099	$2,762	-$738	0.79
AC	400	Chiller	Eff. Chiller	RI	26	Elect.	Elect.	$40,000	$3,535	$2,262	$0	$23,984	$29,781	-$10,219	0.74
AC	401	Chiller	Eff. Chiller	RI	27	Elect.	Elect.	$7,500	$867	$555	$0	$4,497	$5,918	-$1,582	0.79
AC	402	Chiller	Eff. Chiller	RI	28	Elect.	Elect.	$10,000	$2,243	$1,436	$0	$5,996	$9,675	-$325	0.97
AC	404	Chiller	Eff. Chiller	RI	29	Elect.	Elect.	$30,000	$408	$261	$0	$17,988	$18,657	-$11,343	0.62
AC	408	Chiller	Eff. Chiller	RI	30	Elect.	Elect.	$20,000	$1,107	$1,131	$0	$11,992	$14,230	-$5,770	0.71
AC	415	Chiller	Eff. Chiller	RI	31	Elect.	Elect.	$44,000	$4,918	$5,024	$0	$26,382	$36,324	-$7,676	0.83
AC	423	Chiller	Eff. Chiller	RI	32	Elect.	Elect.	$244,000	$44,153	$45,111	$0	$146,302	$235,566	-$8,434	0.97
AC	424	Chiller	Eff. Chiller	RI	33	Elect.	Elect.	$10,000	$2,243	$1,436	$0	$5,996	$9,675	-$325	0.97
AC	425	Chiller	Eff. Chiller	RI	34	Elect.	Elect.	$12,500	$1,756	$1,794	$0	$7,495	$11,046	-$1,454	0.88
AC	425	Chiller	Eff. Chiller	RI	35	Elect.	Elect.	$27,500	$1,522	$1,555	$0	$16,489	$19,566	-$7,934	0.71
AC	425	Chiller	Eff. Chiller	RI	36	Elect.	Elect.	$192,000	$21,459	$21,925	$0	$115,123	$158,507	-$33,493	0.83
AC	430	Chiller	Eff. Chiller	RI	37	Elect.	Elect.	$20,000	$1,107	$1,131	$0	$11,992	$14,230	-$5,770	0.71
AC	431	Chiller	Eff. Chiller	RI	38	Elect.	Elect.	$50,000	$9,580	$9,788	$0	$29,980	$49,348	-$652	0.99
AC	440	Chiller	Eff. Chiller	RI	39	Elect.	Elect.	$25,000	$319	$326	$0	$14,990	$15,636	-$9,364	0.63
AC	501	Chiller	Eff. Chiller	RI	40	Elect.	Elect.	$30,000	$8,565	$5,481	$0	$17,988	$32,035	$2,035	1.07
AC	502	Chiller	Eff. Chiller	RI	41	Elect.	Elect.	$30,000	$8,565	$5,481	$0	$17,988	$32,035	$2,035	1.07
AC	503	Chiller	Eff. Chiller	RI	42	Elect.	Elect.	$30,000	$8,565	$5,481	$0	$17,988	$32,035	$2,035	1.07
AC	505	Chiller	Eff. Chiller	RI	43	Elect.	Elect.	$110,000	$19,629	$12,561	$0	$65,956	$98,146	-$11,854	0.89
AC	510	Chiller	Eff. Chiller	RI	44	Elect.	Elect.	$5,000	$578	$370	$0	$2,998	$3,946	-$1,054	0.79
AC	523	Chiller	Eff. Chiller	RI	45	Elect.	Elect.	$15,000	$0	$0	$0	$8,994	$8,994	-$6,006	0.60
AC	530	Chiller	Eff. Chiller	RI	46	Elect.	Elect.	$30,000	$1,661	$1,697	$0	$17,988	$21,345	-$8,655	0.71
AC	533	Chiller	Eff. Chiller	RI	47	Elect.	Elect.	$21,000	$7,138	$4,568	$0	$12,592	$24,297	$3,297	1.16
AC	533	Chiller	Eff. Chiller	RI	48	Elect.	Elect.	$87,500	$7,733	$4,948	$0	$52,465	$65,146	-$22,354	0.74
AC	534	Chiller	Eff. Chiller	RI	49	Elect.	Elect.	$25,000	$4,790	$4,894	$0	$14,990	$24,674	-$326	0.99
AC	535	Chiller	Eff. Chiller	RI	50	Elect.	Elect.	$14,000	$4,283	$2,741	$0	$8,394	$15,418	$1,418	1.10
AC	535	Chiller	Eff. Chiller	RI	51	Elect.	Elect.	$25,000	$7,648	$4,894	$0	$14,990	$27,532	$2,532	1.10
AC	536	Chiller	Eff. Chiller	RI	52	Elect.	Elect.	$35,000	$6,706	$6,852	$0	$20,986	$34,543	-$457	0.99
AC	537	Chiller	Eff. Chiller	RI	53	Elect.	Elect.	$35,000	$5,234	$3,350	$0	$20,986	$29,570	-$5,430	0.84
AC	545	Chiller	Eff. Chiller	RI	54	Elect.	Elect.	$7,500	$867	$555	$0	$4,497	$5,918	-$1,582	0.79
AC	546	Chiller	Eff. Chiller	RI	55	Elect.	Elect.	$40,000	$0	$0	$0	$23,984	$23,984	-$16,016	0.60
AC	548	Chiller	Eff. Chiller	RI	56	Elect.	Elect.	$4,000	$462	$296	$0	$2,398	$3,156	-$844	0.79
AC	556	Chiller	Eff. Chiller	RI	57	Elect.	Elect.	$15,000	$0	$0	$0	$8,994	$8,994	-$6,006	0.60
AC	557	Chiller	Eff. Chiller	RI	58	Elect.	Elect.	$5,000	$0	$0	$0	$2,998	$2,998	-$2,002	0.60
AC	558	Chiller	Eff. Chiller	RI	59	Elect.	Elect.	$40,000	$3,535	$2,262	$0	$23,984	$29,781	-$10,219	0.74
AC	559	Chiller	Eff. Chiller	RI	60	Elect.	Elect.	$30,000	$1,661	$1,697	$0	$17,988	$21,345	-$8,655	0.71
AC	560	Chiller	Eff. Chiller	RI	61	Elect.	Elect.	$25,000	$1,384	$1,414	$0	$14,990	$17,788	-$7,212	0.71

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
AC	561	Chiller	Eff. Chiller	RI	62	Elect.	Elect.	$27,500	$3,864	$3,948	$0	$16,489	$24,301	-$3,199	0.88
AC	562	Chiller	Eff. Chiller	RI	63	Elect.	Elect.	$27,500	$3,864	$3,948	$0	$16,489	$24,301	-$3,199	0.88
AC	575	Chiller	Eff. Chiller	RI	64	Elect.	Elect.	$37,500	$2,076	$2,121	$0	$22,485	$26,681	-$10,819	0.71
AC	576	Chiller	Eff. Chiller	RI	65	Elect.	Elect.	$25,000	$2,209	$1,414	$0	$14,990	$18,613	-$6,387	0.74
AC	600	Chiller	Eff. Chiller	RI	66	Elect.	Elect.	$8,000	$693	$444	$0	$3,598	$4,735	-$1,265	0.79
AC	624	Chiller	Eff. Chiller	RI	67	Elect.	Elect.	$6,500	$751	$481	$0	$3,897	$5,129	-$1,371	0.79
AC	629	Chiller	Eff. Chiller	RI	68	Elect.	Elect.	$5,000	$362	$370	$0	$2,998	$3,730	-$1,270	0.75
AC	629	Chiller	Eff. Chiller	RI	69	Elect.	Elect.	$17,500	$969	$990	$0	$10,493	$12,451	-$5,049	0.71
AC	630	Chiller	Eff. Chiller	RI	70	Elect.	Elect.	$5,000	$578	$370	$0	$2,998	$3,946	-$1,054	0.79
AC	655	Chiller	Eff. Chiller	RI	71	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	659	Chiller	Eff. Chiller	RI	72	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	673	Chiller	Eff. Chiller	RI	73	Elect.	Elect.	$15,000	$830	$848	$0	$8,994	$10,673	-$4,327	0.71
AC	685	Chiller	Eff. Chiller	RI	74	Elect.	Elect.	$3,500	$404	$259	$0	$2,099	$2,762	-$738	0.79
AC	703	Chiller	Eff. Chiller	RI	75	Elect.	Elect.	$7,500	$867	$555	$0	$4,497	$5,918	-$1,582	0.79
AC	710	Chiller	Eff. Chiller	RI	76	Elect.	Elect.	$2,000	$231	$148	$0	$1,199	$1,578	-$422	0.79
AC	710	Chiller	Eff. Chiller	RI	77	Elect.	Elect.	$17,500	$969	$990	$0	$10,493	$12,451	-$5,049	0.71
AC	722	Chiller	Eff. Chiller	RI	78	Elect.	Elect.	$35,000	$1,937	$1,979	$0	$20,986	$24,903	-$10,097	0.71
AC	727	Chiller	Eff. Chiller	RI	79	Elect.	Elect.	$30,000	$2,651	$1,697	$0	$17,988	$22,336	-$7,664	0.74
AC	732	Chiller	Eff. Chiller	RI	80	Elect.	Elect.	$24,500	$1,356	$1,386	$0	$14,690	$17,432	-$7,068	0.71
AC	734	Chiller	Eff. Chiller	RI	81	Elect.	Elect.	$15,500	$1,370	$877	$0	$9,294	$11,540	-$3,960	0.74
AC	735	Chiller	Eff. Chiller	RI	82	Elect.	Elect.	$4,000	$462	$296	$0	$2,398	$3,156	-$844	0.79
AC	736	Chiller	Eff. Chiller	RI	83	Elect.	Elect.	$5,500	$636	$407	$0	$3,298	$4,340	-$1,160	0.79
AC	738	Chiller	Eff. Chiller	RI	84	Elect.	Elect.	$15,500	$4,795	$877	$0	$9,294	$14,966	-$534	0.97
AC	750	Chiller	Eff. Chiller	RI	85	Elect.	Elect.	$62,500	$3,459	$3,535	$0	$37,475	$44,469	-$18,031	0.71
AC	751	Chiller	Eff. Chiller	RI	86	Elect.	Elect.	$32,500	$1,799	$1,838	$0	$19,487	$23,124	-$9,376	0.71
AC	800	Chiller	Eff. Chiller	RI	87	Elect.	Elect.	$45,000	$6,323	$6,460	$0	$26,982	$39,765	-$5,235	0.88
AC	800	Chiller	Eff. Chiller	RI	88	Elect.	Elect.	$90,000	$4,982	$5,090	$0	$53,964	$64,035	-$25,965	0.71
AC	810	Chiller	Eff. Chiller	RI	89	Elect.	Elect.	$10,000	$2,243	$1,436	$0	$5,996	$9,675	-$325	0.97
AC	908	Chiller	Eff. Chiller	RI	90	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	912	Chiller	Eff. Chiller	RI	91	Elect.	Elect.	$4,000	$462	$296	$0	$2,398	$3,156	-$844	0.79
AC	925	Chiller	Eff. Chiller	RI	92	Elect.	Elect.	$220,000	$39,258	$25,122	$0	$131,912	$196,292	-$23,708	0.89
AC	926	Chiller	Eff. Chiller	RI	93	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	929	Chiller	Eff. Chiller	RI	94	Elect.	Elect.	$96,000	$17,131	$10,962	$0	$57,561	$85,655	-$10,345	0.89
AC	943	Chiller	Eff. Chiller	RI	95	Elect.	Elect.	$7,500	$867	$555	$0	$4,497	$5,918	-$1,582	0.79
AC	945	Chiller	Eff. Chiller	RI	96	Elect.	Elect.	$30,000	$1,661	$1,697	$0	$17,988	$21,345	-$8,655	0.71
AC	946	Chiller	Eff. Chiller	RI	97	Elect.	Elect.	$50,000	$2,768	$2,828	$0	$29,980	$35,575	-$14,425	0.71
AC	957	Chiller	Eff. Chiller	RI	98	Elect.	Elect.	$10,000	$2,243	$1,436	$0	$5,996	$9,675	-$325	0.97
AC	958	Chiller	Eff. Chiller	RI	99	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	965	Chiller	Eff. Chiller	RI	100	Elect.	Elect.	$25,000	$5,608	$3,589	$0	$14,990	$24,187	-$813	0.97
AC	967	Chiller	Eff. Chiller	RI	101	Elect.	Elect.	$10,000	$1,405	$1,436	$0	$5,996	$8,837	-$1,163	0.88
AC	967	Chiller	Eff. Chiller	RI	102	Elect.	Elect.	$44,000	$2,435	$2,488	$0	$26,382	$31,306	-$12,694	0.71
AC	969	Chiller	Eff. Chiller	RI	103	Elect.	Elect.	$16,000	$1,414	$905	$0	$9,594	$11,912	-$4,088	0.74
AC	984	Chiller	Eff. Chiller	RI	104	Elect.	Elect.	$30,000	$1,661	$1,697	$0	$17,988	$21,345	-$8,655	0.71
AC	986	Chiller	Eff. Chiller	RI	105	Elect.	Elect.	$80,000	$14,276	$9,135	$0	$47,968	$71,379	-$8,621	0.89
AC	989	Chiller	Eff. Chiller	RI	106	Elect.	Elect.	$55,000	$12,338	$7,896	$0	$32,978	$53,212	-$1,788	0.97
AC	989	Chiller	Eff. Chiller	RI	107	Elect.	Elect.	$265,000	$23,419	$14,986	$0	$158,894	$197,299	-$67,701	0.74
AC	989	Chiller	Eff. Chiller	RI	108	Elect.	Elect.	$430,000	$95,001	$60,794	$0	$257,827	$413,622	-$16,378	0.96
AC	990	Chiller	Eff. Chiller	RI	109	Elect.	Elect.	$15,000	$3,365	$2,153	$0	$8,994	$14,512	-$488	0.97
AC	990	Chiller	Eff. Chiller	RI	110	Elect.	Elect.	$25,000	$2,209	$1,414	$0	$14,990	$18,613	-$6,387	0.74
AC	991	Chiller	Eff. Chiller	RI	111	Elect.	Elect.	$12,000	$2,692	$1,723	$0	$7,195	$11,610	-$390	0.97
AC	992	Chiller	Eff. Chiller	RI	112	Elect.	Elect.	$4,000	$218	$139	$0	$2,398	$2,755	-$1,245	0.69
AC	992	Chiller	Eff. Chiller	RI	113	Elect.	Elect.	$15,000	$1,326	$848	$0	$8,994	$11,168	-$3,832	0.74
AC	996	Chiller	Eff. Chiller	RI	114	Elect.	Elect.	$9,000	$1,040	$666	$0	$5,396	$7,102	-$1,898	0.79
AC	996	Chiller	Eff. Chiller	RI	115	Elect.	Elect.	$20,000	$1,767	$1,131	$0	$11,992	$14,890	-$5,110	0.74
AC	998	Chiller	Eff. Chiller	RI	116	Elect.	Elect.	$5,000	$578	$370	$0	$2,998	$3,946	-$1,054	0.79
AC	998	Chiller	Eff. Chiller	RI	117	Elect.	Elect.	$52,000	$11,047	$7,069	$0	$31,179	$49,295	-$2,705	0.95
AC	1316	Chiller	Eff. Chiller	RI	118	Elect.	Elect.	$20,000	$1,767	$1,131	$0	$11,992	$14,890	-$5,110	0.74
AC	1353	Chiller	Eff. Chiller	RI	119	Elect.	Elect.	$20,000	$1,767	$1,131	$0	$11,992	$14,890	-$5,110	0.74
AC	1360	Chiller	Eff. Chiller	RI	120	Elect.	Elect.	$4,000	$462	$296	$0	$2,398	$3,156	-$844	0.79
AC	1364	Chiller	Eff. Chiller	RI	121	Elect.	Elect.	$5,000	$578	$370	$0	$2,998	$3,946	-$1,054	0.79
AC	1364	Chiller	Eff. Chiller	RI	122	Elect.	Elect.	$86,400	$15,418	$9,866	$0	$51,805	$77,089	-$9,311	0.89
AC	1365	Chiller	Eff. Chiller	RI	123	Elect.	Elect.	$80,000	$7,070	$4,524	$0	$47,968	$59,562	-$20,438	0.74
AC	1369	Chiller	Eff. Chiller	RI	124	Elect.	Elect.	$15,000	$3,365	$2,153	$0	$8,994	$14,512	-$488	0.97
AC	1380	Chiller	Eff. Chiller	RI	125	Elect.	Elect.	$128,000	$28,279	$18,097	$0	$76,749	$123,125	-$4,875	0.96
AC	1391	Chiller	Eff. Chiller	RI	126	Elect.	Elect.	$7,500	$867	$555	$0	$4,497	$5,918	-$1,582	0.79
AC	1491	Chiller	Eff. Chiller	RI	127	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	1492	Chiller	Eff. Chiller	RI	128	Elect.	Elect.	$2,500	$289	$185	$0	$1,499	$1,973	-$527	0.79
AC	1492	Chiller	Eff. Chiller	RI	129	Elect.	Elect.	$15,000	$1,326	$848	$0	$8,994	$11,168	-$3,832	0.74

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
AC	1493	Chiller	Eff. Chiller	RI	130	Elect.	Elect.	$14,000	$3,141	$2,010	$0	$8,394	$13,545	-$455	0.97
AC	1524	Chiller	Eff. Chiller	RI	131	Elect.	Elect.	$5,000	$578	$370	$0	$2,998	$3,946	-$1,054	0.79
AC	3655	Chiller	Eff. Chiller	RI	132	Elect.	Elect.	$25,000	$2,209	$1,414	$0	$14,990	$18,613	-$6,387	0.74
AC	3656	Chiller	Eff. Chiller	RI	133	Elect.	Elect.	$12,500	$2,804	$1,794	$0	$7,495	$12,094	-$406	0.97
AC	3658	Chiller	Eff. Chiller	RI	134	Elect.	Elect.	$4,000	$462	$296	$0	$2,398	$3,156	-$844	0.79
AC	3659	Chiller	Eff. Chiller	RI	135	Elect.	Elect.	$40,000	$639	$853	$0	$23,984	$25,275	-$14,725	0.63
AC	250	Chiller	Eff. Chiller&TES	RI	9	Elect.	Elect.	$94,250	-$27,119	$102,651	$14,271	$46,704	$136,507	$42,257	1.45
AC	265	Chiller	Eff. Chiller&TES	RI	12	Elect.	Elect.	$48,750	-$22,486	$53,095	$7,381	$24,157	$62,148	$13,398	1.27
AC	312	Chiller	Eff. Chiller&TES	RI	14	Elect.	Elect.	$20,150	-$4,478	$23,295	$3,051	$9,985	$31,853	$11,703	1.58
AC	313	Chiller	Eff. Chiller&TES	RI	15	Elect.	Elect.	$132,600	-$38,154	$144,419	$20,077	$65,708	$192,051	$59,451	1.45
AC	318	Chiller	Eff. Chiller&TES	RI	17	Elect.	Elect.	$32,500	-$9,351	$35,397	$4,921	$16,105	$47,071	$14,571	1.45
AC	329	Chiller	Eff. Chiller&TES	RI	19	Elect.	Elect.	$13,000	-$2,889	$15,029	$1,968	$6,442	$20,550	$7,550	1.58
AC	330	Chiller	Eff. Chiller&TES	RI	20	Elect.	Elect.	$32,500	-$9,351	$35,397	$4,921	$16,105	$47,071	$14,571	1.45
AC	330	Chiller	Eff. Chiller&TES	RI	21	Elect.	Elect.	$39,000	-$8,667	$45,086	$5,905	$19,326	$61,650	$22,650	1.58
AC	330	Chiller	Eff. Chiller&TES	RI	22	Elect.	Elect.	$195,000	-$33,971	$163,697	$29,526	$66,490	$225,741	$30,741	1.16
AC	400	Chiller	Eff. Chiller&TES	RI	26	Elect.	Elect.	$52,000	-$23,985	$56,635	$7,874	$25,768	$66,291	$14,291	1.27
AC	402	Chiller	Eff. Chiller&TES	RI	28	Elect.	Elect.	$13,000	-$4,637	$15,029	$1,968	$6,442	$18,802	$5,802	1.45
AC	404	Chiller	Eff. Chiller&TES	RI	29	Elect.	Elect.	$39,000	-$20,232	$41,041	$5,905	$19,326	$46,040	$7,040	1.18
AC	408	Chiller	Eff. Chiller&TES	RI	30	Elect.	Elect.	$26,000	-$7,481	$28,317	$3,937	$12,884	$37,657	$11,657	1.45
AC	415	Chiller	Eff. Chiller&TES	RI	31	Elect.	Elect.	$71,500	-$12,456	$60,022	$10,826	$24,379	$82,772	$11,272	1.16
AC	423	Chiller	Eff. Chiller&TES	RI	32	Elect.	Elect.	$396,500	-$52,193	$350,099	$60 036	$135,195	$493,137	$96,637	1.24
AC	424	Chiller	Eff. Chiller&TES	RI	33	Elect.	Elect.	$13,000	-$4,637	$15,029	$1,968	$6,442	$18,802	$5,802	1.45
AC	425	Chiller	Eff. Chiller&TES	RI	34	Elect.	Elect.	$16,250	-$3,611	$18,786	$2,460	$8,052	$25,688	$9,438	1.58
AC	425	Chiller	Eff. Chiller&TES	RI	35	Elect.	Elect.	$35,750	-$10,287	$38,937	$5,413	$17,715	$51,778	$16,028	1.45
AC	425	Chiller	Eff. Chiller&TES	RI	36	Elect.	Elect.	$312,000	-$54,354	$261,915	$47,241	$106,383	$361,186	$49,186	1.16
AC	430	Chiller	Eff. Chiller&TES	RI	37	Elect.	Elect.	$26,000	-$7,481	$28,317	$3,937	$12,884	$37,657	$11,657	1.45
AC	431	Chiller	Eff. Chiller&TES	RI	38	Elect.	Elect.	$65,000	-$11,891	$77,754	$9,842	$32,210	$107,915	$42,915	1.66
AC	440	Chiller	Eff. Chiller&TES	RI	39	Elect.	Elect.	$32,500	-$10,416	$34,309	$4,921	$16,105	$44,919	$12,419	1.38
AC	501	Chiller	Eff. Chiller&TES	RI	40	Elect.	Elect.	$39,000	-$12,075	$46,261	$5,905	$19,326	$59,417	$20,417	1.52
AC	502	Chiller	Eff. Chiller&TES	RI	41	Elect.	Elect.	$39,000	-$12,075	$46,261	$5,905	$19,326	$59,417	$20,417	1.52
AC	503	Chiller	Eff. Chiller&TES	RI	42	Elect.	Elect.	$39,000	-$12,075	$46,261	$5,905	$19,326	$59,417	$20,417	1.52
AC	505	Chiller	Eff. Chiller&TES	RI	43	Elect.	Elect.	$178,750	-$49,962	$150,056	$27,065	$60,949	$188,108	$9,358	1.05
AC	523	Chiller	Eff. Chiller&TES	RI	45	Elect.	Elect.	$19,500	-$6,219	$19,687	$2,953	$9,663	$26,083	$6,583	1.34
AC	530	Chiller	Eff. Chiller&TES	RI	46	Elect.	Elect.	$39,000	-$11,222	$42,476	$5,905	$19,326	$56,485	$17,485	1.45
AC	533	Chiller	Eff. Chiller&TES	RI	47	Elect.	Elect.	$27,300	-$7,310	$33,113	$4,134	$13,528	$43 465	$16,165	1.59
AC	533	Chiller	Eff. Chiller&TES	RI	48	Elect.	Elect.	$113,750	-$52,467	$123,889	$17,223	$56,367	$145,012	$31,262	1.27
AC	534	Chiller	Eff. Chiller&TES	RI	49	Elect.	Elect.	$32,500	-$5,945	$38,877	$4,921	$16,105	$53,958	$21,458	1.66
AC	535	Chiller	Eff. Chiller&TES	RI	50	Elect.	Elect.	$18,200	-$5,349	$21,771	$2,756	$9,019	$28,196	$9,996	1.55
AC	535	Chiller	Eff. Chiller&TES	RI	51	Elect.	Elect.	$32,500	-$9,552	$38,877	$4,921	$16,105	$50,351	$17,851	1.55
AC	536	Chiller	Eff. Chiller&TES	RI	52	Elect.	Elect.	$45,500	-$8,323	$54,428	$6,889	$22,547	$75,541	$30,041	1.66
AC	537	Chiller	Eff. Chiller&TES	RI	53	Elect.	Elect.	$45,500	-$18,846	$50,926	$6,889	$22,547	$61,517	$16,017	1.35
AC	546	Chiller	Eff. Chiller&TES	RI	55	Elect.	Elect.	$65,000	-$19,990	$63,279	$9,842	$22,163	$75,294	$10,294	1.16
AC	556	Chiller	Eff. Chiller&TES	RI	57	Elect.	Elect.	$19,500	-$9,964	$19,687	$2,953	$9,663	$22,338	$2,838	1.15
AC	557	Chiller	Eff. Chiller&TES	RI	58	Elect.	Elect.	$6,500	-$3,163	$6,250	$984	$3,221	$7,292	$792	1.12
AC	558	Chiller	Eff. Chiller&TES	RI	59	Elect.	Elect.	$52,000	-$23,985	$56,635	$7,874	$25,768	$66,291	$14,291	1.27
AC	559	Chiller	Eff. Chiller&TES	RI	60	Elect.	Elect.	$39,000	-$11,222	$42,476	$5,905	$19,326	$56,485	$17,485	1.45
AC	560	Chiller	Eff. Chiller&TES	RI	61	Elect.	Elect.	$32,500	-$9,351	$35,397	$4,921	$16,105	$47,071	$14,571	1.45
AC	561	Chiller	Eff. Chiller&TES	RI	62	Elect.	Elect.	$35,750	-$7,945	$41,329	$5,413	$17,715	$56,513	$20,763	1.58
AC	562	Chiller	Eff. Chiller&TES	RI	63	Elect.	Elect.	$35,750	-$7,945	$41,329	$5,413	$17,715	$56,513	$20,763	1.58
AC	575	Chiller	Eff. Chiller&TES	RI	64	Elect.	Elect.	$48,750	-$14,027	$53,095	$7,381	$24,157	$70,607	$21,857	1.45
AC	576	Chiller	Eff. Chiller&TES	RI	65	Elect.	Elect.	$32,500	-$14,991	$35,397	$4,921	$16,105	$41,432	$8,932	1.27
AC	629	Chiller	Eff. Chiller&TES	RI	69	Elect.	Elect.	$22,750	-$6,546	$24,778	$3,445	$11,273	$32,950	$10,200	1.45
AC	673	Chiller	Eff. Chiller&TES	RI	73	Elect.	Elect.	$19,500	-$5,611	$21,238	$2,953	$9,663	$28,243	$8,743	1.45
AC	710	Chiller	Eff. Chiller&TES	RI	77	Elect.	Elect.	$22,750	-$6,546	$24,778	$3,445	$11,273	$32,950	$10,200	1.45
AC	722	Chiller	Eff. Chiller&TES	RI	78	Elect.	Elect.	$45,500	-$13,092	$49,556	$6,889	$22,547	$65,900	$20,400	1.45
AC	727	Chiller	Eff. Chiller&TES	RI	79	Elect.	Elect.	$39,000	-$17,989	$42,476	$5,905	$19,326	$49,719	$10,719	1.27
AC	732	Chiller	Eff. Chiller&TES	RI	80	Elect.	Elect.	$31,850	-$9,164	$34,689	$4,823	$15,783	$46,130	$14,280	1.45
AC	734	Chiller	Eff. Chiller&TES	RI	81	Elect.	Elect.	$20,150	-$9,294	$21,946	$3,051	$9,985	$25,688	$5,538	1.27
AC	738	Chiller	Eff. Chiller&TES	RI	84	Elect.	Elect.	$20,150	-$18,172	$21,946	$3,051	$9,985	$16,810	-$3,340	0.83
AC	750	Chiller	Eff. Chiller&TES	RI	85	Elect.	Elect.	$81,250	-$23,379	$88,492	$12,302	$40,262	$117,678	$36,428	1.45
AC	751	Chiller	Eff. Chiller&TES	RI	86	Elect.	Elect.	$42,250	-$12,157	$46,016	$6,397	$20,936	$61,193	$18,943	1.45
AC	800	Chiller	Eff. Chiller&TES	RI	87	Elect.	Elect.	$58,500	-$13,001	$67,629	$8,858	$28,989	$92,475	$33,975	1.58
AC	800	Chiller	Eff. Chiller&TES	RI	88	Elect.	Elect.	$117,000	-$33,665	$127,429	$17,715	$57,978	$169,456	$52,456	1.45
AC	810	Chiller	Eff. Chiller&TES	RI	89	Elect.	Elect.	$13,000	-$4,637	$15,029	$1,968	$6,442	$18,802	$5,802	1.45
AC	925	Chiller	Eff. Chiller&TES	RI	92	Elect.	Elect.	$357,500	-$99,923	$300,111	$54,131	$121,897	$376,216	$18,716	1.05
AC	929	Chiller	Eff. Chiller&TES	RI	94	Elect.	Elect.	$156,000	-$43,603	$130,958	$23,621	$53,192	$164,167	$8,167	1.05
AC	945	Chiller	Eff. Chiller&TES	RI	96	Elect.	Elect.	$39,000	-$11,222	$42,476	$5,905	$19,326	$56,485	$17,485	1.45
AC	946	Chiller	Eff. Chiller&TES	RI	97	Elect.	Elect.	$65,000	-$18,703	$70,794	$9,842	$32,210	$94,142	$29,142	1.45

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
AC	957	Chiller	Eff. Chiller&TES	RI	98	Elect.	Elect.	$13,000	-$4,637	$15,029	$1,968	$6,442	$18,802	$5,802	1.45
AC	965	Chiller	Eff. Chiller&TES	RI	100	Elect.	Elect.	$32,500	-$11,592	$37,572	$4,921	$16,105	$47,006	$14,506	1.45
AC	967	Chiller	Eff. Chiller&TES	RI	101	Elect.	Elect.	$13,000	-$2,889	$15,029	$1,968	$6,442	$20,550	$7,550	1.58
AC	967	Chiller	Eff. Chiller&TES	RI	102	Elect.	Elect.	$57,200	-$16,459	$62,298	$8,661	$28,345	$82,845	$25,645	1.45
AC	969	Chiller	Eff. Chiller&TES	RI	103	Elect.	Elect.	$20,800	-$9,594	$22,654	$3,149	$10,307	$26,517	$5,717	1.27
AC	984	Chiller	Eff. Chiller&TES	RI	104	Elect.	Elect.	$39,000	-$11,222	$42,476	$5,905	$19,326	$56,485	$17,485	1.45
AC	988	Chiller	Eff. Chiller&TES	RI	105	Elect.	Elect.	$130,000	-$36,336	$109,131	$19,684	$44,326	$136,806	$6,806	1.05
AC	989	Chiller	Eff. Chiller&TES	RI	106	Elect.	Elect.	$71,500	-$25,502	$82,658	$10,826	$35,431	$103,414	$31,914	1.45
AC	989	Chiller	Eff. Chiller&TES	RI	107	Elect.	Elect.	$344,500	-$158,901	$375,207	$52,162	$170,712	$439,180	$94,680	1.27
AC	989	Chiller	Eff. Chiller&TES	RI	108	Elect.	Elect.	$698,750	-$177,035	$598,272	$105,801	$238,254	$765,292	$66,542	1.10
AC	990	Chiller	Eff. Chiller&TES	RI	109	Elect.	Elect.	$19,500	-$6,955	$22,543	$2,953	$9,663	$28,204	$8,704	1.45
AC	990	Chiller	Eff. Chiller&TES	RI	110	Elect.	Elect.	$32,500	-$14,991	$35,397	$4,921	$16,105	$41,432	$8,932	1.27
AC	991	Chiller	Eff. Chiller&TES	RI	111	Elect.	Elect.	$15,600	-$5,564	$18,035	$2,362	$7,730	$22,563	$6,963	1.45
AC	992	Chiller	Eff. Chiller&TES	RI	113	Elect.	Elect.	$19,500	-$8,994	$21,238	$2,953	$9,663	$24,859	$5,359	1.27
AC	996	Chiller	Eff. Chiller&TES	RI	115	Elect.	Elect.	$26,000	-$11,992	$28,317	$3,937	$12,884	$33,146	$7,146	1.27
AC	998	Chiller	Eff. Chiller&TES	RI	117	Elect.	Elect.	$84,500	-$19,795	$68,004	$12,794	$28,812	$89,816	$5,316	1.06
AC	1316	Chiller	Eff. Chiller&TES	RI	118	Elect.	Elect.	$26,000	-$11,992	$28,317	$3,937	$12,884	$33,146	$7,146	1.27
AC	1353	Chiller	Eff. Chiller&TES	RI	119	Elect.	Elect.	$26,000	-$11,992	$28,317	$3,937	$12,884	$33,146	$7,146	1.27
AC	1364	Chiller	Eff. Chiller&TES	RI	122	Elect.	Elect.	$140,400	-$39,243	$117,862	$21,259	$47,872	$147,750	$7,350	1.05
AC	1365	Chiller	Eff. Chiller&TES	RI	123	Elect.	Elect.	$104,000	-$47,970	$113,270	$15,747	$51,536	$132,583	$28,583	1.27
AC	1369	Chiller	Eff. Chiller&TES	RI	124	Elect.	Elect.	$19,500	-$6,955	$22,543	$2,953	$9,663	$28,204	$8,704	1.45
AC	1380	Chiller	Eff. Chiller&TES	RI	125	Elect.	Elect.	$208,000	-$52,699	$178,090	$31,494	$70,922	$227,808	$19,808	1.10
AC	1492	Chiller	Eff. Chiller&TES	RI	129	Elect.	Elect.	$19,500	-$8,994	$21,238	$2,953	$9,663	$24,859	$5,359	1.27
AC	1493	Chiller	Eff. Chiller&TES	RI	130	Elect.	Elect.	$18,200	-$6,491	$21,040	$2,756	$9,019	$26,323	$8,123	1.45
AC	3655	Chiller	Eff. Chiller&TES	RI	132	Elect.	Elect.	$32,500	-$14,991	$35,397	$4,921	$16,105	$41,432	$8,932	1.27
AC	3656	Chiller	Eff. Chiller&TES	RI	133	Elect.	Elect.	$16,250	-$5,796	$18,786	$2,460	$8,052	$23,503	$7,253	1.45
AC	3659	Chiller	Eff. Chiller&TES	RI	135	Elect.	Elect.	$65,000	-$20,832	$68,619	$9,842	$22,163	$79,792	$14,792	1.23
AC	501	Chiller	Gas Chiller/Cogen.	RI	40	Elect.	NG	$51,000	-$30,108	$46,261	-$24,370	$22,515	$14,298	-$36,702	0.28
AC	502	Chiller	Gas Chiller/Cogen.	RI	41	Elect.	NG	$51,000	-$30,108	$46,261	-$24,370	$22,515	$14,298	-$36,702	0.28
AC	503	Chiller	Gas Chiller/Cogen.	RI	42	Elect.	NG	$51,000	-$30,108	$46,261	-$24,370	$22,515	$14,298	-$36,702	0.28
AC	504/505/506	Chiller	Gas Chiller/Cogen.	RI	43	Elect.	NG	$233,750	-$189,697	$150,056	-$111,698	$75,568	-$75,772	-$309,522	-0.32
AC	989	Chiller	Gas Chiller/Cogen.	RI	108	Elect.	NG	$913,750	-$255,346	$598,272	-$436,637	$295,400	$201,690	-$712,060	0.22
AC	1364	Chiller	Gas Chiller/Cogen.	RI	122	Elect.	NG	$183,600	$192,108	$117,862	-$87,734	$59,355	$281,591	$97,991	1.53
Boilers	Multiple	Steam Boilers	Tune-up 18	RI	1	NG,F.Oil	NG,F.Oil	$9,500	$31,206	$0	-$7,811	-$4,630	$18,764	$9,264	1.98
Boilers	Multiple	Hot-Water Boilers	Tune-up 32	RI	2	NG,F.Oil	NG,F.Oil	$13,000	$18,470	$0	-$7,811	-$4,630	$6,028	-$6,972	0.46
Boilers	Multiple	All Boilers	Tune-up 50	RI	3	NG,F.Oil	NG,F.Oil	$17,500	$49,675	$0	-$7,811	-$4,630	$37,234	$19,734	2.13
Boilers	430	Hot-Water Boilers	Pulse Boilers	RI	5a	F.Oil	NG	$14,296	$3,385	$0	$0	$2,385	$5,769	-$8,527	0.40
Boilers	440	Hot-Water Boilers	Pulse Boilers	RI	5b	F.Oil	NG	$11,080	$2,621	$0	$0	$2,031	$4,653	-$6,427	0.42
Boilers	629	Hot-Water Boilers	Pulse Boilers	RI	5c	F.Oil	NG	$6,934	$1,639	$0	$0	$819	$2,458	-$4,475	0.35
Boilers	632	Hot-Water Boilers	Pulse Boilers	RI	5d	F.Oil	NG	$20,015	$4,736	$0	$0	$7,184	$11,920	-$8,095	0.60
Boilers	650	Hot-Water Boilers	Pulse Boilers	RI	5e	F.Oil	NG	$6,219	$1,470	$0	$0	$1,140	$2,610	-$3,608	0.42
Boilers	672	Hot-Water Boilers	Pulse Boilers	RI	5f	F.Oil	NG	$16,941	$4,010	$0	$0	$3,409	$7,419	-$9,522	0.44
Boilers	673	Hot-Water Boilers	Pulse Boilers	RI	5g	F.Oil	NG	$6,362	$1,508	$0	$0	$1,607	$3,115	-$3,247	0.49
Boilers	681	Hot-Water Boilers	Pulse Boilers	RI	5h	F.Oil	NG	$2,144	$507	$0	$0	$432	$938	-$1,206	0.44
Boilers	691	Hot-Water Boilers	Pulse Boilers	RI	5i	F.Oil	NG	$7,720	$1,827	$0	$0	$912	$2,739	-$4,981	0.35
Boilers	703	Hot-Water Boilers	Pulse Boilers	RI	5j	F.Oil	NG	$3,145	$745	$0	$0	$633	$1,377	-$1,768	0.44
Boilers	810	Hot-Water Boilers	Pulse Boilers	RI	5k	F.Oil	NG	$7,148	$1,689	$0	$0	$889	$2,578	-$4,570	0.36
Boilers	925	Hot-Water Boilers	Pulse Boilers	RI	5l	NG	NG	$65,763	$10,600	$0	$0	$24,643	$35,243	-$30,520	0.54
Boilers	945	Hot-Water Boilers	Pulse Boilers	RI	5m	NG	NG	$21,445	$3,457	$0	$0	$4,315	$7,773	-$13,672	0.36
Boilers	957	Hot-Water Boilers	Pulse Boilers	RI	5n	F.Oil	NG	$5,576	$1,320	$0	$0	$1,682	$3,002	-$2,574	0.54
Boilers	984	Hot-Water Boilers	Pulse Boilers	RI	5o	F.Oil	NG	$28,593	$6,763	$0	$0	$7,896	$14,659	-$13,934	0.51
Boilers	988	Hot-Water Boilers	Pulse Boilers	RI	5p	NG	NG	$9,650	$1,556	$0	$0	$1,610	$3,165	-$6,485	0.33
Boilers	989	Hot-Water Boilers	Pulse Boilers	RI	5q	NG	NG	$228,742	$112,474	$0	$0	$33,009	$145,483	-$83,260	0.64
Boilers	990	Hot-Water Boilers	Pulse Boilers	RI	5r	F.Oil	NG	$4,932	$1,170	$0	$0	$2,287	$3,457	-$1,475	0.70
Boilers	992	Hot-Water Boilers	Pulse Boilers	RI	5s	F.Oil	NG	$6,004	$1,420	$0	$0	$1,324	$2,745	-$3,260	0.46
Boilers	998	Hot-Water Boilers	Pulse Boilers	RI	5t	NG	NG	$28,593	$1,347	$0	$0	$3,928	$5,275	-$23,317	0.18
Boilers	1316	Hot-Water Boilers	Pulse Boilers	RI	5u	F.Oil	NG	$17,870	$4,229	$0	$0	$4,316	$8,545	-$9,325	0.48
Boilers	1364	Hot-Water Boilers	Pulse Boilers	RI	5v	NG,F.Oil	NG	$36,456	$10,247	$0	$0	$5,524	$15,771	-$20,685	0.43
Boilers	1492	Hot-Water Boilers	Pulse Boilers	RI	5w	F.Oil	NG	$5,004	$1,182	$0	$0	$2,224	$3,406	-$1,597	0.68
Boilers	1497	Hot-Water Boilers	Pulse Boilers	RI	5x	F.Oil	NG	$6,219	$1,470	$0	$0	$1,140	$2,610	-$3,608	0.42
Boilers	3695	Hot-Water Boilers	Pulse Boilers	RI	5y	F.Oil	NG	$7,148	$1,689	$0	$0	$889	$2,578	-$4,570	0.36
Controls	ADMIN	E-1	EMCS(exist. chill.)	RI	1	Elect.	Elect.	$13,200	$75,447	NA (a)	$0	-$1,973	$73,473	$60,273	5.57
Controls	COMCATN	E-2	EMCS(exist. chill.)	RI	2	Elect.	Elect.	$24,200	$109,608	NA	$0	-$3,618	$105,990	$81,790	4.38
Controls	DGR	E-3	EMCS(exist. chill.)	RI	3	Elect.	Elect.	$4,400	$32,711	NA	$0	-$658	$32,053	$27,653	7.28
Controls	MISC	E-4	EMCS(exist. chill.)	RI	4	Elect.	Elect.	$2,200	$7,428	NA	$0	-$329	$7,099	$4,899	3.23
Controls	PLT-BLD	E-5	EMCS(exist. chill.)	RI	5	Elect.	Elect.	$6,600	$2,595	NA	$0	-$987	$1,609	-$4,991	0.24
Controls	R&D	E-6	EMCS(exist. chill.)	RI	6	Elect.	Elect.	$8,800	$119,184	NA	$0	-$1,316	$117,869	$109,069	13.39
Controls	REC	E-7	EMCS(exist. chill.)	RI	7	Elect.	Elect.	$6,600	$21,654	NA	$0	-$987	$20,668	$14,068	3.13

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Controls	SHOP-ELC	E-8	EMCS(exist. chill)	RI	8	Elect.	Elect.	$2,200	$9,349	NA	$0	-$329	$9,020	$6,820	4.10
Controls	WHS	E-9	EMCS(exist. chill)	RI	9	Elect.	Elect.	$6,600	$8,758	NA	$0	-$987	$7,771	$1,171	1.18
Dishwasher	Fam. Hsg	DW-1	Eff. Dshwshr	RI	1	Elect.	Elect.	$677,880	$68,690	NA	$0	$305,812	$374,502	-$303,378	0.55
Envelope	989	Heating/Cooling	Ceiling Insulation	RI	1a	Elect.	Elect.	$14,850	$8,952	NA	$0	$0	$8,952	-$5,898	0.60
Envelope	Wherry	Heating/Cooling	Ceiling Insulation	RI	1b	Elect.	Elect.	$416,680	$1,945,937	NA	$0	$0	$1,945,937	$1,529,257	4.67
Envelope	TLF	Heating/Cooling	Refl. Window Trtmnt	RI	2a	Elect.	Elect.	$166,002	$395,584	NA	$0	$0	$395,584	$229,582	2.38
Envelope	FAM HSG	Heating/Cooling	Refl. Window Trtmnt	RI	2b	Elect.	Elect.	$448,892	$2,068,113	NA	$0	$0	$2,068,113	$1,619,221	4.61
Envelope	ADMIN	Heating/Cooling	Multi-Glazed Windows	RI	3a	Elect.	Elect.	$623,596	$312,940	NA	$0	$0	$312,940	-$310,656	0.50
Envelope	BRK/ADM	Heating/Cooling	Multi-Glazed Windows	RI	3b	Elect.	Elect.	$374,463	$234,897	NA	$0	$0	$234,897	-$139,566	0.63
Envelope	HOTEL	Heating/Cooling	Multi-Glazed Windows	RI	3c	Elect.	Elect.	$166,002	$104,131	NA	$0	$0	$104,131	-$61,871	0.63
Envelope	FAM HSG	Heating/Cooling	Multi-Glazed Windows	RI	3d	Elect.	Elect.	$448,892	$544,397	NA	$0	$0	$544,397	$95,505	1.21
Envelope	TRAING	Heating/Cooling	Multi-Glazed Windows	RI	3e	Elect.	Elect.	$130,190	$89,322	NA	$0	$0	$89,322	-$40,868	0.69
Envelope	ADMIN	Heating/Cooling	Weath. Package	RI	4a	Elect.	Elect.	$99,440	$243,189	NA	$0	$0	$243,189	$143,750	2.45
Envelope	BRK/ADM	Heating/Cooling	Weath. Package	RI	4b	Elect.	Elect.	$35,857	$102,142	NA	$0	$0	$102,142	$66,285	2.85
Envelope	CLUB	Heating/Cooling	Weath. Package	RI	4c	Elect.	Elect.	$2,573	$20,468	NA	$0	$0	$20,468	$17,895	7.96
Envelope	TRAING	Heating/Cooling	Weath. Package	RI	4d	Elect.	Elect.	$4,334	$7,402	NA	$0	$0	$7,402	$3,068	1.71
Envelope	FAM HSG	Heating/Cooling	Weath. Package	RI	4e	Elect.	Elect.	$213,156	$339,338	NA	$0	$0	$339,338	$126,182	1.59
Envelope	Wherry	Heating/Cooling	Radiant Barriers	RI	5	Elect.	Elect.	$717,380	$196,793	NA	$0	$0	$196,793	-$520,587	0.27
Fuel-Switch	Family Housing	W.Htrs,Stoves,Dryers	Eff. NG Replacements	RI	1	Elect.	NG	$2,606,300	$161,576	NA	$0	$360,308	$521,886	-$2,084,414	0.20
Fuel-Switch	Family Housing	W.Htrs,Stoves,Dryers	Std. NG Replacements	RI	2	Elect.	NG	$1,945,000	-$47,392	NA	$0	$733,581	$686,189	-$1,258,811	0.35
HVAC	Family Housing	Air Source Ht. Pump	Gmd-Cpld Ht. Pump	RI	1	Elect.	Elect.	$2,411,800	$292,570	NA	$0	$1,152,761	$1,445,331	-$966,469	0.60
HVAC	Family Housing	Air Source Ht. Pump	Gmd-Cpld Ht. Pump	ROF	1	Elect.	Elect.	$1,629,326	$143,938	NA	$0	$2,782,086	$2,926,025	$1,296,699	1.80
Lighting	3	1F40 STD	None	RI	1	Elect.	Elect.	$0	$0	$0	$0	$0	$0	$0	(b)
Lighting	1	1F40ES STD	1F32T8 ELC	RI	1	Elect.	Elect.	$1,187	$1,169	$426	$426	$0	$2,021	$835	1.70
Lighting	2	1F40ES STD	1F32T8 ELC	RI	1	Elect.	Elect.	$50,908	$32,128	$18,289	$19,970	$0	$70,388	$19,480	1.38
Lighting	4	2F40ES STD	2F32T8 ELC	RI	1	Elect.	Elect.	$15,251	$8,772	$3,656	$7,649	$0	$20,077	$4,826	1.32
Lighting	5	INC 3-60	None	RI	1	Elect.	Elect.	$0	$0	$0	$0	$0	$0	$0	(b)
Lighting	2	EXIT 2xPL9	LED	RI	10	Elect.	Elect.	$55,088	$33,168	$8,392	$137,547	$0	$179,107	$124,019	3.25
Lighting	3	INC 2x60 ceil	CFL 2-11 CEIL FIXT	RI	10	Elect.	Elect.	$192,685	$1,544,463	$319,737	$521,510	$0	$2,385,709	$2,193,024	12.38
Lighting	2	EXIT INC (2x15)	LED	RI	11	Elect.	Elect.	$4,872	$4,314	$1,091	$21,447	$0	$26,853	$21,981	5.51
Lighting	3	INC 50 MR spot	None	RI	11	Elect.	Elect.	$0	$0	$0	$0	$0	$0	$0	(b)
Lighting	2	EXIT INC (2x20)	LED	RI	12	Elect.	Elect.	$6,969	$8,638	$2,186	$8,712	$0	$19,536	$12,568	2.80
Lighting	3	INC 75 Ceil	CFL 2-9 + BLST	RI	12	Elect.	Elect.	$133,192	$672,749	$139,273	-$6,442	$0	$805,580	$672,388	6.05
Lighting	2	INC 2x60 Ceil	CFL 2-11 CEIL FIXT	RI	13	Elect.	Elect.	$1,693	$14,809	$2,810	$4,970	$0	$22,589	$20,895	13.34
Lighting	2	INC 2x75 lamp	None	RI	14	Elect.	Elect.	$0	$0	$0	$0	$0	$0	$0	(b)
Lighting	2	INC 60 Ceil	CFL 11 CEIL FIXT	RI	15	Elect.	Elect.	$26,350	$117,020	$26,523	$48,706	$0	$192,249	$165,899	7.30
Lighting	2	INC 75 Ceil	CFL 2-9 + BLST	RI	16	Elect.	Elect.	$3,069	$14,158	$3,209	-$69	$0	$17,298	$14,230	5.64
Lighting	2	INC 75 spot	None	RI	17	Elect.	Elect.	$0	$0	$0	$0	$0	$0	$0	(b)
Lighting	[illegible]	1F40 STD	1F32T8 ELC REF	RI	2	Elect.	Elect.	$85,271	$76,280	$17,289	$9,193	$0	$102,762	$17,491	1.21
Lighting	4	2F40 STD	None	RI	2	Elect.	Elect.	$0	$0	$0	$0	$0	$0	$0	(b)
Lighting	5	INC 2-60	CFL 2-15 CEIL	RI	2	Elect.	Elect.	$173,899	$438,100	$223,084	$242,107	$0	$903,291	$729,393	5.19
Lighting	3	2F40 STD	2F40ES ELC REF	RI	2a	Elect.	Elect.	$168,781	$236,671	$51,677	$45,048	$0	$333,396	$164,615	1.98
Lighting	1	2F40ES STD	2F32T8 ELC	RI	2a	Elect.	Elect.	$72,340	$49,073	$17,342	$37,144	$0	$103,560	$31,220	1.43
Lighting	3	2F40 STD	2F40ES ELC REF	RI	2b	Elect.	Elect.	$6,453	$9,049	$1,976	$1,722	$0	$12,747	$6,294	1.98
Lighting	3	2F40 STD	SENS	RI	2b	Elect.	Elect.	$952	$6,334	$1,383	$3,351	$0	$11,068	$10,116	11.63
Lighting	3	2F40 STD	2F40ES ELC REF SENS	RI	2b	Elect.	Elect.	$7,405	$13,121	$2,865	$3,351	$0	$19,337	$11,932	2.61
Lighting	1	2F40ES STD	SENS	RI	2b	Elect.	Elect.	$11,968	$40,013	$14,140	$32,360	$0	$86,513	$74,545	7.23
Lighting	1	2F40ES STD	2F32T8 ELC	RI	2b	Elect.	Elect.	$41,812	$28,364	$10,023	$21,469	$0	$59,856	$18,045	1.43
Lighting	1	2F40ES STD	2F32T8 ELC SENS	RI	2b	Elect.	Elect.	$53,780	$61,286	$21,658	$32,360	$0	$115,304	$61,524	2.14
Lighting	1	2F40 STD	None	RI	3	Elect.	Elect.	$0	$0	$0	$0	$0	$0	$0	(b)
Lighting	3	2F96 STD	2F96ES ELC REF	RI	3	Elect.	Elect.	$313,746	$256,688	$134,029	$54,745	$0	$445,463	$131,717	1.42
Lighting	4	3F40ES STD	2F40ES ELC REF	RI	3	Elect.	Elect.	$31,091	$22,934	$17,407	$9,911	$0	$50,251	$19,160	1.62
Lighting	5	INC 1-60	CFL 15 CEIL	RI	3	Elect.	Elect.	$73,319	$207,959	$55,771	$61,499	$0	$325,229	$251,910	4.44
Lighting	2	2F40ES STD	2F32T8 ELC	RI	3a	Elect.	Elect.	$70,630	$81,162	$16,932	$37,953	$0	$136,047	$65,417	1.93
Lighting	2	2F40ES STD	SENS	RI	3b	Elect.	Elect.	$7,208	$40,803	$8,512	$27,596	$0	$76,912	$69,704	10.67
Lighting	2	2F40ES STD	2F32T8 ELC	RI	3b	Elect.	Elect.	$25,171	$28,924	$6,034	$13,526	$0	$48,484	$23,313	1.93
Lighting	2	2F40ES STD	2F32T8 ELC SENS	RI	3b	Elect.	Elect.	$32,379	$62,496	$13,038	$27,596	$0	$103,130	$70,751	3.19
Lighting	2	2F40 STD	2F40ES ELC REF	RI	4	Elect.	Elect.	$8,464	$4,553	$2,592	$2,027	$0	$9,171	$707	1.08
Lighting	4	4F40ES STD	3F40ES ELC REF	RI	4	Elect.	Elect.	$14,040	$12,750	$6,199	$5,184	$0	$24,133	$10,093	1.72
Lighting	1	4F40ES STD	3F40ES ELC REF	RI	4	Elect.	Elect.	$34,655	$46,694	$15,301	$15,130	$0	$77,125	$42,470	2.23
Lighting	3	3F40 STD	2F40 STD REF	RI	4a	Elect.	Elect.	$1,559	$1,599	$1,141	$361	$0	$3,101	$1,543	1.99
Lighting	3	3F40 STD	SENS	RI	4b	Elect.	Elect.	$27,744	$1,200	$856	$576	$0	$2,632	-$25,112	0.09
Lighting	3	3F40 STD	2F40 STD REF SENS	RI	4b	Elect.	Elect.	$29,303	$2,400	$1,712	$576	$0	$4,688	-$24,615	0.16
Lighting	3	3F40 STD	2F40 STD REF	RI	4b	Elect.	Elect.	$1,559	$1,600	$1,142	$361	$0	$3,103	$1,544	1.99
Lighting	2	2F96 STD	2F96ES ELC REF	RI	5	Elect.	Elect.	$9,970	$8,175	$4,259	$1,750	$0	$14,184	$4,214	1.42
Lighting	3	4F40ES STD	3F40ES ELC REF	RI	5	Elect.	Elect.	$71,370	$60,348	$31,511	$25,580	$0	$117,438	$46,068	1.65
Lighting	4	6F40 STD	None	RI	5	Elect.	Elect.	$0	$0	$0	$0	$0	$0	$0	(b)
Lighting	1	3F40ES STD	2F40ES ELC REF	RI	5a	Elect.	Elect.	$608,955	$905,958	$340,938	$345,493	$0	$1,592,390	$983,435	2.61

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Lighting	1	3F40ES STD	2F40ES ELC REF SENS	RI	5b	Elect.	Elect.	$460,312	$744,557	$280,199	$276,869	$0	$1,301,624	$841,312	2.83
Lighting	1	3F40ES STD	SENS	RI	5b	Elect.	Elect.	$58,684	$296,422	$111,552	$276,869	$0	$684,844	$626,160	11.67
Lighting	1	3F40ES STD	2F40ES ELC REF	RI	5b	Elect.	Elect.	$401,628	$597,513	$224,862	$227,866	$0	$1,050,240	$648,612	2.61
Lighting	2	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	$9,990	$27,017	$6,124	$3,429	$0	$36,570	$26,580	3.66
Lighting	1	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	$126,567	$288,098	$77,583	$42,490	$0	$408,171	$281,604	3.22
Lighting	3	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	$1,204	$1,034	$738	$327	$0	$2,100	$896	1.74
Lighting	1	6F40 STD	None	RI	7	Elect.	Elect.	$0	$0	$0	$0	$0	$0	$0	(b)
Lighting	3	EXIT INC(2x20)	LED	RI	7	Elect.	Elect.	$3,604	$4,466	$1,130	$4,506	$0	$10,104	$6,500	2.80
Lighting	2	3F40ES STD	2F40ES ELC REF	RI	7a	Elect.	Elect.	$19,451	$57,368	$10,890	$18,986	$0	$87,243	$67,793	4.49
Lighting	2	3F40ES STD	2F40ES ELC REF SENS	RI	7b	Elect.	Elect.	$13,479	$43,293	$8,218	$15,194	$0	$66,705	$53,225	4.95
Lighting	2	3F40ES STD	2F40ES ELC REF	RI	7b	Elect.	Elect.	$11,779	$34,743	$6,595	$11,498	$0	$52,836	$41,056	4.49
Lighting	2	3F40ES STD	SENS	RI	7b	Elect.	Elect.	$1,700	$17,236	$3,272	$15,194	$0	$35,702	$34,002	21.00
Lighting	1	EXIT INC(2x15)	LED	RI	8	Elect.	Elect.	$72,799	$64,458	$16,308	$320,461	$0	$401,227	$328,429	5.51
Lighting	3	INC 100 Ceil	CFL 2-11 CEIL FIXT	RI	8	Elect.	Elect.	$3,537	$6,400	$4,565	$352	$0	$11,318	$7,781	3.20
Lighting	2	4F40ES STD	3F40ES ELC REF	RI	8a	Elect.	Elect.	$417,010	$383,518	$184,115	$154,476	$0	$722,109	$305,099	1.73
Lighting	2	4F40ES STD	SENS	RI	8b	Elect.	Elect.	$1,292	$6,414	$3,079	$5,301	$0	$14,794	$13,502	11.45
Lighting	2	4F40ES STD	3F40ES ELC REF SENS	RI	8b	Elect.	Elect.	$12,592	$14,209	$6,821	$5,301	$0	$26,331	$13,738	2.09
Lighting	2	4F40ES STD	3F40ES ELC REF	RI	8b	Elect.	Elect.	$11,300	$10,393	$4,989	$4,186	$0	$19,568	$8,268	1.73
Lighting	2	4F40 STD	3F32T8 ELC REF	RI	9	Elect.	Elect.	$74,937	$240,094	$45,935	$26,533	$0	$312,561	$237,624	4.17
Lighting	3	INC 150	None	RI	9	Elect.	Elect.	$0	$0	$0	$0	$0	$0	$0	(b)
Lighting	1	INC 75 Can	CFL 20 + BLST	RI	9	Elect.	Elect.	$53,331	$156,297	$58,710	$44,781	$0	$259,788	$206,458	4.87
Motors	ADMIN	Fan Motor	Eff. Motor	RI	1a	Elect.	Elect.	$122,024	$157,936	$46,000	$0	$32,410	$236,345	$114,371	1.94
Motors	BRK/ADM	Fan Motor	Eff. Motor	RI	2a	Elect.	Elect.	$31,771	$41,122	$11,977	$0	$8,438	$61,536	$29,765	1.94
Motors	CHAPEL	Fan Motor	Eff. Motor	RI	3a	Elect.	Elect.	$1,632	$2,113	$615	$0	$433	$3,162	$1,530	1.94
Motors	CLINIC	Fan Motor	Eff. Motor	RI	4a	Elect.	Elect.	$944	$1,222	$356	$0	$251	$1,829	$885	1.94
Motors	CLUB	Fan Motor	Eff. Motor	RI	5a	Elect.	Elect.	$2,037	$2,662	$775	$0	$538	$3,975	$1,938	1.95
Motors	COMCATN	Fan Motor	Eff. Motor	RI	6a	Elect.	Elect.	$11,468	$14,844	$4,323	$0	$3,046	$22,213	$10,745	1.94
Motors	DGR	Fan Motor	Eff. Motor	RI	7a	Elect.	Elect.	$20,660	$26,741	$7,788	$0	$5,487	$40,017	$19,357	1.94
Motors	DINING	Fan Motor	Eff. Motor	RI	8a	Elect.	Elect.	$11,328	$14,661	$4,270	$0	$3,009	$21,940	$10,612	1.94
Motors	GROCERY	Fan Motor	Eff. Motor	RI	9a	Elect.	Elect.	$11,637	$15,063	$4,387	$0	$3,091	$22,540	$10,903	1.94
Motors	HANGER	Fan Motor	Eff. Motor	RI	10a	Elect.	Elect.	$15,972	$20,672	$6,021	$0	$4,242	$30,935	$14,963	1.94
Motors	HOSPITL	Fan Motor	Eff. Motor	RI	11a	Elect.	Elect.	$10,165	$13,157	$3,832	$0	$2,700	$19,689	$9,524	1.94
Motors	HSG-FAM	Fan Motor	Eff. Motor	RI	12a	Elect.	Elect.	$1,703	$2,204	$642	$0	$452	$3,298	$1,595	1.94
Motors	MISC	Fan Motor	Eff. Motor	RI	13a	Elect.	Elect.	$581	$752	$219	$0	$154	$1,125	$544	1.94
Motors	MTRPOOL	Fan Motor	Eff. Motor	RI	14a	Elect.	Elect.	$7,085	$9,170	$2,671	$0	$1,882	$13,723	$6,638	1.94
Motors	MWR	Fan Motor	Eff. Motor	RI	15a	Elect.	Elect.	$15,869	$20,539	$5,982	$0	$4,214	$30,736	$14,867	1.94
Motors	PLT-BLD	Fan Motor	Eff. Motor	RI	16a	Elect.	Elect.	$638	$827	$241	$0	$169	$1,237	$599	1.94
Motors	R&D	Fan Motor	Eff. Motor	RI	17a	Elect.	Elect.	$7,592	$9,826	$2,862	$0	$2,017	$14,704	$7,112	1.94
Motors	REC	Fan Motor	Eff. Motor	RI	18a	Elect.	Elect.	$5,940	$7,689	$2,239	$0	$1,577	$11,505	$5,565	1.94
Motors	RESTRNT	Fan Motor	Eff. Motor	RI	19a	Elect.	Elect.	$450	$582	$170	$0	$120	$872	$422	1.94
Motors	SECURITY	Fan Motor	Eff. Motor	RI	20a	Elect.	Elect.	$5,317	$6,880	$2,004	$0	$1,413	$10,297	$4,980	1.94
Motors	SHOP	Fan Motor	Eff. Motor	RI	21a	Elect.	Elect.	$4,665	$6,037	$1,758	$0	$1,239	$9,035	$4,370	1.94
Motors	SHOP-ELEC	Fan Motor	Eff. Motor	RI	22a	Elect.	Elect.	$23,090	$29,885	$8,704	$0	$6,133	$44,722	$21,632	1.94
Motors	STOR-UH	Fan Motor	Eff. Motor	RI	23a	Elect.	Elect.	$5,836	$7,555	$2,200	$0	$1,549	$11,304	$5,468	1.94
Motors	TERMINL	Fan Motor	Eff. Motor	RI	24a	Elect.	Elect.	$11,962	$15,483	$4,510	$0	$3,177	$23,170	$11,208	1.94
Motors	TRAING	Fan Motor	Eff. Motor	RI	25a	Elect.	Elect.	$5,407	$6,999	$2,038	$0	$1,436	$10,473	$5,066	1.94
Motors	WHS	Fan Motor	Eff. Motor	RI	26a	Elect.	Elect.	$43,405	$56,179	$16,363	$0	$11,528	$84,070	$40,665	1.94
Motors	ADMIN	Fan Motor	Eff. Motor	ROF	1b	Elect.	Elect.	$92,728	$98,746	$28,761	$0	$68,986	$196,493	$103,765	2.12
Motors	BRK/ADM	Fan Motor	Eff. Motor	ROF	2b	Elect.	Elect.	$24,143	$25,710	$7,488	$0	$17,961	$51,160	$27,017	2.12
Motors	CHAPEL	Fan Motor	Eff. Motor	ROF	3b	Elect.	Elect.	$1,240	$1,321	$385	$0	$923	$2,628	$1,388	2.12
Motors	CLINIC	Fan Motor	Eff. Motor	ROF	4b	Elect.	Elect.	$717	$764	$223	$0	$534	$1,520	$803	2.12
Motors	CLUB	Fan Motor	Eff. Motor	ROF	5b	Elect.	Elect.	$1,548	$1,664	$485	$0	$1,148	$3,297	$1,749	2.13
Motors	COMCATN	Fan Motor	Eff. Motor	ROF	6b	Elect.	Elect.	$8,715	$9,281	$2,703	$0	$6,483	$18,467	$9,753	2.12
Motors	DGR	Fan Motor	Eff. Motor	ROF	7b	Elect.	Elect.	$15,700	$16,719	$4,870	$0	$11,680	$33,269	$17,569	2.12
Motors	DINING	Fan Motor	Eff. Motor	ROF	8b	Elect.	Elect.	$8,608	$9,167	$2,670	$0	$6,405	$18,241	$9,633	2.12
Motors	GROCERY	Fan Motor	Eff. Motor	ROF	9b	Elect.	Elect.	$8,843	$9,418	$2,743	$0	$6,579	$18,739	$9,896	2.12
Motors	HANGER	Fan Motor	Eff. Motor	ROF	10b	Elect.	Elect.	$12,137	$12,925	$3,764	$0	$9,029	$25,719	$13,582	2.12
Motors	HOSPITL	Fan Motor	Eff. Motor	ROF	11b	Elect.	Elect.	$7,725	$8,226	$2,396	$0	$5,747	$16,369	$8,644	2.12
Motors	HSG-FAM	Fan Motor	Eff. Motor	ROF	12b	Elect.	Elect.	$1,294	$1,378	$401	$0	$963	$2,742	$1,448	2.12
Motors	MISC	Fan Motor	Eff. Motor	ROF	13b	Elect.	Elect.	$442	$470	$137	$0	$328	$935	$494	2.12
Motors	MTRPOOL	Fan Motor	Eff. Motor	ROF	14b	Elect.	Elect.	$5,384	$5,733	$1,670	$0	$4,006	$11,409	$6,025	2.12
Motors	MWR	Fan Motor	Eff. Motor	ROF	15b	Elect.	Elect.	$12,059	$12,842	$3,740	$0	$8,971	$25,553	$13,494	2.12
Motors	PLT-BLD	Fan Motor	Eff. Motor	ROF	16b	Elect.	Elect.	$485	$517	$151	$0	$360	$1,028	$543	2.12
Motors	R&D	Fan Motor	Eff. Motor	ROF	17b	Elect.	Elect.	$5,769	$6,143	$1,789	$0	$4,292	$12,225	$6,456	2.12
Motors	REC	Fan Motor	Eff. Motor	ROF	18b	Elect.	Elect.	$4,514	$4,807	$1,400	$0	$3,358	$9,565	$5,051	2.12
Motors	RESTRNT	Fan Motor	Eff. Motor	ROF	19b	Elect.	Elect.	$342	$364	$106	$0	$255	$725	$383	2.12
Motors	SECURITY	Fan Motor	Eff. Motor	ROF	20b	Elect.	Elect.	$4,040	$4,302	$1,253	$0	$3,007	$8,561	$4,521	2.12
Motors	SHOP	Fan Motor	Eff. Motor	ROF	21b	Elect.	Elect.	$3,545	$3,775	$1,099	$0	$2,637	$7,512	$3,967	2.12

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Motors	SHOP-ELEC	Fan Motor	Eff. Motor	ROF	22b	Elect.	Elect.	$17,547	$18,685	$5,442	$0	$13,054	$37,181	$19,635	2.12
Motors	STOR-UH	Fan Motor	Eff. Motor	ROF	23b	Elect.	Elect.	$4,435	$4,723	$1,376	$0	$3,299	$9,398	$4,963	2.12
Motors	TERMINL	Fan Motor	Eff. Motor	ROF	24b	Elect.	Elect.	$9,090	$9,681	$2,820	$0	$6,763	$19,263	$10,173	2.12
Motors	TRAING	Fan Motor	Eff. Motor	ROF	25b	Elect.	Elect.	$4,109	$4,376	$1,275	$0	$3,057	$8,707	$4,598	2.12
Motors	WHS	Fan Motor	Eff. Motor	ROF	26b	Elect.	Elect.	$32,984	$35,125	$10,230	$0	$24,539	$69,894	$36,910	2.12
Motors	ADMIN	Chilled Water Pump	Eff. Motor	RI	27a	Elect.	Elect.	$36,979	$46,299	NA	$0	$9,821	$56,120	$19,141	1.52
Motors	BRK/ADM	Chilled Water Pump	Eff. Motor	RI	28a	Elect.	Elect.	$8,564	$10,722	NA	$0	$2,274	$12,997	$4,433	1.52
Motors	CHAPEL	Chilled Water Pump	Eff. Motor	RI	29a	Elect.	Elect.	$1,125	$1,409	NA	$0	$299	$1,708	$583	1.52
Motors	CLINIC	Chilled Water Pump	Eff. Motor	RI	30a	Elect.	Elect.	$450	$563	NA	$0	$120	$683	$233	1.52
Motors	CLUB	Chilled Water Pump	Eff. Motor	RI	31a	Elect.	Elect.	$338	$422	NA	$0	$90	$512	$174	1.51
Motors	COMCATN	Chilled Water Pump	Eff. Motor	RI	32a	Elect.	Elect.	$788	$986	NA	$0	$209	$1,196	$408	1.52
Motors	DGR	Chilled Water Pump	Eff. Motor	RI	33a	Elect.	Elect.	$4,794	$6,003	NA	$0	$1,273	$7,276	$2,482	1.52
Motors	DINING	Chilled Water Pump	Eff. Motor	RI	34a	Elect.	Elect.	$3,523	$4,410	NA	$0	$936	$5,346	$1,823	1.52
Motors	GROCERY	Chilled Water Pump	Eff. Motor	RI	35a	Elect.	Elect.	$1,801	$2,255	NA	$0	$478	$2,733	$932	1.52
Motors	HANGER	Chilled Water Pump	Eff. Motor	RI	36a	Elect.	Elect.	$2,139	$2,677	NA	$0	$568	$3,246	$1,107	1.52
Motors	HOSPITL	Chilled Water Pump	Eff. Motor	RI	37a	Elect.	Elect.	$3,601	$4,508	NA	$0	$956	$5,464	$1,863	1.52
Motors	MISC	Chilled Water Pump	Eff. Motor	RI	38a	Elect.	Elect.	$450	$563	NA	$0	$120	$683	$233	1.52
Motors	MWR	Chilled Water Pump	Eff. Motor	RI	39a	Elect.	Elect.	$4,726	$5,917	NA	$0	$1,255	$7,172	$2,446	1.52
Motors	PLT-BLD	Chilled Water Pump	Eff. Motor	RI	40a	Elect.	Elect.	$8,891	$11,131	NA	$0	$2,362	$13,493	$4,602	1.52
Motors	R&D	Chilled Water Pump	Eff. Motor	RI	41a	Elect.	Elect.	$2,611	$3,269	NA	$0	$694	$3,963	$1,352	1.52
Motors	REC	Chilled Water Pump	Eff. Motor	RI	42a	Elect.	Elect.	$551	$690	NA	$0	$146	$837	$286	1.52
Motors	SECURITY	Chilled Water Pump	Eff. Motor	RI	43a	Elect.	Elect.	$844	$1,057	NA	$0	$224	$1,281	$437	1.52
Motors	SHOP-ELEC	Chilled Water Pump	Eff. Motor	RI	44a	Elect.	Elect.	$2,295	$2,874	NA	$0	$610	$3,484	$1,189	1.52
Motors	STOR-UH	Chilled Water Pump	Eff. Motor	RI	45a	Elect.	Elect.	$394	$493	NA	$0	$104	$597	$203	1.52
Motors	TERMINL	Chilled Water Pump	Eff. Motor	RI	46a	Elect.	Elect.	$2,026	$2,536	NA	$0	$538	$3,074	$1,048	1.52
Motors	TRAING	Chilled Water Pump	Eff. Motor	RI	47a	Elect.	Elect.	$2,026	$2,536	NA	$0	$538	$3,074	$1,048	1.52
Motors	WHS	Chilled Water Pump	Eff. Motor	RI	48a	Elect.	Elect.	$6,415	$8,031	NA	$0	$1,704	$9,735	$3,320	1.52
Motors	ADMIN	Chilled Water Pump	Eff. Motor	ROF	27b	Elect.	Elect.	$28,101	$28,948	NA	$0	$20,906	$49,853	$21,752	1.77
Motors	BRK/ADM	Chilled Water Pump	Eff. Motor	ROF	28b	Elect.	Elect.	$6,508	$6,704	NA	$0	$4,841	$11,545	$5,037	1.77
Motors	CHAPEL	Chilled Water Pump	Eff. Motor	ROF	29b	Elect.	Elect.	$855	$881	NA	$0	$636	$1,517	$662	1.77
Motors	CLINIC	Chilled Water Pump	Eff. Motor	ROF	30b	Elect.	Elect.	$342	$352	NA	$0	$255	$607	$265	1.77
Motors	CLUB	Chilled Water Pump	Eff. Motor	ROF	31b	Elect.	Elect.	$257	$264	NA	$0	$191	$455	$198	1.77
Motors	COMCATN	Chilled Water Pump	Eff. Motor	ROF	32b	Elect.	Elect.	$599	$617	NA	$0	$446	$1,062	$463	1.77
Motors	DGR	Chilled Water Pump	Eff. Motor	ROF	33b	Elect.	Elect.	$3,643	$3,753	NA	$0	$2,710	$6,463	$2,820	1.77
Motors	DINING	Chilled Water Pump	Eff. Motor	ROF	34b	Elect.	Elect.	$2,677	$2,757	NA	$0	$1,992	$4,749	$2,072	1.77
Motors	GROCERY	Chilled Water Pump	Eff. Motor	ROF	35b	Elect.	Elect.	$1,369	$1,410	NA	$0	$1,018	$2,428	$1,059	1.77
Motors	HANGER	Chilled Water Pump	Eff. Motor	ROF	36b	Elect.	Elect.	$1,625	$1,674	NA	$0	$1,209	$2,883	$1,258	1.77
Motors	HOSPITL	Chilled Water Pump	Eff. Motor	ROF	37b	Elect.	Elect.	$2,736	$2,819	NA	$0	$2,036	$4,854	$2,118	1.77
Motors	MISC	Chilled Water Pump	Eff. Motor	ROF	38b	Elect.	Elect.	$342	$352	NA	$0	$255	$607	$265	1.77
Motors	MWR	Chilled Water Pump	Eff. Motor	ROF	39b	Elect.	Elect.	$3,591	$3,700	NA	$0	$2,672	$6,371	$2,780	1.77
Motors	PLT-BLD	Chilled Water Pump	Eff. Motor	ROF	40b	Elect.	Elect.	$6,756	$6,959	NA	$0	$5,027	$11,986	$5,230	1.77
Motors	R&D	Chilled Water Pump	Eff. Motor	ROF	41b	Elect.	Elect.	$1,984	$2,044	NA	$0	$1,476	$3,520	$1,536	1.77
Motors	REC	Chilled Water Pump	Eff. Motor	ROF	42b	Elect.	Elect.	$419	$432	NA	$0	$311	$743	$324	1.77
Motors	SECURITY	Chilled Water Pump	Eff. Motor	ROF	43b	Elect.	Elect.	$641	$661	NA	$0	$477	$1,138	$497	1.77
Motors	SHOP-ELEC	Chilled Water Pump	Eff. Motor	ROF	44b	Elect.	Elect.	$1,744	$1,797	NA	$0	$1,298	$3,095	$1,351	1.77
Motors	STOR-UH	Chilled Water Pump	Eff. Motor	ROF	45b	Elect.	Elect.	$299	$308	NA	$0	$222	$531	$231	1.77
Motors	TERMINL	Chilled Water Pump	Eff. Motor	ROF	46b	Elect.	Elect.	$1,540	$1,585	NA	$0	$1,145	$2,730	$1,191	1.77
Motors	TRAING	Chilled Water Pump	Eff. Motor	ROF	47b	Elect.	Elect.	$1,540	$1,585	NA	$0	$1,145	$2,730	$1,191	1.77
Motors	WHS	Chilled Water Pump	Eff. Motor	ROF	48b	Elect.	Elect.	$4,875	$5,021	NA	$0	$3,627	$8,648	$3,773	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	RI	49a	Elect.	Elect.	$6,865	$8,595	NA	$0	$1,823	$10,418	$3,553	1.52
Motors	ADMIN	Condenser Pump	Eff. Motor	RI	50a	Elect.	Elect.	$5,402	$6,763	NA	$0	$1,435	$8,198	$2,796	1.52
Motors	ADMIN	Condenser Pump	Eff. Motor	RI	51a	Elect.	Elect.	$788	$986	NA	$0	$209	$1,195	$408	1.52
Motors	ADMIN	Condenser Pump	Eff. Motor	RI	52a	Elect.	Elect.	$675	$845	NA	$0	$179	$1,025	$349	1.52
Motors	ADMIN	Condenser Pump	Eff. Motor	RI	53a	Elect.	Elect.	$12,098	$15,146	NA	$0	$3,213	$18,359	$6,262	1.52
Motors	BRK/ADM	Condenser Pump	Eff. Motor	RI	54a	Elect.	Elect.	$5,120	$6,411	NA	$0	$1,360	$7,771	$2,650	1.52
Motors	BRK/ADM	Condenser Pump	Eff. Motor	RI	55a	Elect.	Elect.	$675	$845	NA	$0	$179	$1,025	$349	1.52
Motors	BRK/ADM	Condenser Pump	Eff. Motor	RI	56a	Elect.	Elect.	$675	$845	NA	$0	$179	$1,025	$349	1.52
Motors	BRK/ADM	Condenser Pump	Eff. Motor	RI	57a	Elect.	Elect.	$675	$845	NA	$0	$179	$1,025	$349	1.52
Motors	DGR	Condenser Pump	Eff. Motor	RI	58a	Elect.	Elect.	$1,238	$1,550	NA	$0	$329	$1,879	$641	1.52
Motors	DINING	Condenser Pump	Eff. Motor	RI	59a	Elect.	Elect.	$900	$1,127	NA	$0	$239	$1,366	$466	1.52
Motors	HOSPITL	Condenser Pump	Eff. Motor	RI	60a	Elect.	Elect.	$3,601	$4,509	NA	$0	$956	$5,465	$1,864	1.52
Motors	MWR	Condenser Pump	Eff. Motor	RI	61a	Elect.	Elect.	$1,125	$1,409	NA	$0	$299	$1,708	$582	1.52
Motors	TRAING	Condenser Pump	Eff. Motor	RI	62a	Elect.	Elect.	$563	$704	NA	$0	$149	$854	$291	1.52
Motors	WHS	Condenser Pump	Eff. Motor	RI	63a	Elect.	Elect.	$675	$845	NA	$0	$179	$1,025	$349	1.52
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	49b	Elect.	Elect.	$5,217	$5,374	NA	$0	$3,881	$9,255	$4,038	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	50b	Elect.	Elect.	$4,105	$4,228	NA	$0	$3,054	$7,282	$3,177	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	51b	Elect.	Elect.	$599	$617	NA	$0	$445	$1,062	$463	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	52b	Elect.	Elect.	$513	$529	NA	$0	$382	$910	$397	1.77

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	53b	Elect.	Elect.	$9,193	$9,470	NA	$0	$6,839	$16,309	$7,116	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	54b	Elect.	Elect.	$3,891	$4,008	NA	$0	$2,895	$6,903	$3,012	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	55b	Elect.	Elect.	$513	$529	NA	$0	$382	$910	$397	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	56b	Elect.	Elect.	$513	$529	NA	$0	$382	$910	$397	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	57b	Elect.	Elect.	$513	$529	NA	$0	$382	$910	$397	1.77
Motors	DGR	Condenser Pump	Eff. Motor	ROF	58b	Elect.	Elect.	$941	$969	NA	$0	$700	$1,669	$728	1.77
Motors	DINING	Condenser Pump	Eff. Motor	ROF	59b	Elect.	Elect.	$684	$705	NA	$0	$509	$1,214	$530	1.77
Motors	HOSPITL	Condenser Pump	Eff. Motor	ROF	60b	Elect.	Elect.	$2,737	$2,819	NA	$0	$2,036	$4,855	$2,118	1.77
Motors	MWR	Condenser Pump	Eff. Motor	ROF	61b	Elect.	Elect.	$855	$881	NA	$0	$636	$1,517	$662	1.77
Motors	TRAING	Condenser Pump	Eff. Motor	ROF	62b	Elect.	Elect.	$428	$440	NA	$0	$318	$759	$331	1.77
Motors	WHS	Condenser Pump	Eff. Motor	ROF	63b	Elect.	Elect.	$513	$529	NA	$0	$382	$910	$397	1.77
Motors	Irrigation	Irrigation Pump	Eff. Motor	RI	64a	Elect.	Elect.	$113	$26	NA	$0	$30	$56	-$57	0.49
Motors	Irrigation	Irrigation Pump	Eff. Motor	RI	65a	Elect.	Elect.	$338	$77	NA	$0	$90	$167	-$171	0.49
Motors	Irrigation	Irrigation Pump	Eff. Motor	RI	66a	Elect.	Elect.	$900	$205	NA	$0	$239	$444	-$456	0.49
Motors	Irrigation	Irrigation Pump	Eff. Motor	RI	67a	Elect.	Elect.	$1,688	$385	NA	$0	$448	$833	-$855	0.49
Motors	Irrigation	Irrigation Pump	Eff. Motor	RI	68a	Elect.	Elect.	$20,256	$4,619	NA	$0	$5,380	$9,999	-$10,257	0.49
Motors	Irrigation	Irrigation Pump	Eff. Motor	RI	69a	Elect.	Elect.	$12,660	$2,887	NA	$0	$3,363	$6,250	-$6,411	0.49
Motors	Irrigation	Irrigation Pump	Eff. Motor	RI	70a	Elect.	Elect.	$4,501	$1,026	NA	$0	$1,196	$2,222	-$2,279	0.49
Motors	South Plant	Sewage Pump	Eff. Motor	RI	71a	Elect.	Elect.	$113	$171	NA	$0	$30	$201	$88	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	72a	Elect.	Elect.	$225	$342	NA	$0	$60	$402	$177	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	73a	Elect.	Elect.	$225	$29	NA	$0	$60	$88	-$137	0.39
Motors	South Plant	Sewage Pump	Eff. Motor	RI	74a	Elect.	Elect.	$338	$43	NA	$0	$90	$132	-$205	0.39
Motors	South Plant	Sewage Pump	Eff. Motor	RI	75a	Elect.	Elect.	$563	$71	NA	$0	$149	$221	-$342	0.39
Motors	South Plant	Sewage Pump	Eff. Motor	RI	76a	Elect.	Elect.	$844	$1,283	NA	$0	$224	$1,507	$663	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	77a	Elect.	Elect.	$1,125	$1,711	NA	$0	$299	$2,010	$884	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	78a	Elect.	Elect.	$3,939	$499	NA	$0	$1,046	$1,545	-$2,394	0.39
Motors	South Plant	Sewage Pump	Eff. Motor	RI	79a	Elect.	Elect.	$3,939	$5,988	NA	$0	$1,046	$7,034	$3,095	1.79
Motors	North Plant	Sewage Pump	Eff. Motor	RI	80a	Elect.	Elect.	$2,251	$855	NA	$0	$598	$1,453	-$798	0.65
Motors	North Plant	Sewage Pump	Eff. Motor	RI	81a	Elect.	Elect.	$1,688	$1,123	NA	$0	$448	$1,571	-$117	0.93
Motors	North Plant	Sewage Pump	Eff. Motor	RI	82a	Elect.	Elect.	$2,251	$3,422	NA	$0	$598	$4,019	$1,769	1.79
Motors	North Plant	Sewage Pump	Eff. Motor	RI	83a	Elect.	Elect.	$563	$855	NA	$0	$149	$1,005	$442	1.79
Motors	North Plant	Sewage Pump	Eff. Motor	RI	84a	Elect.	Elect.	$1,125	$178	NA	$0	$299	$477	-$648	0.42
Motors	North Plant	Sewage Pump	Eff. Motor	RI	85a	Elect.	Elect.	$1,125	$499	NA	$0	$299	$798	-$327	0.71
Motors	North Plant	Sewage Pump	Eff. Motor	RI	86a	Elect.	Elect.	$4,501	$2,281	NA	$0	$1,196	$3,477	-$1,025	0.77
Motors	North Plant	Sewage Pump	Eff. Motor	RI	87a	Elect.	Elect.	$9,003	$3,422	NA	$0	$2,391	$5,813	-$3,190	0.65
Motors	Lift Station	Lift Station Pump	Eff. Motor	RI	88a	Elect.	Elect.	$6,077	$2,772	NA	$0	$1,614	$4,386	-$1,691	0.72
Motors	Lift Station	Lift Station Pump	Eff. Motor	RI	89a	Elect.	Elect.	$7,878	$3,593	NA	$0	$2,092	$5,685	-$2,193	0.72
Motors	Lift Station	Lift Station Pump	Eff. Motor	RI	90a	Elect.	Elect.	$3,376	$1,540	NA	$0	$897	$2,436	-$940	0.72
Motors	Lift Station	Lift Station Pump	Eff. Motor	RI	91a	Elect.	Elect.	$11,816	$5,389	NA	$0	$3,138	$8,527	-$3,289	0.72
Motors	Irrigation	Irrigation Pump	Eff. Motor	ROF	64b	Elect.	Elect.	$86	$16	NA	$0	$64	$80	-$6	0.93
Motors	Irrigation	Irrigation Pump	Eff. Motor	ROF	65b	Elect.	Elect.	$257	$48	NA	$0	$191	$239	-$18	0.93
Motors	Irrigation	Irrigation Pump	Eff. Motor	ROF	66b	Elect.	Elect.	$684	$128	NA	$0	$509	$637	-$47	0.93
Motors	Irrigation	Irrigation Pump	Eff. Motor	ROF	67b	Elect.	Elect.	$1,283	$241	NA	$0	$954	$1,195	-$88	0.93
Motors	Irrigation	Irrigation Pump	Eff. Motor	ROF	68b	Elect.	Elect.	$15,393	$2,888	NA	$0	$11,452	$14,340	-$1,053	0.93
Motors	Irrigation	Irrigation Pump	Eff. Motor	ROF	69b	Elect.	Elect.	$9,621	$1,805	NA	$0	$7,157	$8,962	-$658	0.93
Motors	Irrigation	Irrigation Pump	Eff. Motor	ROF	70b	Elect.	Elect.	$3,421	$642	NA	$0	$2,545	$3,187	-$234	0.93
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	71b	Elect.	Elect.	$86	$107	NA	$0	$64	$171	$85	1.99
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	72b	Elect.	Elect.	$171	$214	NA	$0	$127	$341	$170	1.99
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	73b	Elect.	Elect.	$171	$18	NA	$0	$127	$145	-$26	0.85
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	74b	Elect.	Elect.	$257	$27	NA	$0	$191	$218	-$39	0.85
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	75b	Elect.	Elect.	$428	$45	NA	$0	$318	$363	-$65	0.85
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	76b	Elect.	Elect.	$641	$802	NA	$0	$477	$1,279	$638	1.99
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	77b	Elect.	Elect.	$855	$1,070	NA	$0	$636	$1,706	$851	1.99
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	78b	Elect.	Elect.	$2,993	$312	NA	$0	$2,227	$2,539	-$454	0.85
Motors	South Plant	Sewage Pump	Eff. Motor	ROF	79b	Elect.	Elect.	$2,993	$3,744	NA	$0	$2,227	$5,971	$2,977	1.99
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	80b	Elect.	Elect.	$1,710	$535	NA	$0	$1,272	$1,807	$97	1.06
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	81b	Elect.	Elect.	$1,283	$702	NA	$0	$954	$1,656	$373	1.29
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	82b	Elect.	Elect.	$1,710	$2,139	NA	$0	$1,272	$3,412	$1,701	1.99
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	83b	Elect.	Elect.	$428	$535	NA	$0	$318	$853	$425	1.99
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	84b	Elect.	Elect.	$855	$111	NA	$0	$636	$748	-$107	0.87
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	85b	Elect.	Elect.	$855	$312	NA	$0	$636	$948	$93	1.11
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	86b	Elect.	Elect.	$3,421	$1,426	NA	$0	$2,545	$3,971	$550	1.16
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	87b	Elect.	Elect.	$6,841	$2,139	NA	$0	$5,090	$7,229	$388	1.06
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	88b	Elect.	Elect.	$4,618	$1,733	NA	$0	$3,436	$5,168	$550	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	89b	Elect.	Elect.	$5,986	$2,246	NA	$0	$4,454	$6,700	$714	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	90b	Elect.	Elect.	$2,566	$963	NA	$0	$1,909	$2,871	$306	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	91b	Elect.	Elect.	$8,979	$3,369	NA	$0	$6,680	$10,050	$1,070	1.12
Refrigerator	APPR PFY50	RF-1	Eff. Refrig.	RI	1	Elect.	Elect.	$1,761	$302	$99	$0	$794	$1,195	-$566	0.68

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Refrigerator	Capehart Hsg	RF-2	Eff. Refrig	RI	2	Elect.	Elect.	$588,413	$100,613	$32,831	$0	$264,549	$397,993	-$188,420	0.68
Refrigerator	Wherry Hsg	RF-3	Eff. Refrig.	RI	3	Elect.	Elect.	$325,198	$55,796	$18,207	$0	$146,707	$220,709	-$104,489	0.68
Refrigerator	Temp.Lod.Fac.	RF-4	Eff. Refrig.	RI	4	Elect.	Elect.	$34,046	$5,841	$1,906	$0	$15,359	$23,107	-$10,939	0.68
Refrigerator	Dormitories	RF-5	Eff. Refrig	RI	5	Elect.	Elect.	$118,261	$23,366	$7,624	$0	$52,449	$83,439	-$32,822	0.72
Refrigerator	VOQ	RF-6	Eff. Refrig.	RI	6	Elect.	Elect.	$35,448	$7,124	$2,325	$0	$15,992	$25,441	-$10,007	0.72
Transport.	Sedan	Compact, 4 psgr, Class II	CNG Vehicle	RI	B102	Gas	NG	$48,000	$66,884	$0	$94,135	-$23,080	$137,939	$89,939	2.87
Transport.	Sedan	Midsize, 5 psgr, Class II (See Note 1)	CNG Vehicle	RI	B103	Gas	NG	$8,000	$479	$0	$0	-$3,847	-$3,367	-$11,367	-0.42
Transport.	Sedan	Compact, Law Enforcement, Class II	CNG Vehicle	RI	B106	Gas	NG	$30,000	$124,830	$0	$60,340	-$41,665	$143,505	$113,505	4.78
Transport.	Wagon	Station Wagon, Compact, Class II	CNG Vehicle	RI	B150	Gas	NG	$45,000	$40,167	$0	$39,942	-$19,233	$60,875	$15,875	1.35
Transport.	Ambulance	Modular, 4x2	CNG Vehicle	RI	B162	Gas	NG	$9,000	$25,910	$0	$28,663	-$1,355	$53,218	$44,218	5.91
Transport.	Ambulance	Modular, 4x4	CNG Vehicle	RI	B163	Gas	NG	$9,000	$2,167	$0	$5,811	-$1,149	$6,829	-$2,171	0.76
Transport.	Truck	Panel Truck, 4x2, 6,999 GVW & under	CNG Vehicle	RI	B168	Gas	NG	$93,000	$110,854	$0	$148,843	-$32,744	$226,953	$133,953	2.44
Transport.	Truck	Multistop, 4x2, 12,500-16,999 GVW	CNG Vehicle	RI	B177	Gas	NG	$11,000	$2,461	$0	$6,581	-$5,129	$3,913	-$8,087	0.33
Transport.	Truck	Multistop, 4x2, 8,500-12,499 GVW	CNG Vehicle	RI	B178	Gas	NG	$3,000	$1,494	$0	$1,718	-$1,282	$1,930	-$1,070	0.64
Transport.	Truck	Carryall, 4x2, 6,999 GVW & under	CNG Vehicle	RI	B185	Gas	NG	$75,000	$110,701	$0	$84,933	-$26,406	$169,229	$94,229	2.26
Transport.	Truck	Carryall, 4x2, 7 DAX	CNG Vehicle	RI	B188	Gas	NG	$18,000	$28,321	$0	$26,284	-$7,693	$46,912	$28,912	2.61
Transport.	Truck	Carryall, 4x4, 7,500 GVW	CNG Vehicle	RI	B190	Gas	NG	$3,000	$4,466	$0	$7,104	-$1,056	$10,533	$7,533	3.51
Transport.	Truck	Carryall, 4x2, Conv, 15 psgr, 7,700 GVW	CNG Vehicle	RI	B192	Gas	NG	$9,000	$17,473	$0	$14,896	-$3,169	$29,200	$20,200	3.24
Transport.	Truck	Carryall, Low Silhouette, 4x2, 7,100 GVW	CNG Vehicle	RI	B193	Gas	NG	$3,000	$208	$0	$555	-$1,056	-$294	-$3,294	-0.10
Transport.	Truck	Utility, 4x4, 6,000 GVW	CNG Vehicle	RI	B198	Gas	NG	$3,000	$448	$0	$98	-$1,056	-$511	-$3,511	-0.17
Transport.	Pickup	Compact, 4x2, 4,599 GVW & under	CNG Vehicle	RI	B200	Gas	NG	$285,000	$200,866	$0	$317,378	-$100,344	$417,901	$132,901	1.47
Transport.	Pickup	Compact, 4x2, 4,600-5,799 GVW	CNG Vehicle	RI	B204	Gas	NG	$63,000	$78,271	$0	$81,340	-$22,181	$137,430	$74,430	2.18
Transport.	Pickup	4 dr cab, 4x2, 5,500 GVW	CNG Vehicle	RI	B217	Gas	NG	$60,000	$64,428	$0	$59,067	-$17,617	$105,878	$45,878	1.76
Transport.	Pickup	4 dr cab, 4x4, 7,000-8510 GVW	CNG Vehicle	RI	B222	Gas	NG	$45,000	$55,626	$0	$49,448	-$19,233	$85,840	$40,840	1.91
Transport.	Truck	Cargo, 4x4, 12,499 GVW & under	CNG Vehicle	RI	B237	Gas	NG	$15,000	$4,879	$0	$7,788	-$5,281	$7,385	-$7,615	0.49
Transport.	Truck	Cargo, 4x4, 17,000-20,999 GVW	CNG Vehicle	RI	B239	Gas	NG	$9,000	$2,429	$0	$4,171	-$2,643	$3,957	-$5,043	0.44
Transport.	Truck	Stake, 4x2, 7,000 GVW	CNG Vehicle	RI	B261	Gas	NG	$48,000	$73,101	$0	$63,547	-$14,094	$122,554	$74,554	2.55
Transport.	Bus	School, 28-29 psgr, 4x2	CNG Vehicle	RI	B121	Diesel	NG,Dies	$20,000	$8,040	$0	$17,169	-$1,916	$21,293	$1,293	1.06
Transport.	Bus	School, 42-45 psgr, 4x2	CNG Vehicle	RI	B130	Diesel	NG,Dies	$8,000	$3,687	$0	$27,979	-$766	$30,899	$22,899	3.86
Transport.	Bus	Intercity, 41-51 psgr, 4x2	CNG Vehicle	RI	B139	Diesel	NG,Dies	$4,000	$7,601	$0	$10,439	-$532	$17,509	$13,509	4.38
Transport.	Truck	Multistop, 4x2, 8,499 GVW & under	CNG Vehicle	RI	B176	Diesel	NG,Dies	$39,000	$12,427	$0	$53,181	-$16,669	$48,940	$9,940	1.25
Transport.	Truck	Multistop, 4x2, 1-ton	CNG Vehicle	RI	B180	Diesel	NG,Dies	$21,000	$3,706	$0	$35,173	-$7,394	$31,486	$10,486	1.50
Transport.	Bus	16 psgr, 4x2	CNG Vehicle	RI	B184	Diesel	NG,Dies	$4,000	$1,735	$0	$8,377	-$1,056	$9,056	$5,056	2.26
Transport.	Truck	Carryall, 4x2, Conv, 9 psgr	CNG Vehicle	RI	B191	Diesel	NG,Dies	$3,000	$1,455	$0	$2,234	-$881	$2,808	-$192	0.94
Transport.	Pickup	Compact, 4x4, 4,600-5,799 GVW	CNG Vehicle	RI	B211	Diesel	NG,Dies	$3,000	$986	$0	$4,128	-$1,282	$3,832	$832	1.28
Transport.	Truck	Stake, 4x2, 12,500-16,999 GVW, 1-1/2 ton	CNG Vehicle	RI	B264	Diesel	NG,Dies	$18,000	$3,635	$0	$32,619	-$5,285	$30,969	$12,969	1.72
Transport.	Truck	Stake, 4x2, 10,000 GVW	CNG Vehicle	RI	B265	Diesel	NG,Dies	$24,000	$10,040	$0	$39,684	-$5,927	$43,797	$19,797	1.82
Transport.	Truck	Tractor, 4x2, 24,000-44,500 GVW	CNG Vehicle	RI	B353	Diesel	NG,Dies	$15,000	$11,005	$0	$22,386	-$3,133	$30,258	$15,258	2.02
Transport.	Truck	Tractor, 6x4, 24,000-44,500 GVW	CNG Vehicle	RI	B361	Diesel	NG,Dies	$12,000	$12,834	$0	$200,615	-$2,127	$211,322	$199,322	17.61
Transport.	Tractor	Whse, 4,000-6,999#	CNG Vehicle	RI	E801	Gas	NG	$30,000	$15,169	$0	$49,577	-$6,266	$58,480	$28,480	1.95
Transport.	Forklift	2,000-5,999#, ST	CNG Vehicle	RI	E830	Gas	NG	$2,000	$598	$0	$4,616	-$470	$4,745	$2,745	2.37
Transport.	Forklift	2,000-5,999#, PT	CNG Vehicle	RI	E831	Gas	NG	$20,000	$11,924	$0	$50,744	-$6,606	$56,062	$36,062	2.80
Transport.	Forklift	6,000-9,999#, PT	CNG Vehicle	RI	E832	Gas	NG	$4,000	$873	$0	$7,553	-$1,111	$7,315	$3,315	1.83
Transport.	Forklift	4,000#, PT	CNG Vehicle	RI	E816	Diesel	NG,Dies	$33,000	$3,158	$0	$66,554	-$11,619	$58,093	$25,093	1.76
Transport.	Forklift	6,000-6,200#, PT	CNG Vehicle	RI	E822	Diesel	NG,Dies	$36,000	$4,718	$0	$74,025	-$6,890	$69,853	$33,853	1.94
Transport.	Forklift	15,000#	CNG Vehicle	RI	E824	Diesel	NG,Dies	$21,000	$832	$0	$20,468	-$5,166	$16,135	-$4,865	0.77
Transport.	Lift	Platform, 40K, 463L	CNG Vehicle	RI	E940	Diesel	NG,Dies	$4,000	$652	$0	$39,208	-$1,056	$38,803	$34,803	9.70
Transport.	Forklift	Huster, 463L, 10K	CNG Vehicle	RI	E956	Diesel	NG,Dies	$12,000	$817	$0	$7,874	-$2,127	$6,563	-$5,437	0.55
Transport.	Forklift	Allis Chalmers, 463L, 10K	CNG Vehicle	RI	E957	Diesel	NG,Dies	$9,000	$991	$0	$21,660	-$1,595	$21,057	$12,057	2.34
Transport.	Forklift	AT(463L), 10K	CNG Vehicle	RI	E958	Diesel	NG,Dies	$12,000	$1,752	$0	$5,686	-$2,963	$4,475	-$7,525	0.37
Transport.	Sedan	Compact, 4 psgr, Class II	CNG Vehicle	ROF	B102	Gas	NG	$41,031	$53,204	$0	$72,262	-$16,462	$109,004	$67,974	2.66
Transport.	Sedan	Midsize, 5 psgr, Class II (See Note 1)	CNG Vehicle	ROF	B103	Gas	NG	$6,838	$381	$0	$0	-$2,744	-$2,362	-$9,201	-0.35
Transport.	Sedan	Compact, Law Enforcement, Class II	CNG Vehicle	ROF	B106	Gas	NG	$27,737	$112,046	$0	$53,055	-$36,227	$128,874	$101,138	4.65
Transport.	Wagon	Station Wagon, Compact, Class II	CNG Vehicle	ROF	B150	Gas	NG	$38,466	$31,952	$0	$30,661	-$13,719	$48,895	$10,428	1.27
Transport.	Ambulance	Modular, 4x2	CNG Vehicle	ROF	B162	Gas	NG	$6,839	$16,742	$0	$17,650	-$488	$33,904	$27,065	4.96
Transport.	Ambulance	Modular, 4x4	CNG Vehicle	ROF	B163	Gas	NG	$6,839	$1,381	$0	$3,579	-$362	$4,598	-$2,241	0.67
Transport.	Truck	Panel Truck, 4x2, 6,999 GVW & under	CNG Vehicle	ROF	B168	Gas	NG	$79,497	$88,199	$0	$114,259	-$22,974	$179,484	$99,987	2.26
Transport.	Truck	Multistop, 4x2, 12,500-16,999 GVW	CNG Vehicle	ROF	B177	Gas	NG	$10,258	$1,958	$0	$5,052	-$3,658	$3,351	-$6,906	0.33
Transport.	Truck	Multistop, 4x2, 8,500-12,499 GVW	CNG Vehicle	ROF	B178	Gas	NG	$2,564	$1,188	$0	$1,319	-$915	$1,593	-$972	0.62
Transport.	Truck	Carryall, 4x2, 6,999 GVW & under	CNG Vehicle	ROF	B185	Gas	NG	$64,110	$88,061	$0	$65,199	-$18,527	$134,732	$70,622	2.10
Transport.	Truck	Carryall, 4x2, 7 DAX	CNG Vehicle	ROF	B188	Gas	NG	$15,386	$22,533	$0	$20,177	-$5,487	$37,223	$21,836	2.42
Transport.	Truck	Carryall, 4x4, 7,500 GVW	CNG Vehicle	ROF	B190	Gas	NG	$2,564	$3,567	$0	$5,453	-$741	$8,279	$5,715	3.23
Transport.	Truck	Carryall, 4x2, Conv, 15 psgr, 7,700 GVW	CNG Vehicle	ROF	B192	Gas	NG	$7,693	$13,897	$0	$11,435	-$2,223	$23,109	$15,415	3.00
Transport.	Truck	Carryall, Low Silhouette, 4x2, 7,100 GVW	CNG Vehicle	ROF	B193	Gas	NG	$2,564	$165	$0	$426	-$741	-$150	-$2,714	-0.06
Transport.	Truck	Utility, 4x4, 6,000 GVW	CNG Vehicle	ROF	B198	Gas	NG	$2,564	$356	$0	$75	-$741	-$310	-$2,875	-0.12
Transport.	Pickup	Compact, 4x2, 4,599 GVW & under	CNG Vehicle	ROF	B200	Gas	NG	$243,619	$159,753	$0	$243,633	-$70,404	$332,982	$89,363	1.37
Transport.	Pickup	Compact, 4x2, 4,600-5,799 GVW	CNG Vehicle	ROF	B204	Gas	NG	$53,853	$62,274	$0	$62,440	-$15,563	$109,151	$55,298	2.03
Transport.	Pickup	4 dr cab, 4x2, 5,500 GVW	CNG Vehicle	ROF	B217	Gas	NG	$49,316	$47,897	$0	$42,235	-$10,886	$79,245	$29,930	1.61

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Transport.	Pickup	4 dr cab, 4x4, 7,000-8510 GVW	CNG Vehicle	ROF	B222	Gas	NG	$38,466	$44,216	$0	$37,958	-$13,719	$68,455	$29,989	1.78
Transport.	Truck	Cargo, 4x4, 12,499 GVW & under	CNG Vehicle	ROF	B237	Gas	NG	$12,822	$3,880	$0	$5,978	-$3,705	$6,153	-$6,670	0.48
Transport.	Truck	Cargo, 4x4, 17,000-20,999 GVW	CNG Vehicle	ROF	B239	Gas	NG	$7,397	$1,783	$0	$2,982	-$1,633	$3,132	-$4,265	0.42
Transport.	Truck	Stake, 4x2, 7,000 GVW	CNG Vehicle	ROF	B261	Gas	NG	$39,453	$54,419	$0	$45,438	-$6,709	$91,148	$51,696	2.31
Transport.	Bus	School, 26-29 psgr, 4x2	CNG Vehicle	ROF	B121	Diesel	NG,Dies	$15,198	$4,133	$0	$10,572	-$603	$14,102	-$1,096	0.93
Transport.	Bus	School, 42-45 psgr, 4x2	CNG Vehicle	ROF	B130	Diesel	NG,Dies	$6,079	$2,523	$0	$17,229	-$241	$19,511	$13,431	3.21
Transport.	Bus	Intercity, 41-51 psgr, 4x2	CNG Vehicle	ROF	B139	Diesel	NG,Dies	$3,161	$5,571	$0	$6,936	-$253	$12,255	$9,093	3.88
Transport.	Truck	Multistop, 4x2, 8,499 GVW & under	CNG Vehicle	ROF	B176	Diesel	NG,Dies	$33,337	$10,327	$0	$40,824	-$11,889	$39,262	$5,924	1.18
Transport.	Truck	Multistop, 4x2, 1-ton	CNG Vehicle	ROF	B180	Diesel	NG,Dies	$17,951	$3,080	$0	$27,000	-$5,188	$24,893	$6,942	1.39
Transport.	Bus	16 psgr, 4x2	CNG Vehicle	ROF	B184	Diesel	NG,Dies	$3,419	$1,442	$0	$6,431	-$741	$7,132	$3,713	2.09
Transport.	Truck	Carryall, 4x2, Conv, 9 psgr	CNG Vehicle	ROF	B191	Diesel	NG,Dies	$2,466	$1,139	$0	$1,597	-$544	$2,192	-$273	0.89
Transport.	Pickup	Compact, 4x4, 4,600-5,799 GVW	CNG Vehicle	ROF	B211	Diesel	NG,Dies	$2,564	$818	$0	$3,169	-$915	$3,072	$508	1.20
Transport.	Truck	Stake, 4x2, 12,500-16,999 GVW, 1-1/2 ton	CNG Vehicle	ROF	B264	Diesel	NG,Dies	$14,795	$2,847	$0	$23,323	-$3,266	$22,904	$8,110	1.55
Transport.	Truck	Stake, 4x2, 10,000 GVW	CNG Vehicle	ROF	B265	Diesel	NG,Dies	$19,726	$7,862	$0	$28,375	-$3,554	$32,683	$12,957	1.66
Transport.	Truck	Tractor, 4x2, 24,000-44,500 GVW	CNG Vehicle	ROF	B353	Diesel	NG,Dies	$11,855	$8,077	$0	$14,874	-$1,578	$21,374	$9,519	1.80
Transport.	Truck	Tractor, 6x4, 24,000-44,500 GVW	CNG Vehicle	ROF	B361	Diesel	NG,Dies	$9,484	$9,420	$0	$133,297	-$1,010	$141,706	$132,222	14.94
Transport.	Tractor	Whse, 4,000-6,999#	CNG Vehicle	ROF	E801	Gas	NG	$23,709	$10,535	$0	$32,941	-$3,156	$40,320	$16,610	1.70
Transport.	Forklift	2,000-5,999#, ST	CNG Vehicle	ROF	E830	Gas	NG	$1,581	$416	$0	$3,087	-$237	$3,246	$1,666	2.05
Transport.	Forklift	2,000-5,999#, PT	CNG Vehicle	ROF	E831	Gas	NG	$16,439	$8,873	$0	$36,284	-$4,082	$41,074	$24,636	2.50
Transport.	Forklift	6,000-9,999#, PT	CNG Vehicle	ROF	E832	Gas	NG	$3,288	$650	$0	$5,401	-$666	$5,384	$2,096	1.64
Transport.	Forklift	4,000#, PT	CNG Vehicle	ROF	E816	Diesel	NG,Dies	$28,209	$2,625	$0	$51,090	-$8,152	$45,563	$17,355	1.62
Transport.	Forklift	6,000-6,200#, PT	CNG Vehicle	ROF	E822	Diesel	NG,Dies	$29,589	$3,694	$0	$52,930	-$5,331	$51,294	$21,705	1.73
Transport.	Forklift	15,000#	CNG Vehicle	ROF	E824	Diesel	NG,Dies	$17,260	$652	$0	$14,650	-$3,109	$12,192	-$5,068	0.71
Transport.	Lift	Platform, 40K, 463L	CNG Vehicle	ROF	E940	Diesel	NG,Dies	$3,419	$542	$0	$30,097	-$741	$29,899	$26,479	8.74
Transport.	Forklift	Huster, 463L, 10K	CNG Vehicle	ROF	E956	Diesel	NG,Dies	$9,484	$599	$0	$5,231	-$1,010	$4,821	-$4,663	0.51
Transport.	Forklift	Allis Chalmers, 463L, 10K	CNG Vehicle	ROF	E957	Diesel	NG,Dies	$7,113	$728	$0	$14,392	-$758	$14,362	$7,249	2.02
Transport.	Forklift	AT(463L), 10K	CNG Vehicle	ROF	E958	Diesel	NG,Dies	$9,863	$1,372	$0	$4,066	-$1,777	$3,661	-$6,202	0.37
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	1	Elect.	Elect.	$1,203	$87	$22	$0	$26	$135	-$1,069	0.11
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	2	Elect.	Elect.	$1,203	$87	$22	$0	$880	$989	-$214	0.82
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	3	Elect.	Elect.	$3,017	$200	$50	$0	$2,202	$2,452	-$565	0.81
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	4	Elect.	Elect.	$1,509	$100	$25	$0	$32	$157	-$1,351	0.10
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	5	Elect.	Elect.	$6,025	$422	$106	$0	$4,383	$4,911	-$1,114	0.82
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	6	Elect.	Elect.	$6,025	$422	$106	$0	$2,128	$2,656	-$3,369	0.44
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	7	Elect.	Elect.	$15,137	$1,188	$297	$0	$10,985	$12,471	-$2,666	0.82
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	8	Elect.	Elect.	$7,569	$594	$149	$0	$327	$1,070	-$6,499	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	9	Elect.	Elect.	$17,805	$1,325	$332	$0	$12,899	$14,555	-$3,250	0.82
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	10	Elect.	Elect.	$8,902	$662	$166	$0	$3,131	$3,959	-$4,943	0.44
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	11	Elect.	Elect.	$2,967	$221	$55	$0	$63	$339	-$2,629	0.11
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	12	Elect.	Elect.	$7,465	$680	$170	$0	$5,395	$6,246	-$1,219	0.84
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	13	Elect.	Elect.	$48,523	$4,421	$1,107	$0	$17,026	$22,554	-$25,969	0.46
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	14	Elect.	Elect.	$22,395	$2,040	$511	$0	$6,374	$8,925	-$13,470	0.40
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	15	Elect.	Elect.	$22,395	$2,040	$511	$0	$473	$3,024	-$19,371	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	16	Elect.	Elect.	$13,183	$1,271	$318	$0	$9,512	$11,101	-$2,081	0.84
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	17	Elect.	Elect.	$57,125	$5,507	$1,378	$0	$20,012	$26,897	-$30,227	0.47
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	18	Elect.	Elect.	$26,365	$2,542	$636	$0	$2,359	$5,537	-$20,828	0.21
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	19	Elect.	Elect.	$39,548	$3,812	$954	$0	$833	$5,600	-$33,948	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	20	Elect.	Elect.	$8,788	$847	$212	$0	$378	$1,437	-$7,351	0.16
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	21	Elect.	Elect.	$40,375	$3,007	$753	$0	$11,222	$14,982	-$25,394	0.37
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	22	Elect.	Elect.	$9,625	$649	$162	$0	$419	$1,231	-$8,394	0.13
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	23	Elect.	Elect.	$1,203	$81	$20	$0	$427	$529	-$674	0.44
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	24	Elect.	Elect.	$1,509	$100	$25	$0	$137	$262	-$1,247	0.17
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	25	Elect.	Elect.	$1,509	$100	$25	$0	$296	$422	-$1,087	0.28
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	26	Elect.	Elect.	$1,509	$100	$25	$0	$32	$157	-$1,351	0.10
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	27	Elect.	Elect.	$1,509	$100	$25	$0	$1,256	$1,382	-$127	0.92
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	28	Elect.	Elect.	$12,051	$845	$211	$0	$522	$1,578	-$10,472	0.13
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	29	Elect.	Elect.	$6,025	$422	$106	$0	$5,002	$5,530	-$495	0.92
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	30	Elect.	Elect.	$2,008	$141	$35	$0	$1,667	$1,843	-$165	0.92
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	31	Elect.	Elect.	$2,008	$141	$35	$0	$337	$513	-$1,495	0.26
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	32	Elect.	Elect.	$2,523	$198	$50	$0	$2,089	$2,337	-$186	0.93
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	33	Elect.	Elect.	$2,523	$198	$50	$0	$1,831	$2,079	-$444	0.82
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	34	Elect.	Elect.	$30,275	$2,377	$595	$0	$1,309	$4,281	-$25,994	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	35	Elect.	Elect.	$8,902	$662	$166	$0	$7,360	$8,188	-$715	0.92
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	36	Elect.	Elect.	$8,902	$662	$166	$0	$800	$1,628	-$7,275	0.18
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	37	Elect.	Elect.	$47,479	$3,532	$884	$0	$2,049	$6,465	-$41,014	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	38	Elect.	Elect.	$20,772	$1,545	$387	$0	$7,306	$9,238	-$11,534	0.44
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	39	Elect.	Elect.	$22,395	$2,040	$511	$0	$964	$3,515	-$18,880	0.16
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	40	Elect.	Elect.	$4,526	$301	$75	$0	$3,303	$3,679	-$847	0.81
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	41	Elect.	Elect.	$8,902	$662	$166	$0	$384	$1,212	-$7,690	0.14

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	42	Elect.	Elect.	$8,902	$662	$166	$0	$188	$1,016	-$7,886	0.11
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	43	Elect.	Elect.	$13,183	$1,271	$318	$0	$4,173	$5,762	-$7,420	0.44
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	44	Elect.	Elect.	$13,183	$1,271	$318	$0	$567	$2,156	-$11,027	0.16
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	45	Elect.	Elect.	$29,112	$1,679	$420	$0	$9,979	$12,078	-$17,034	0.41
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	46	Elect.	Elect.	$40,375	$3,007	$753	$0	$11,222	$14,982	-$25,394	0.37
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	47	Elect.	Elect.	$7,569	$594	$149	$0	$5,493	$6,236	-$1,333	0.82
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	48	Elect.	Elect.	$2,008	$178	$45	$0	$1,667	$1,890	-$119	0.94
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	49	Elect.	Elect.	$2,796	$266	$67	$0	$984	$1,317	-$1,479	0.47
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	50	Elect.	Elect.	$2,796	$266	$67	$0	$121	$453	-$2,343	0.16
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	51	Elect.	Elect.	$7,465	$859	$215	$0	$2,619	$3,694	-$3,771	0.49
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	52	Elect.	Elect.	$7,465	$859	$215	$0	$158	$1,232	-$6,233	0.17
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	53	Elect.	Elect.	$8,047	$632	$158	$0	$1,756	$2,547	-$5,500	0.32
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	54	Elect.	Elect.	$18,445	$1,336	$335	$0	$6,323	$7,994	-$10,451	0.43
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	55	Elect.	Elect.	$9,223	$668	$167	$0	$2,857	$3,693	-$5,530	0.40
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	56	Elect.	Elect.	$9,223	$668	$167	$0	$388	$1,223	-$7,999	0.13
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	57	Elect.	Elect.	$9,223	$668	$167	$0	$190	$1,026	-$8,197	0.11
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	58	Elect.	Elect.	$11,176	$1,050	$263	$0	$3,831	$5,143	-$6,033	0.46
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	59	Elect.	Elect.	$11,176	$1,050	$263	$0	$3,107	$4,420	-$6,757	0.40
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	60	Elect.	Elect.	$11,176	$1,050	$263	$0	$230	$1,543	-$9,633	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	61	Elect.	Elect.	$12,809	$1,253	$314	$0	$9,041	$10,608	-$2,201	0.83
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	62	Elect.	Elect.	$38,427	$3,759	$941	$0	$13,168	$17,868	-$20,559	0.46
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	63	Elect.	Elect.	$12,809	$1,253	$314	$0	$264	$1,831	-$10,978	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	64	Elect.	Elect.	$13,780	$1,418	$355	$0	$4,722	$6,494	-$7,286	0.47
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	65	Elect.	Elect.	$3,733	$430	$108	$0	$1,310	$1,847	-$1,886	0.49
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	66	Elect.	Elect.	$12,809	$1,253	$314	$0	$539	$2,105	-$10,704	0.16
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	67	Elect.	Elect.	$8,047	$632	$158	$0	$2,759	$3,550	-$4,497	0.44
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	68	Elect.	Elect.	$18,445	$1,336	$335	$0	$6,323	$7,994	-$10,451	0.43
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	69	Elect.	Elect.	$11,176	$1,050	$263	$0	$3,831	$5,143	-$6,033	0.46
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	70	Elect.	Elect.	$11,176	$1,050	$263	$0	$230	$1,543	-$9,633	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	71	Elect.	Elect.	$12,809	$1,253	$314	$0	$9,041	$10,608	-$2,201	0.83
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	72	Elect.	Elect.	$12,809	$1,253	$314	$0	$4,389	$5,956	-$6,853	0.46
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	73	Elect.	Elect.	$12,809	$1,253	$314	$0	$3,560	$5,127	-$7,682	0.40
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	74	Elect.	Elect.	$12,809	$1,253	$314	$0	$1,121	$2,688	-$10,121	0.21
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	75	Elect.	Elect.	$12,809	$1,253	$314	$0	$539	$2,105	-$10,704	0.16
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	76	Elect.	Elect.	$32,635	$3,818	$956	$0	$2,856	$7,630	-$25,006	0.23
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	77	Elect.	Elect.	$22,610	$2,148	$538	$0	$4,276	$6,962	-$15,648	0.31
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	78	Elect.	Elect.	$135,659	$12,887	$3,226	$0	$2,785	$18,898	-$116,761	0.14
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	79	Elect.	Elect.	$24,366	$2,506	$627	$0	$2,127	$5,260	-$19,106	0.22
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	80	Elect.	Elect.	$28,713	$4,123	$1,032	$0	$591	$5,745	-$22,968	0.20
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	RI	81	Elect.	Elect.	$32,945	$5,018	$1,256	$0	$678	$6,951	-$25,994	0.21
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	82	Elect.	Elect.	$1,203	$87	$22	$0	$1,005	$1,113	-$90	0.93
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	83	Elect.	Elect.	$2,406	$174	$44	$0	$105	$323	-$2,084	0.13
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	84	Elect.	Elect.	$1,509	$100	$25	$0	$1,256	$1,382	-$127	0.92
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	85	Elect.	Elect.	$1,509	$100	$25	$0	$534	$660	-$849	0.44
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	86	Elect.	Elect.	$6,025	$422	$106	$0	$261	$789	-$5,236	0.13
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	87	Elect.	Elect.	$7,569	$594	$149	$0	$5,127	$5,870	-$1,699	0.78
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	88	Elect.	Elect.	$15,137	$1,188	$297	$0	$654	$2,140	-$12,997	0.14
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	89	Elect.	Elect.	$8,902	$662	$166	$0	$6,449	$7,277	-$1,625	0.82
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	90	Elect.	Elect.	$8,902	$662	$166	$0	$5,608	$6,436	-$2,467	0.72
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	91	Elect.	Elect.	$8,902	$662	$166	$0	$2,261	$3,089	-$5,813	0.35
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	92	Elect.	Elect.	$3,733	$340	$85	$0	$2,698	$3,123	-$610	0.84
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	93	Elect.	Elect.	$11,198	$1,020	$255	$0	$7,555	$8,830	-$2,367	0.79
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	94	Elect.	Elect.	$14,930	$1,360	$340	$0	$643	$2,344	-$12,586	0.16
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	95	Elect.	Elect.	$13,183	$1,271	$318	$0	$8,880	$10,468	-$2,714	0.79
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	96	Elect.	Elect.	$21,971	$2,118	$530	$0	$7,697	$10,345	-$11,626	0.47
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	97	Elect.	Elect.	$13,183	$1,271	$318	$0	$3,335	$4,924	-$8,259	0.37
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	98	Elect.	Elect.	$40,375	$3,007	$753	$0	$3,534	$7,293	-$33,082	0.18
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	99	Elect.	Elect.	$819	$49	$12	$0	$36	$97	-$722	0.12
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	100	Elect.	Elect.	$3,610	$243	$61	$0	$1,282	$1,586	-$2,023	0.44
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	101	Elect.	Elect.	$7,219	$487	$122	$0	$315	$923	-$6,296	0.13
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	102	Elect.	Elect.	$6,034	$401	$100	$0	$262	$764	-$5,271	0.13
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	103	Elect.	Elect.	$4,017	$282	$70	$0	$3,335	$3,687	-$330	0.92
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	104	Elect.	Elect.	$24,101	$1,690	$423	$0	$1,044	$3,157	-$20,944	0.13
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	105	Elect.	Elect.	$58,027	$4,556	$1,140	$0	$2,508	$8,205	-$49,822	0.14
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	106	Elect.	Elect.	$178,046	$13,245	$3,315	$0	$7,683	$24,244	-$153,802	0.14
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	107	Elect.	Elect.	$3,733	$340	$85	$0	$334	$760	-$2,973	0.20
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	108	Elect.	Elect.	$179,160	$16,324	$4,086	$0	$7,713	$28,123	-$151,038	0.16
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	109	Elect.	Elect.	$3,733	$340	$85	$0	$79	$504	-$3,229	0.14

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	110	Elect.	Elect.	$30,759	$2,965	$742	$0	$1,322	$5,030	-$25,730	0.16
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	111	Elect.	Elect.	$9,704	$560	$140	$0	$408	$1,108	-$8,596	0.11
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	112	Elect.	Elect.	$2,008	$141	$35	$0	$1,667	$1,843	-$165	0.92
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	113	Elect.	Elect.	$7,569	$594	$149	$0	$5,127	$5,870	-$1,699	0.78
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	114	Elect.	Elect.	$40,375	$3,007	$753	$0	$3,534	$7,293	-$33,082	0.18
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	115	Elect.	Elect.	$2,796	$266	$67	$0	$251	$584	-$2,212	0.21
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	116	Elect.	Elect.	$3,733	$430	$108	$0	$1,310	$1,847	-$1,886	0.49
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	117	Elect.	Elect.	$3,733	$430	$108	$0	$834	$1,371	-$2,362	0.37
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	118	Elect.	Elect.	$3,733	$430	$108	$0	$726	$1,263	-$2,470	0.34
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	119	Elect.	Elect.	$3,733	$430	$108	$0	$161	$698	-$3,035	0.19
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	120	Elect.	Elect.	$7,465	$859	$215	$0	$158	$1,232	-$6,233	0.17
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	121	Elect.	Elect.	$8,047	$632	$158	$0	$1,311	$2,101	-$5,946	0.26
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	122	Elect.	Elect.	$8,047	$632	$158	$0	$705	$1,495	-$6,552	0.19
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	123	Elect.	Elect.	$8,047	$632	$158	$0	$166	$957	-$7,091	0.12
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	124	Elect.	Elect.	$18,445	$1,336	$335	$0	$4,566	$6,237	-$12,208	0.34
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	125	Elect.	Elect.	$9,223	$668	$167	$0	$1,502	$2,337	-$6,885	0.25
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	126	Elect.	Elect.	$18,445	$1,336	$335	$0	$776	$2,447	-$15,998	0.13
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	127	Elect.	Elect.	$11,176	$1,050	$263	$0	$3,107	$4,420	-$6,757	0.40
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	128	Elect.	Elect.	$22,353	$2,100	$526	$0	$1,957	$4,582	-$17,770	0.21
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	129	Elect.	Elect.	$22,353	$2,100	$526	$0	$461	$3,087	-$19,266	0.14
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	130	Elect.	Elect.	$23,594	$2,148	$538	$0	$8,044	$10,729	-$12,864	0.45
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	131	Elect.	Elect.	$23,594	$2,148	$538	$0	$5,809	$8,494	-$15,100	0.36
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	132	Elect.	Elect.	$26,049	$2,506	$627	$0	$535	$3,668	-$22,381	0.14
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	133	Elect.	Elect.	$61,634	$6,921	$1,732	$0	$1,265	$9,919	-$51,716	0.16
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	134	Elect.	Elect.	$5,592	$532	$133	$0	$241	$907	-$4,685	0.16
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	135	Elect.	Elect.	$8,047	$632	$158	$0	$166	$957	-$7,091	0.12
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	136	Elect.	Elect.	$9,223	$668	$167	$0	$1,030	$1,865	-$7,357	0.20
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	137	Elect.	Elect.	$9,223	$668	$167	$0	$807	$1,643	-$7,580	0.18
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	138	Elect.	Elect.	$11,176	$1,050	$263	$0	$2,766	$4,079	-$7,098	0.36
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	RI	139	Elect.	Elect.	$11,176	$1,050	$263	$0	$1,248	$2,561	-$8,616	0.23
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	1	Elect.	Elect.	$1,336	$244	$61	$0	$26	$331	-$1,005	0.25
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	2	Elect.	Elect.	$1,336	$244	$61	$0	$880	$1,185	-$151	0.89
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	3	Elect.	Elect.	$3,357	$561	$140	$0	$2,202	$2,904	-$453	0.86
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	4	Elect.	Elect.	$1,678	$281	$70	$0	$32	$383	-$1,295	0.23
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	5	Elect.	Elect.	$6,721	$1,183	$296	$0	$4,383	$5,862	-$859	0.87
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	6	Elect.	Elect.	$6,721	$1,183	$296	$0	$2,128	$3,607	-$3,114	0.54
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	7	Elect.	Elect.	$16,917	$3,328	$833	$0	$10,985	$15,146	-$1,771	0.90
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	8	Elect.	Elect.	$8,458	$1,664	$416	$0	$327	$2,408	-$6,051	0.28
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	9	Elect.	Elect.	$19,924	$3,709	$928	$0	$12,899	$17,536	-$2,389	0.88
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	10	Elect.	Elect.	$9,962	$1,854	$464	$0	$3,131	$5,450	-$4,513	0.55
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	11	Elect.	Elect.	$3,321	$618	$155	$0	$63	$836	-$2,485	0.25
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	12	Elect.	Elect.	$8,369	$1,904	$477	$0	$5,395	$7,777	-$593	0.93
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	13	Elect.	Elect.	$54,399	$12,379	$3,098	$0	$17,026	$32,504	-$21,896	0.60
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	14	Elect.	Elect.	$25,107	$5,713	$1,430	$0	$6,374	$13,517	-$11,590	0.54
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	15	Elect.	Elect.	$25,107	$5,713	$1,430	$0	$473	$7,616	-$17,491	0.30
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	16	Elect.	Elect.	$14,798	$3,558	$891	$0	$9,512	$13,961	-$837	0.94
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	17	Elect.	Elect.	$64,125	$15,419	$3,859	$0	$20,012	$39,291	-$24,834	0.61
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	18	Elect.	Elect.	$29,596	$7,117	$1,781	$0	$2,359	$11,257	-$18,339	0.38
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	19	Elect.	Elect.	$44,394	$10,675	$2,672	$0	$833	$14,180	-$30,214	0.32
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	20	Elect.	Elect.	$9,865	$2,372	$594	$0	$378	$3,344	-$6,522	0.34
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	21	Elect.	Elect.	$46,097	$8,420	$2,107	$0	$11,222	$21,749	-$24,348	0.47
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	22	Elect.	Elect.	$10,688	$1,818	$455	$0	$419	$2,692	-$7,996	0.25
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	23	Elect.	Elect.	$1,336	$227	$57	$0	$427	$711	-$625	0.53
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	24	Elect.	Elect.	$1,678	$281	$70	$0	$137	$487	-$1,191	0.29
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	25	Elect.	Elect.	$1,678	$281	$70	$0	$296	$647	-$1,031	0.39
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	26	Elect.	Elect.	$1,678	$281	$70	$0	$32	$383	-$1,295	0.23
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	27	Elect.	Elect.	$1,678	$281	$70	$0	$1,256	$1,607	-$71	0.96
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	28	Elect.	Elect.	$13,441	$2,366	$592	$0	$522	$3,480	-$9,962	0.26
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	29	Elect.	Elect.	$6,721	$1,183	$296	$0	$5,002	$6,481	-$240	0.96
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	30	Elect.	Elect.	$2,240	$394	$99	$0	$1,667	$2,160	-$80	0.96
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	31	Elect.	Elect.	$2,240	$394	$99	$0	$337	$830	-$1,410	0.37
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	32	Elect.	Elect.	$2,819	$555	$139	$0	$2,089	$2,783	-$37	0.99
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	33	Elect.	Elect.	$2,819	$555	$139	$0	$1,831	$2,524	-$295	0.90
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	34	Elect.	Elect.	$33,834	$6,656	$1,666	$0	$1,309	$9,630	-$24,204	0.28
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	35	Elect.	Elect.	$9,962	$1,854	$464	$0	$7,360	$9,678	-$284	0.97
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	36	Elect.	Elect.	$9,962	$1,854	$464	$0	$800	$3,118	-$6,844	0.31
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	37	Elect.	Elect.	$53,131	$9,890	$2,475	$0	$2,049	$14,414	-$38,717	0.27
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	38	Elect.	Elect.	$23,245	$4,327	$1,083	$0	$7,306	$12,716	-$10,529	0.55

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	39	Elect.	Elect.	$25,107	$5,713	$1,430	$0	$964	$8,108	-$17,000	0.32
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	40	Elect.	Elect.	$5,035	$842	$211	$0	$3,303	$4,355	-$680	0.86
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	41	Elect.	Elect.	$9,962	$1,854	$464	$0	$384	$2,703	-$7,259	0.27
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	42	Elect.	Elect.	$9,962	$1,854	$464	$0	$188	$2,507	-$7,455	0.25
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	43	Elect.	Elect.	$14,798	$3,558	$891	$0	$4,173	$8,622	-$6,176	0.58
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	44	Elect.	Elect.	$14,798	$3,558	$891	$0	$567	$5,016	-$9,782	0.34
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	45	Elect.	Elect.	$33,229	$4,701	$1,177	$0	$9,979	$15,857	-$17,372	0.48
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	46	Elect.	Elect.	$46,097	$8,420	$2,107	$0	$11,222	$21,749	-$24,348	0.47
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	47	Elect.	Elect.	$8,458	$1,664	$416	$0	$5,493	$7,573	-$886	0.90
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	48	Elect.	Elect.	$2,240	$498	$125	$0	$1,667	$2,290	$50	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	49	Elect.	Elect.	$3,127	$745	$186	$0	$984	$1,916	-$1,212	0.61
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	50	Elect.	Elect.	$3,127	$745	$186	$0	$121	$1,052	-$2,075	0.34
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	51	Elect.	Elect.	$8,369	$2,406	$602	$0	$2,619	$5,627	-$2,742	0.67
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	52	Elect.	Elect.	$8,369	$2,406	$602	$0	$158	$3,165	-$5,204	0.38
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	53	Elect.	Elect.	$9,184	$1,771	$443	$0	$1,756	$3,970	-$5,214	0.43
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	54	Elect.	Elect.	$21,053	$3,742	$937	$0	$6,323	$11,002	-$10,051	0.52
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	55	Elect.	Elect.	$10,526	$1,871	$468	$0	$2,857	$5,196	-$5,330	0.49
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	56	Elect.	Elect.	$10,526	$1,871	$468	$0	$388	$2,727	-$7,799	0.26
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	57	Elect.	Elect.	$10,526	$1,871	$468	$0	$190	$2,530	-$7,997	0.24
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	58	Elect.	Elect.	$12,758	$2,940	$736	$0	$3,831	$7,507	-$5,252	0.59
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	59	Elect.	Elect.	$12,758	$2,940	$736	$0	$3,107	$6,783	-$5,975	0.53
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	60	Elect.	Elect.	$12,758	$2,940	$736	$0	$230	$3,907	-$8,852	0.31
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	61	Elect.	Elect.	$14,624	$3,508	$878	$0	$9,041	$13,428	-$1,196	0.92
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	62	Elect.	Elect.	$43,871	$10,525	$2,634	$0	$13,168	$26,327	-$17,544	0.60
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	63	Elect.	Elect.	$14,624	$3,508	$878	$0	$264	$4,650	-$9,973	0.32
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	64	Elect.	Elect.	$15,733	$3,989	$994	$0	$4,722	$9,685	-$6,048	0.62
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	65	Elect.	Elect.	$4,185	$1,203	$301	$0	$1,310	$2,814	-$1,371	0.67
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	66	Elect.	Elect.	$14,624	$3,508	$878	$0	$539	$4,925	-$9,699	0.34
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	67	Elect.	Elect.	$9,184	$1,771	$443	$0	$2,759	$4,973	-$4,211	0.54
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	68	Elect.	Elect.	$21,053	$3,742	$937	$0	$6,323	$11,002	-$10,051	0.52
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	69	Elect.	Elect.	$12,758	$2,940	$736	$0	$3,831	$7,507	-$5,252	0.59
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	70	Elect.	Elect.	$12,758	$2,940	$736	$0	$230	$3,907	-$8,852	0.31
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	71	Elect.	Elect.	$14,624	$3,508	$878	$0	$9,041	$13,428	-$1,196	0.92
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	72	Elect.	Elect.	$14,624	$3,508	$878	$0	$4,389	$8,776	-$5,848	0.60
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	73	Elect.	Elect.	$14,624	$3,508	$878	$0	$3,560	$7,947	-$6,677	0.54
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	74	Elect.	Elect.	$14,624	$3,508	$878	$0	$1,121	$5,507	-$9,116	0.38
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	75	Elect.	Elect.	$14,624	$3,508	$878	$0	$539	$4,925	-$9,699	0.34
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	76	Elect.	Elect.	$37,266	$10,692	$2,676	$0	$2,856	$16,223	-$21,043	0.44
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	77	Elect.	Elect.	$25,891	$6,014	$1,505	$0	$4,276	$11,796	-$14,096	0.46
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	78	Elect.	Elect.	$155,349	$36,084	$9,032	$0	$2,785	$47,901	-$107,448	0.31
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	79	Elect.	Elect.	$27,872	$7,016	$1,756	$0	$2,127	$10,900	-$16,973	0.39
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	80	Elect.	Elect.	$32,831	$0	$0	$0	$591	$591	-$32,241	0.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	RI	81	Elect.	Elect.	$37,674	$0	$0	$0	$678	$678	-$36,997	0.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	82	Elect.	Elect.	$1,336	$244	$61	$0	$1,005	$1,309	-$26	0.98
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	83	Elect.	Elect.	$2,672	$488	$122	$0	$105	$715	-$1,957	0.27
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	84	Elect.	Elect.	$1,678	$281	$70	$0	$1,256	$1,607	-$71	0.96
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	85	Elect.	Elect.	$1,678	$281	$70	$0	$534	$885	-$793	0.53
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	86	Elect.	Elect.	$6,721	$1,183	$296	$0	$261	$1,740	-$4,981	0.26
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	87	Elect.	Elect.	$8,458	$1,664	$416	$0	$5,127	$7,207	-$1,251	0.85
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	88	Elect.	Elect.	$16,917	$3,328	$833	$0	$654	$4,815	-$12,102	0.28
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	89	Elect.	Elect.	$9,962	$1,854	$464	$0	$6,449	$8,768	-$1,194	0.88
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	90	Elect.	Elect.	$9,962	$1,854	$464	$0	$5,608	$7,926	-$2,036	0.80
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	91	Elect.	Elect.	$9,962	$1,854	$464	$0	$2,261	$4,579	-$5,383	0.46
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	92	Elect.	Elect.	$4,185	$952	$238	$0	$2,698	$3,888	-$296	0.93
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	93	Elect.	Elect.	$12,554	$2,857	$715	$0	$7,555	$11,126	-$1,427	0.89
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	94	Elect.	Elect.	$16,738	$3,809	$953	$0	$643	$5,405	-$11,333	0.32
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	95	Elect.	Elect.	$14,798	$3,558	$891	$0	$8,880	$13,328	-$1,469	0.90
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	96	Elect.	Elect.	$24,663	$5,931	$1,484	$0	$7,697	$15,112	-$9,551	0.61
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	97	Elect.	Elect.	$14,798	$3,558	$891	$0	$3,335	$7,784	-$7,014	0.53
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	98	Elect.	Elect.	$46,097	$8,420	$2,107	$0	$3,534	$14,061	-$32,036	0.31
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	99	Elect.	Elect.	$906	$137	$34	$0	$36	$207	-$699	0.23
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	100	Elect.	Elect.	$4,008	$682	$171	$0	$1,282	$2,134	-$1,874	0.53
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	101	Elect.	Elect.	$8,016	$1,363	$341	$0	$315	$2,019	-$5,997	0.25
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	102	Elect.	Elect.	$6,714	$1,123	$281	$0	$262	$1,666	-$5,048	0.25
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	103	Elect.	Elect.	$4,480	$789	$197	$0	$3,335	$4,320	-$160	0.96
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	104	Elect.	Elect.	$26,883	$4,731	$1,184	$0	$1,044	$6,960	-$19,923	0.26
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	105	Elect.	Elect.	$64,848	$12,756	$3,193	$0	$2,508	$18,458	-$46,391	0.28
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	106	Elect.	Elect.	$199,243	$37,087	$9,283	$0	$7,683	$54,053	-$145,190	0.27

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	107	Elect.	Elect.	$4,185	$952	$238	$0	$334	$1,525	-$2,659	0.36
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	108	Elect.	Elect.	$200,859	$45,707	$11,440	$0	$7,713	$64,860	-$135,998	0.32
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	109	Elect.	Elect.	$4,185	$952	$238	$0	$79	$1,269	-$2,915	0.30
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	110	Elect.	Elect.	$34,529	$8,303	$2,078	$0	$1,322	$11,703	-$22,826	0.34
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	111	Elect.	Elect.	$11,076	$1,567	$392	$0	$408	$2,367	-$8,709	0.21
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	112	Elect.	Elect.	$2,240	$394	$99	$0	$1,667	$2,160	-$80	0.96
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	113	Elect.	Elect.	$8,458	$1,664	$416	$0	$5,127	$7,207	-$1,251	0.85
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	114	Elect.	Elect.	$46,097	$8,420	$2,107	$0	$3,534	$14,061	-$32,036	0.31
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	115	Elect.	Elect.	$3,127	$745	$186	$0	$251	$1,183	-$1,945	0.38
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	116	Elect.	Elect.	$4,185	$1,203	$301	$0	$1,310	$2,814	-$1,371	0.67
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	117	Elect.	Elect.	$4,185	$1,203	$301	$0	$834	$2,337	-$1,847	0.56
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	118	Elect.	Elect.	$4,185	$1,203	$301	$0	$726	$2,230	-$1,955	0.53
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	119	Elect.	Elect.	$4,185	$1,203	$301	$0	$161	$1,665	-$2,520	0.40
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	120	Elect.	Elect.	$8,369	$2,406	$602	$0	$158	$3,165	-$5,204	0.38
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	121	Elect.	Elect.	$9,184	$1,771	$443	$0	$1,311	$3,525	-$5,659	0.38
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	122	Elect.	Elect.	$9,184	$1,771	$443	$0	$705	$2,919	-$6,265	0.32
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	123	Elect.	Elect.	$9,184	$1,771	$443	$0	$166	$2,380	-$6,804	0.26
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	124	Elect.	Elect.	$21,053	$3,742	$937	$0	$4,566	$9,245	-$11,808	0.44
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	125	Elect.	Elect.	$10,526	$1,871	$468	$0	$1,502	$3,841	-$6,685	0.36
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	126	Elect.	Elect.	$21,053	$3,742	$937	$0	$776	$5,455	-$15,598	0.26
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	127	Elect.	Elect.	$12,758	$2,940	$736	$0	$3,107	$6,783	-$5,975	0.53
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	128	Elect.	Elect.	$25,517	$5,880	$1,472	$0	$1,957	$9,309	-$16,208	0.36
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	129	Elect.	Elect.	$25,517	$5,880	$1,472	$0	$461	$7,813	-$17,704	0.31
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	130	Elect.	Elect.	$27,039	$6,014	$1,505	$0	$8,044	$15,563	-$11,476	0.58
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	131	Elect.	Elect.	$27,039	$6,014	$1,505	$0	$5,809	$13,328	-$13,712	0.49
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	132	Elect.	Elect.	$29,836	$7,016	$1,756	$0	$535	$9,307	-$20,529	0.31
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	133	Elect.	Elect.	$70,571	$0	$0	$0	$1,265	$1,265	-$69,306	0.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	134	Elect.	Elect.	$6,255	$1,490	$373	$0	$241	$2,105	-$4,150	0.34
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	135	Elect.	Elect.	$9,184	$1,771	$443	$0	$166	$2,380	-$6,804	0.26
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	136	Elect.	Elect.	$10,526	$1,871	$468	$0	$1,030	$3,369	-$7,157	0.32
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	137	Elect.	Elect.	$10,526	$1,871	$468	$0	$807	$3,147	-$7,380	0.30
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	138	Elect.	Elect.	$12,758	$2,940	$736	$0	$2,766	$6,442	-$6,316	0.50
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	RI	139	Elect.	Elect.	$12,758	$2,940	$736	$0	$1,248	$4,924	-$7,834	0.39
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	1	Elect.	Elect.	$469	$2	$1	$0	$466	$469	$0	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	2	Elect.	Elect.	$1,070	$72	$18	$0	$960	$1,050	-$19	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	3	Elect.	Elect.	$2,682	$166	$41	$0	$2,403	$2,610	-$72	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	4	Elect.	Elect.	$589	$3	$1	$0	$584	$588	-$1	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	5	Elect.	Elect.	$5,356	$349	$87	$0	$4,785	$5,221	-$136	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	6	Elect.	Elect.	$3,763	$174	$43	$0	$3,486	$3,703	-$61	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	7	Elect.	Elect.	$13,457	$961	$246	$0	$11,994	$13,221	-$236	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	8	Elect.	Elect.	$3,071	$31	$8	$0	$3,027	$3,066	-$5	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	9	Elect.	Elect.	$15,828	$1,094	$274	$0	$14,085	$15,453	-$376	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	10	Elect.	Elect.	$5,560	$272	$68	$0	$5,137	$5,477	-$83	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	11	Elect.	Elect.	$1,158	$6	$1	$0	$1,149	$1,156	-$1	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	12	Elect.	Elect.	$6,636	$562	$141	$0	$5,893	$6,595	-$41	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	13	Elect.	Elect.	$30,307	$1,816	$455	$0	$27,961	$30,232	-$75	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	14	Elect.	Elect.	$12,933	$684	$171	$0	$12,054	$12,909	-$24	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	15	Elect.	Elect.	$8,737	$52	$13	$0	$8,672	$8,737	$0	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	16	Elect.	Elect.	$11,719	$1,049	$263	$0	$10,391	$11,703	-$16	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	17	Elect.	Elect.	$35,680	$2,262	$566	$0	$32,885	$35,714	$34	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	18	Elect.	Elect.	$11,570	$274	$69	$0	$11,241	$11,584	$14	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	19	Elect.	Elect.	$15,428	$98	$24	$0	$15,312	$15,434	$6	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	20	Elect.	Elect.	$3,566	$44	$11	$0	$3,513	$3,568	$2	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	21	Elect.	Elect.	$23,316	$1,007	$252	$0	$21,463	$22,722	-$593	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	22	Elect.	Elect.	$3,905	$34	$8	$0	$3,853	$3,896	-$10	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	23	Elect.	Elect.	$752	$33	$8	$0	$698	$740	-$11	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	24	Elect.	Elect.	$662	$11	$3	$0	$645	$658	-$4	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	25	Elect.	Elect.	$774	$23	$6	$0	$737	$766	-$9	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	26	Elect.	Elect.	$589	$3	$1	$0	$584	$588	-$1	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	27	Elect.	Elect.	$1,451	$94	$24	$0	$1,291	$1,409	-$42	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	28	Elect.	Elect.	$4,889	$44	$11	$0	$4,821	$4,876	-$13	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	29	Elect.	Elect.	$5,794	$397	$99	$0	$5,141	$5,637	-$156	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	30	Elect.	Elect.	$1,931	$132	$33	$0	$1,714	$1,879	-$52	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	31	Elect.	Elect.	$991	$28	$7	$0	$947	$982	-$9	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	32	Elect.	Elect.	$2,426	$186	$47	$0	$2,148	$2,380	-$46	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	33	Elect.	Elect.	$2,243	$164	$41	$0	$1,999	$2,203	-$39	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	34	Elect.	Elect.	$12,283	$124	$31	$0	$12,109	$12,264	-$19	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	35	Elect.	Elect.	$8,560	$622	$156	$0	$7,565	$8,343	-$217	0.97

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	36	Elect.	Elect.	$3,907	$72	$18	$0	$3,799	$3,888	-$19	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	37	Elect.	Elect.	$19,263	$184	$46	$0	$18,987	$19,217	-$47	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	38	Elect.	Elect.	$12,974	$635	$159	$0	$11,987	$12,781	-$194	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	39	Elect.	Elect.	$9,086	$106	$27	$0	$8,953	$9,086	$0	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	40	Elect.	Elect.	$4,023	$248	$62	$0	$3,604	$3,915	-$109	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	41	Elect.	Elect.	$3,612	$35	$9	$0	$3,560	$3,603	-$9	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	42	Elect.	Elect.	$3,473	$17	$4	$0	$3,448	$3,469	-$4	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	43	Elect.	Elect.	$7,917	$473	$118	$0	$7,334	$7,926	$9	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	44	Elect.	Elect.	$5,349	$66	$17	$0	$5,269	$5,352	$4	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	45	Elect.	Elect.	$18,183	$690	$173	$0	$16,540	$17,402	-$781	0.96
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	46	Elect.	Elect.	$23,316	$1,007	$252	$0	$21,463	$22,722	-$593	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	47	Elect.	Elect.	$6,729	$491	$123	$0	$5,997	$6,610	-$118	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	48	Elect.	Elect.	$1,931	$167	$42	$0	$1,714	$1,923	-$9	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	49	Elect.	Elect.	$1,746	$109	$27	$0	$1,614	$1,751	$4	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	50	Elect.	Elect.	$1,134	$14	$3	$0	$1,118	$1,136	$1	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	51	Elect.	Elect.	$4,663	$353	$88	$0	$4,302	$4,743	$80	1.02
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	52	Elect.	Elect.	$2,912	$22	$6	$0	$2,891	$2,918	$6	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	53	Elect.	Elect.	$4,296	$167	$42	$0	$4,008	$4,217	-$80	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	54	Elect.	Elect.	$11,521	$549	$137	$0	$10,480	$11,166	-$355	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	55	Elect.	Elect.	$5,539	$249	$62	$0	$5,068	$5,380	-$159	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	56	Elect.	Elect.	$3,742	$35	$9	$0	$3,678	$3,722	-$20	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	57	Elect.	Elect.	$3,598	$17	$4	$0	$3,567	$3,588	-$10	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	58	Elect.	Elect.	$6,981	$431	$108	$0	$6,349	$6,889	-$92	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	59	Elect.	Elect.	$6,454	$352	$88	$0	$5,942	$6,382	-$72	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	60	Elect.	Elect.	$4,360	$27	$7	$0	$4,322	$4,356	-$4	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	61	Elect.	Elect.	$11,387	$1,035	$259	$0	$9,895	$11,189	-$199	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	62	Elect.	Elect.	$24,001	$1,544	$386	$0	$21,828	$23,759	-$243	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	63	Elect.	Elect.	$4,997	$32	$8	$0	$4,953	$4,994	-$3	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	64	Elect.	Elect.	$8,607	$582	$146	$0	$7,827	$8,555	-$52	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	65	Elect.	Elect.	$2,331	$176	$44	$0	$2,151	$2,371	$40	1.02
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	66	Elect.	Elect.	$5,197	$65	$16	$0	$5,108	$5,190	-$7	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	67	Elect.	Elect.	$5,026	$260	$65	$0	$4,573	$4,897	-$129	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	68	Elect.	Elect.	$11,521	$549	$137	$0	$10,480	$11,166	-$355	0.97
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	69	Elect.	Elect.	$6,981	$431	$108	$0	$6,349	$6,889	-$92	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	70	Elect.	Elect.	$4,360	$27	$7	$0	$4,322	$4,356	-$4	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	71	Elect.	Elect.	$11,387	$1,035	$259	$0	$9,895	$11,189	-$199	0.98
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	72	Elect.	Elect.	$8,000	$515	$129	$0	$7,276	$7,920	-$81	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	73	Elect.	Elect.	$7,397	$420	$105	$0	$6,809	$7,334	-$63	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	74	Elect.	Elect.	$5,621	$135	$34	$0	$5,436	$5,605	-$16	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	75	Elect.	Elect.	$5,197	$65	$16	$0	$5,108	$5,190	-$7	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	76	Elect.	Elect.	$14,322	$412	$103	$0	$13,849	$14,365	$43	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	77	Elect.	Elect.	$11,607	$496	$124	$0	$10,881	$11,502	-$106	0.99
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	78	Elect.	Elect.	$52,923	$331	$83	$0	$52,451	$52,864	-$59	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	79	Elect.	Elect.	$10,693	$271	$68	$0	$10,335	$10,673	-$19	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	80	Elect.	Elect.	$11,202	$106	$26	$0	$11,103	$11,235	$33	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	81	Elect.	Elect.	$12,853	$129	$32	$0	$12,739	$12,900	$47	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	82	Elect.	Elect.	$1,157	$82	$20	$0	$1,032	$1,135	-$22	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	83	Elect.	Elect.	$976	$9	$2	$0	$963	$975	-$2	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	84	Elect.	Elect.	$1,451	$94	$24	$0	$1,291	$1,409	-$42	0.97
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	85	Elect.	Elect.	$942	$41	$10	$0	$874	$926	-$16	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	86	Elect.	Elect.	$2,445	$22	$6	$0	$2,411	$2,438	-$7	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	87	Elect.	Elect.	$6,470	$459	$115	$0	$5,787	$6,361	-$109	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	88	Elect.	Elect.	$6,142	$62	$16	$0	$6,055	$6,132	-$10	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	89	Elect.	Elect.	$7,914	$547	$137	$0	$7,043	$7,726	-$188	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	90	Elect.	Elect.	$7,317	$478	$120	$0	$6,559	$7,157	-$160	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	91	Elect.	Elect.	$4,943	$198	$50	$0	$4,638	$4,885	-$58	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	92	Elect.	Elect.	$3,318	$281	$70	$0	$2,946	$3,298	-$21	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	93	Elect.	Elect.	$9,572	$788	$197	$0	$8,531	$9,516	-$55	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	94	Elect.	Elect.	$6,058	$71	$18	$0	$5,969	$6,058	$0	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	95	Elect.	Elect.	$11,269	$982	$246	$0	$10,029	$11,256	-$12	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	96	Elect.	Elect.	$13,723	$870	$218	$0	$12,648	$13,736	$13	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	97	Elect.	Elect.	$7,320	$380	$95	$0	$6,854	$7,329	$10	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	98	Elect.	Elect.	$17,718	$325	$81	$0	$17,135	$17,541	-$177	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	99	Elect.	Elect.	$332	$3	$1	$0	$328	$331	-$1	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	100	Elect.	Elect.	$2,255	$100	$25	$0	$2,095	$2,221	-$34	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	101	Elect.	Elect.	$2,929	$25	$6	$0	$2,890	$2,922	-$7	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	102	Elect.	Elect.	$2,448	$21	$5	$0	$2,415	$2,441	-$7	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	103	Elect.	Elect.	$3,862	$265	$66	$0	$3,427	$3,758	-$104	0.97

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	104	Elect.	Elect.	$9,779	$88	$22	$0	$9,642	$9,752	-$26	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	105	Elect.	Elect.	$23,543	$237	$59	$0	$23,209	$23,506	-$37	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	106	Elect.	Elect.	$72,238	$690	$173	$0	$71,200	$72,063	-$175	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	107	Elect.	Elect.	$1,638	$37	$9	$0	$1,592	$1,638	$0	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	108	Elect.	Elect.	$72,690	$851	$213	$0	$71,627	$72,691	$1	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	109	Elect.	Elect.	$1,456	$9	$2	$0	$1,445	$1,456	$0	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	110	Elect.	Elect.	$12,480	$155	$39	$0	$12,295	$12,488	$9	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	111	Elect.	Elect.	$3,937	$29	$7	$0	$3,870	$3,906	-$31	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	112	Elect.	Elect.	$1,931	$132	$33	$0	$1,714	$1,879	-$52	0.97
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	113	Elect.	Elect.	$6,470	$459	$115	$0	$5,787	$6,361	-$109	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	114	Elect.	Elect.	$17,718	$325	$81	$0	$17,135	$17,541	-$177	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	115	Elect.	Elect.	$1,227	$29	$7	$0	$1,193	$1,229	$2	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	116	Elect.	Elect.	$2,331	$176	$44	$0	$2,151	$2,371	$40	1.02
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	117	Elect.	Elect.	$1,993	$114	$28	$0	$1,878	$2,020	$27	1.01
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	118	Elect.	Elect.	$1,916	$99	$25	$0	$1,816	$1,940	$24	1.01
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	119	Elect.	Elect.	$1,514	$22	$6	$0	$1,492	$1,520	$6	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	120	Elect.	Elect.	$2,912	$22	$6	$0	$2,891	$2,918	$6	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	121	Elect.	Elect.	$3,972	$126	$31	$0	$3,757	$3,914	-$58	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	122	Elect.	Elect.	$3,531	$68	$17	$0	$3,415	$3,501	-$31	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	123	Elect.	Elect.	$3,139	$16	$4	$0	$3,112	$3,132	-$7	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	124	Elect.	Elect.	$10,242	$400	$100	$0	$9,490	$9,990	-$252	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	125	Elect.	Elect.	$4,553	$133	$33	$0	$4,305	$4,471	-$81	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	126	Elect.	Elect.	$7,484	$70	$17	$0	$7,356	$7,443	-$41	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	127	Elect.	Elect.	$6,454	$352	$88	$0	$5,942	$6,382	-$72	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	128	Elect.	Elect.	$9,809	$227	$57	$0	$9,487	$9,770	-$39	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	129	Elect.	Elect.	$8,720	$54	$13	$0	$8,644	$8,712	-$9	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	130	Elect.	Elect.	$14,737	$882	$221	$0	$13,361	$14,464	-$272	0.98
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	131	Elect.	Elect.	$13,101	$642	$161	$0	$12,107	$12,911	-$190	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	132	Elect.	Elect.	$10,162	$64	$16	$0	$10,071	$10,152	-$11	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	133	Elect.	Elect.	$24,045	$178	$44	$0	$23,830	$24,052	$8	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	134	Elect.	Elect.	$2,269	$28	$7	$0	$2,236	$2,271	$2	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	135	Elect.	Elect.	$3,139	$16	$4	$0	$3,112	$3,132	-$7	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	136	Elect.	Elect.	$4,209	$92	$23	$0	$4,040	$4,154	-$55	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	137	Elect.	Elect.	$4,047	$72	$18	$0	$3,914	$4,004	-$43	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	138	Elect.	Elect.	$6,206	$314	$79	$0	$5,750	$6,143	-$63	0.99
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	139	Elect.	Elect.	$5,101	$144	$36	$0	$4,895	$5,075	-$26	0.99
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	1	Elect.	Elect.	$521	$8	$2	$0	$515	$523	$1	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	2	Elect.	Elect.	$1,188	$201	$50	$0	$969	$1,221	$33	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	3	Elect.	Elect.	$2,984	$464	$116	$0	$2,425	$3,005	$21	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	4	Elect.	Elect.	$655	$7	$2	$0	$647	$656	$1	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	5	Elect.	Elect.	$5,975	$977	$244	$0	$4,831	$6,052	$78	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	6	Elect.	Elect.	$4,198	$486	$122	$0	$3,642	$4,250	$52	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	7	Elect.	Elect.	$15,039	$2,748	$688	$0	$12,112	$15,548	$509	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	8	Elect.	Elect.	$3,432	$87	$22	$0	$3,345	$3,453	$21	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	9	Elect.	Elect.	$17,713	$3,063	$767	$0	$14,226	$18,055	$343	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	10	Elect.	Elect.	$6,222	$762	$191	$0	$5,376	$6,328	$106	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	11	Elect.	Elect.	$1,295	$16	$4	$0	$1,279	$1,298	$3	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	12	Elect.	Elect.	$7,440	$1,573	$394	$0	$5,953	$7,919	$479	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	13	Elect.	Elect.	$33,978	$5,085	$1,273	$0	$29,285	$35,643	$1,666	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	14	Elect.	Elect.	$14,499	$1,914	$479	$0	$12,742	$15,135	$636	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	15	Elect.	Elect.	$9,795	$147	$37	$0	$9,665	$9,848	$53	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	16	Elect.	Elect.	$13,155	$2,938	$735	$0	$10,499	$14,172	$1,017	1.08
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	17	Elect.	Elect.	$40,052	$6,334	$1,585	$0	$34,463	$42,382	$2,330	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	18	Elect.	Elect.	$12,988	$768	$192	$0	$12,329	$13,290	$302	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	19	Elect.	Elect.	$17,319	$274	$69	$0	$17,086	$17,429	$110	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	20	Elect.	Elect.	$4,003	$124	$31	$0	$3,897	$4,052	$49	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	21	Elect.	Elect.	$26,620	$2,821	$706	$0	$22,914	$26,441	-$179	0.99
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	22	Elect.	Elect.	$4,336	$95	$24	$0	$4,232	$4,351	$14	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	23	Elect.	Elect.	$834	$93	$23	$0	$728	$845	$11	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	24	Elect.	Elect.	$737	$30	$8	$0	$702	$740	$3	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	25	Elect.	Elect.	$862	$65	$16	$0	$787	$868	$6	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	26	Elect.	Elect.	$655	$7	$2	$0	$647	$656	$1	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	27	Elect.	Elect.	$1,614	$264	$66	$0	$1,295	$1,625	$11	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	28	Elect.	Elect.	$5,453	$123	$31	$0	$5,317	$5,471	$18	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	29	Elect.	Elect.	$6,462	$1,111	$278	$0	$5,157	$6,547	$84	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	30	Elect.	Elect.	$2,154	$370	$93	$0	$1,719	$2,182	$28	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	31	Elect.	Elect.	$1,106	$78	$20	$0	$1,018	$1,116	$10	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	32	Elect.	Elect.	$2,711	$521	$130	$0	$2,154	$2,806	$95	1.04

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	33	Elect.	Elect.	$2,507	$458	$115	$0	$2,019	$2,591	$85	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	34	Elect.	Elect.	$13,727	$347	$87	$0	$13,379	$13,812	$85	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	35	Elect.	Elect.	$9,579	$1,742	$436	$0	$7,590	$9,768	$189	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	36	Elect.	Elect.	$4,372	$200	$50	$0	$4,156	$4,406	$34	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	37	Elect.	Elect.	$21,557	$515	$129	$0	$21,003	$21,647	$91	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	38	Elect.	Elect.	$14,519	$1,777	$445	$0	$12,544	$14,766	$248	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	39	Elect.	Elect.	$10,187	$298	$75	$0	$9,921	$10,293	$107	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	40	Elect.	Elect.	$4,477	$695	$174	$0	$3,638	$4,508	$31	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	41	Elect.	Elect.	$4,042	$97	$24	$0	$3,938	$4,059	$17	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	42	Elect.	Elect.	$3,886	$48	$12	$0	$3,836	$3,895	$9	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	43	Elect.	Elect.	$8,887	$1,325	$332	$0	$7,722	$9,378	$491	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	44	Elect.	Elect.	$6,004	$185	$46	$0	$5,846	$6,078	$74	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	45	Elect.	Elect.	$20,754	$1,931	$483	$0	$17,467	$19,882	-$873	0.96
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	46	Elect.	Elect.	$26,620	$2,821	$706	$0	$22,914	$26,441	-$179	0.99
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	47	Elect.	Elect.	$7,520	$1,374	$344	$0	$6,056	$7,774	$255	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	48	Elect.	Elect.	$2,154	$468	$117	$0	$1,719	$2,304	$150	1.07
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	49	Elect.	Elect.	$1,953	$306	$77	$0	$1,689	$2,071	$118	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	50	Elect.	Elect.	$1,269	$39	$10	$0	$1,236	$1,285	$16	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	51	Elect.	Elect.	$5,227	$988	$247	$0	$4,505	$5,741	$514	1.10
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	52	Elect.	Elect.	$3,265	$62	$15	$0	$3,222	$3,299	$34	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	53	Elect.	Elect.	$4,903	$469	$117	$0	$4,326	$4,911	$8	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	54	Elect.	Elect.	$13,149	$1,537	$385	$0	$11,067	$12,989	-$160	0.99
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	55	Elect.	Elect.	$6,322	$697	$174	$0	$5,381	$6,252	-$70	0.99
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	56	Elect.	Elect.	$4,271	$98	$24	$0	$4,143	$4,265	-$6	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	57	Elect.	Elect.	$4,107	$48	$12	$0	$4,044	$4,104	-$3	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	58	Elect.	Elect.	$7,969	$1,208	$302	$0	$6,706	$8,216	$247	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	59	Elect.	Elect.	$7,368	$985	$247	$0	$6,343	$7,575	$207	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	60	Elect.	Elect.	$4,977	$75	$19	$0	$4,901	$4,996	$18	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	61	Elect.	Elect.	$13,000	$2,897	$725	$0	$10,016	$13,638	$638	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	62	Elect.	Elect.	$27,402	$4,323	$1,082	$0	$23,055	$28,460	$1,059	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	63	Elect.	Elect.	$5,705	$90	$23	$0	$5,618	$5,730	$25	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	64	Elect.	Elect.	$9,827	$1,631	$408	$0	$8,267	$10,306	$479	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	65	Elect.	Elect.	$2,614	$494	$124	$0	$2,253	$2,870	$257	1.10
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	66	Elect.	Elect.	$5,933	$183	$46	$0	$5,755	$5,984	$51	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	67	Elect.	Elect.	$5,736	$727	$182	$0	$4,829	$5,738	$2	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	68	Elect.	Elect.	$13,149	$1,537	$385	$0	$11,067	$12,989	-$160	0.99
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	69	Elect.	Elect.	$7,969	$1,208	$302	$0	$6,706	$8,216	$247	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	70	Elect.	Elect.	$4,977	$75	$19	$0	$4,901	$4,996	$18	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	71	Elect.	Elect.	$13,000	$2,897	$725	$0	$10,016	$13,638	$638	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	72	Elect.	Elect.	$9,134	$1,441	$361	$0	$7,685	$9,487	$353	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	73	Elect.	Elect.	$8,445	$1,175	$294	$0	$7,270	$8,739	$294	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	74	Elect.	Elect.	$6,417	$379	$95	$0	$6,047	$6,521	$104	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	75	Elect.	Elect.	$5,933	$183	$46	$0	$5,755	$5,984	$51	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	76	Elect.	Elect.	$16,354	$1,154	$289	$0	$15,409	$16,853	$499	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	77	Elect.	Elect.	$13,292	$1,390	$348	$0	$11,840	$13,577	$285	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	78	Elect.	Elect.	$60,605	$926	$232	$0	$59,659	$60,817	$212	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	79	Elect.	Elect.	$12,231	$758	$190	$0	$11,516	$12,463	$232	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	80	Elect.	Elect.	$12,808	$0	$0	$0	$12,610	$12,610	-$198	0.98
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	81	Elect.	Elect.	$14,698	$0	$0	$0	$14,470	$14,470	-$227	0.98
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	82	Elect.	Elect.	$1,285	$229	$57	$0	$1,035	$1,322	$37	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	83	Elect.	Elect.	$1,084	$25	$6	$0	$1,058	$1,090	$6	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	84	Elect.	Elect.	$1,614	$264	$66	$0	$1,295	$1,625	$11	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	85	Elect.	Elect.	$1,048	$115	$29	$0	$913	$1,057	$8	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	86	Elect.	Elect.	$2,727	$62	$15	$0	$2,659	$2,736	$9	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	87	Elect.	Elect.	$7,230	$1,286	$322	$0	$5,864	$7,472	$241	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	88	Elect.	Elect.	$6,864	$173	$43	$0	$6,689	$6,906	$43	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	89	Elect.	Elect.	$8,856	$1,531	$383	$0	$7,113	$9,028	$171	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	90	Elect.	Elect.	$8,188	$1,338	$335	$0	$6,673	$8,345	$157	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	91	Elect.	Elect.	$5,532	$555	$139	$0	$4,921	$5,614	$82	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	92	Elect.	Elect.	$3,720	$786	$197	$0	$2,977	$3,960	$240	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	93	Elect.	Elect.	$10,731	$2,207	$552	$0	$8,649	$11,409	$678	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	94	Elect.	Elect.	$6,791	$199	$50	$0	$6,614	$6,862	$71	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	95	Elect.	Elect.	$12,649	$2,749	$688	$0	$10,169	$13,607	$957	1.08
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	96	Elect.	Elect.	$15,405	$2,436	$610	$0	$13,255	$16,301	$896	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	97	Elect.	Elect.	$8,217	$1,064	$266	$0	$7,285	$8,616	$399	1.05
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	98	Elect.	Elect.	$20,229	$909	$228	$0	$19,062	$20,199	-$30	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	99	Elect.	Elect.	$368	$7	$2	$0	$359	$368	$0	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	100	Elect.	Elect.	$2,503	$280	$70	$0	$2,185	$2,535	$32	1.01

Table 3.5
All EROs: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	101	Elect.	Elect.	$3,252	$71	$18	$0	$3,174	$3,263	$11	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	102	Elect.	Elect.	$2,724	$59	$15	$0	$2,657	$2,731	$7	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	103	Elect.	Elect.	$4,306	$741	$185	$0	$3,438	$4,364	$56	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	104	Elect.	Elect.	$10,907	$247	$62	$0	$10,634	$10,943	$36	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	105	Elect.	Elect.	$26,311	$665	$166	$0	$25,642	$26,474	$163	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	106	Elect.	Elect.	$80,838	$1,933	$484	$0	$78,761	$81,178	$340	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	107	Elect.	Elect.	$1,836	$103	$26	$0	$1,744	$1,873	$36	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	108	Elect.	Elect.	$81,494	$2,382	$596	$0	$79,368	$82,346	$853	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	109	Elect.	Elect.	$1,632	$24	$6	$0	$1,611	$1,641	$9	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	110	Elect.	Elect.	$14,009	$433	$108	$0	$13,640	$14,181	$172	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	111	Elect.	Elect.	$4,494	$82	$20	$0	$4,359	$4,462	-$32	0.99
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	112	Elect.	Elect.	$2,154	$370	$93	$0	$1,719	$2,182	$28	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	113	Elect.	Elect.	$7,230	$1,286	$322	$0	$5,864	$7,472	$241	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	114	Elect.	Elect.	$20,229	$909	$228	$0	$19,062	$20,199	-$30	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	115	Elect.	Elect.	$1,372	$80	$20	$0	$1,305	$1,405	$33	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	116	Elect.	Elect.	$2,614	$494	$124	$0	$2,253	$2,870	$257	1.10
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	117	Elect.	Elect.	$2,234	$318	$80	$0	$2,004	$2,402	$168	1.08
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	118	Elect.	Elect.	$2,148	$278	$70	$0	$1,948	$2,296	$147	1.07
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	119	Elect.	Elect.	$1,698	$63	$16	$0	$1,653	$1,732	$34	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	120	Elect.	Elect.	$3,265	$62	$15	$0	$3,222	$3,299	$34	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	121	Elect.	Elect.	$4,533	$352	$88	$0	$4,102	$4,542	$9	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	122	Elect.	Elect.	$4,030	$191	$48	$0	$3,798	$4,037	$7	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	123	Elect.	Elect.	$3,583	$45	$11	$0	$3,528	$3,585	$2	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	124	Elect.	Elect.	$11,690	$1,119	$280	$0	$10,186	$11,586	-$104	0.99
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	125	Elect.	Elect.	$5,196	$372	$93	$0	$4,702	$5,167	-$29	0.99
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	126	Elect.	Elect.	$8,542	$195	$49	$0	$8,286	$8,530	-$12	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	127	Elect.	Elect.	$7,368	$985	$247	$0	$6,343	$7,575	$207	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	128	Elect.	Elect.	$11,198	$635	$159	$0	$10,552	$11,346	$149	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	129	Elect.	Elect.	$9,955	$151	$38	$0	$9,803	$9,991	$37	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	130	Elect.	Elect.	$16,889	$2,471	$618	$0	$14,137	$17,226	$338	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	131	Elect.	Elect.	$15,014	$1,799	$450	$0	$13,027	$15,276	$262	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	132	Elect.	Elect.	$11,640	$180	$45	$0	$11,458	$11,683	$43	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	133	Elect.	Elect.	$27,531	$0	$0	$0	$27,102	$27,102	-$429	0.98
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	134	Elect.	Elect.	$2,538	$78	$19	$0	$2,473	$2,570	$32	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	135	Elect.	Elect.	$3,583	$45	$11	$0	$3,528	$3,585	$2	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	136	Elect.	Elect.	$4,804	$257	$64	$0	$4,465	$4,786	-$18	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	137	Elect.	Elect.	$4,619	$202	$51	$0	$4,353	$4,606	-$13	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	138	Elect.	Elect.	$7,084	$879	$220	$0	$6,172	$7,272	$187	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	139	Elect.	Elect.	$5,823	$403	$101	$0	$5,411	$5,916	$93	1.02
Wtr. Heating	Capehart Hsg	Water Heater	Desuperheater	RI	1	Elect.	Elect.	$349,650	$1,064,261	NA	$0	-$461,648	$602,614	$252,964	1.72
Wtr. Heating	APPR PFY50	WH-1	Solar Water Heater	RI	1	Elect.	Elect.	$2,094	$3,442	NA	$0	-$848	$2,594	$500	1.24
Wtr. Heating	Capehart Hsg	WH-1	Solar Water Heater	RI	2	Elect.	Elect.	$697,302	$1,146,241	NA	$0	-$282,454	$863,787	$166,485	1.24
Wtr. Heating	Wherry Hsg	WH-1	Solar Water Heater	RI	3	Elect.	Elect.	$386,692	$635,653	NA	$0	-$156,636	$479,017	$92,325	1.24
Wtr. Heating	Temp.Lod.Fac.	WH-1	Solar Water Heater	RI	4	Elect.	Elect.	$34,900	$57,369	NA	$0	-$14,137	$43,233	$8,333	1.24
Wtr. Heating	501	Water Heater	Solar Water Heater	RI	1a	Elect.	Elect.	$20,125	$32,493	NA	$0	-$8,152	$24,341	$4,216	1.21
Wtr. Heating	502	Water Heater	Solar Water Heater	RI	1b	Elect.	Elect.	$20,125	$32,493	NA	$0	-$8,152	$24,341	$4,216	1.21
Wtr. Heating	503	Water Heater	Solar Water Heater	RI	1c	Elect.	Elect.	$20,125	$32,493	NA	$0	-$8,152	$24,341	$4,216	1.21
Wtr. Heating	504	Water Heater	Solar Water Heater	RI	1d	Elect.	Elect.	$20,125	$32,527	NA	$0	-$8,152	$24,375	$4,250	1.21
Wtr. Heating	505	Water Heater	Solar Water Heater	RI	1e	Elect.	Elect.	$18,477	$29,348	NA	$0	-$7,484	$21,864	$3,387	1.18
Wtr. Heating	506	Water Heater	Solar Water Heater	RI	1f	Elect.	Elect.	$18,477	$29,348	NA	$0	-$7,484	$21,864	$3,387	1.18
Wtr. Heating	Family Housing	Elec. Wtr. Htrs	Eff. Elec. Wtr. Htrs	RI	1	Elect.	Elect.	$637,960	$95,900	NA	$0	$52,134	$148,034	-$489,926	0.23
Wtr. Heating	Family Housing	Elec. Wtr. Htrs	Elec. Heat Pump	RI	2	Elect.	Elect.	$2,256,200	$934,841	NA	$0	-$861,287	$73,554	-$2,182,646	0.03
Wtr. Heating	Family Housing	Elec. Wtr. Htrs	Eff. Elec. Wtr. Htrs	ROF	1	Elect.	Elect.	$484,797	$59,960	NA	$0	$282,428	$342,388	-$142,409	0.71
Wtr. Heating	Family Housing	Elec. Wtr. Htrs	Elec. Heat Pump	ROF	2	Elect.	Elect.	$1,714,527	$584,493	NA	$0	-$46,831	$537,662	-$1,176,864	0.31

(a): NA denotes EROs where demand reductions were not considered because of uncertainty about contribution to the monthly peak.
(b): Optimal choice was not retrofit. Therefore, no SIR can be calculated.

Table 3.6
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Controls	R&D	E-6	EMCS(exist. chill.)	RI	6	Elect.	Elect.	777	NA (a)	777	NA	$109,069	13.39
Lighting	2	INC 2x60 Ceil	CFL 2-11 CEIL FIXT	RI	13	Elect.	Elect.	94	28	94	28	$20,895	13.34
Lighting	3	INC 2x60 ceil	CFL 2-11 CEIL FIXT	RI	10	Elect.	Elect.	9,779	3,211	9,779	3,211	$2,193,024	12.38
Envelope	CLUB	Heating/Cooling	Weath. Package	RI	4c	Elect.	Elect.	121	NA	121	NA	$17,895	7.96
Lighting	2	INC 60 Ceil	CFL 11 CEIL FIXT	RI	15	Elect.	Elect.	737	266	737	266	$165,899	7.30
Controls	DGR	E-3	EMCS(exist. chill.)	RI	3	Elect.	Elect.	213	NA	213	NA	$27,653	7.28
Lighting	1	2F40ES STD	SENS	RI	2b	Elect.	Elect.	252	142	252	142	$74,545	7.23
Lighting	3	INC 75 Ceil	CFL 2-9 + BLST	RI	12	Elect.	Elect.	4,260	1,399	4,260	1,399	$672,388	6.05
Lighting	2	INC 75 Ceil	CFL 2-9 + BLST	RI	16	Elect.	Elect.	89	32	89	32	$14,230	5.64
Controls	ADMIN	E-1	EMCS(exist. chill.)	RI	1	Elect.	Elect.	492	NA	492	NA	$60,273	5.57
Lighting	2	EXIT INC (2x15)	LED	RI	11	Elect.	Elect.	27	11	27	11	$21,981	5.51
Lighting	1	EXIT INC(2x15)	LED	RI	8	Elect.	Elect.	408	164	408	164	$328,429	5.51
Lighting	5	INC 2-60	CFL 2-15 CEIL	RI	2	Elect.	Elect.	2,756	2,241	2,756	2,241	$729,393	5.19
Lighting	2	3F40ES STD	2F40ES ELC REF SENS	RI	7b	Elect.	Elect.	274	83	274	83	$53,225	4.95
Lighting	1	INC 75 Can	CFL 20 + BLST	RI	9	Elect.	Elect.	985	590	985	590	$206,458	4.87
Envelope	Wherry	Heating/Cooling	Ceiling Insulation	RI	1b	Elect.	Elect.	11,498	NA	11,498	NA	$1,529,257	4.67
Envelope	FAM HSG	Heating/Cooling	Refl. Window Trtmnt	RI	2b	Elect.	Elect.	12,220	NA	12,220	NA	$1,619,221	4.61
Lighting	2	3F40ES STD	2F40ES ELC REF	RI	7a	Elect.	Elect.	363	109	363	109	$67,793	4.49
Lighting	5	INC 1-60	CFL 15 CEIL	RI	3	Elect.	Elect.	1,308	560	1,308	560	$251,910	4.44
Controls	COMCATN	E-2	EMCS(exist. chill.)	RI	2	Elect.	Elect.	715	NA	715	NA	$81,790	4.38
Lighting	2	4F40 STD	3F32T8 ELC REF	RI	9	Elect.	Elect.	1,520	461	1,520	461	$237,624	4.17
Controls	SHOP-ELC	E-8	EMCS(exist. chill.)	RI	8	Elect.	Elect.	61	NA	61	NA	$6,820	4.10
Lighting	2	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	170	62	170	62	$26,580	3.66
Lighting	2	EXIT 2xPL9	LED	RI	10	Elect.	Elect.	210	84	210	84	$124,019	3.25
Controls	MISC	E-4	EMCS(exist. chill.)	RI	4	Elect.	Elect.	48	NA	48	NA	$4,899	3.23
Lighting	1	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	1,820	779	1,820	779	$281,604	3.22
Lighting	3	INC 100 Ceil	CFL 2-11 CEIL FIXT	RI	8	Elect.	Elect.	41	46	41	46	$7,781	3.20
Lighting	2	2F40ES STD	2F32T8 ELC SENS	RI	3b	Elect.	Elect.	396	131	396	131	$70,751	3.19
Controls	REC	E-7	EMCS(exist. chill.)	RI	7	Elect.	Elect.	141	NA	141	NA	$14,068	3.13
Envelope	BRK/ADM	Heating/Cooling	Weath. Package	RI	4b	Elect.	Elect.	604	NA	604	NA	$66,285	2.85
Lighting	1	3F40ES STD	2F40ES ELC REF SENS	RI	5b	Elect.	Elect.	4,691	2,814	4,691	2,814	$841,312	2.83
Lighting	2	EXIT INC (2x20)	LED	RI	12	Elect.	Elect.	55	22	55	22	$12,568	2.80
Lighting	3	EXIT INC(2x20)	LED	RI	7	Elect.	Elect.	28	11	28	11	$6,500	2.80
Lighting	1	3F40ES STD	2F40ES ELC REF	RI	5a	Elect.	Elect.	5,707	3,424	5,707	3,424	$983,435	2.61
Lighting	3	2F40 STD	2F40ES ELC REF SENS	RI	2b	Elect.	Elect.	83	29	83	29	$11,932	2.61
Envelope	ADMIN	Heating/Cooling	Weath. Package	RI	4a	Elect.	Elect.	1,437	NA	1,437	NA	$143,750	2.45
Envelope	TLF	Heating/Cooling	Refl. Window Trtmnt	RI	2a	Elect.	Elect.	2,337	NA	2,337	NA	$229,582	2.38
Lighting	1	4F40ES STD	3F40ES ELC REF	RI	4	Elect.	Elect.	295	154	295	154	$42,470	2.23
Boilers	Multiple	All Boilers	Tune-up 50	RI	3	NG,F.Oil	NG,F.Oil	623	0	623	0	$19,734	2.13
Lighting	2	4F40ES STD	3F40ES ELC REF SENS	RI	8b	Elect.	Elect.	90	69	90	69	$13,738	2.09
Lighting	3	3F40 STD	2F40 STD REF	RI	4b	Elect.	Elect.	10	11	10	11	$1,544	1.99
Lighting	3	3F40 STD	2F40 STD REF	RI	4a	Elect.	Elect.	10	11	10	11	$1,543	1.99
Lighting	3	2F40 STD	2F40ES ELC REF	RI	2a	Elect.	Elect.	1,499	519	1,499	519	$164,615	1.98
Transport.	Vehicles	Various	CNG Vehicle	RI		Gas/Diesel	NG,Diesel	1,268	0	1,268	0	1,254,734	1.97
Motors	CLUB	Fan Motor	Eff. Motor	RI	5a	Elect.	Elect.	17	8	17	8	$1,938	1.95
Motors	PLT-BLD	Fan Motor	Eff. Motor	RI	16a	Elect.	Elect.	5	2	5	2	$599	1.94
Motors	RESTRNT	Fan Motor	Eff. Motor	RI	19a	Elect.	Elect.	4	2	4	2	$422	1.94
Motors	CHAPEL	Fan Motor	Eff. Motor	RI	3a	Elect.	Elect.	13	6	13	6	$1,530	1.94
Motors	CLINIC	Fan Motor	Eff. Motor	RI	4a	Elect.	Elect.	8	4	8	4	$885	1.94
Motors	TRAING	Fan Motor	Eff. Motor	RI	25a	Elect.	Elect.	44	20	44	20	$5,066	1.94
Motors	STOR-UH	Fan Motor	Eff. Motor	RI	23a	Elect.	Elect.	47	22	47	22	$5,468	1.94

Table 3.6
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Motors	TERMINL	Fan Motor	Eff. Motor	RI	24a	Elect.	Elect.	97	45	97	45	$11,208	1.94
Motors	COMCATN	Fan Motor	Eff. Motor	RI	6a	Elect.	Elect.	93	43	93	43	$10,745	1.94
Motors	GROCERY	Fan Motor	Eff. Motor	RI	9a	Elect.	Elect.	94	44	94	44	$10,903	1.94
Motors	HOSPITL	Fan Motor	Eff. Motor	RI	11a	Elect.	Elect.	82	38	82	38	$9,524	1.94
Motors	REC	Fan Motor	Eff. Motor	RI	18a	Elect.	Elect.	48	22	48	22	$5,565	1.94
Motors	DGR	Fan Motor	Eff. Motor	RI	7a	Elect.	Elect.	167	78	167	78	$19,357	1.94
Motors	MTRPOOL	Fan Motor	Eff. Motor	RI	14a	Elect.	Elect.	57	27	57	27	$6,638	1.94
Motors	ADMIN	Fan Motor	Eff. Motor	RI	1a	Elect.	Elect.	986	462	986	462	$114,321	1.94
Motors	WHS	Fan Motor	Eff. Motor	RI	26a	Elect.	Elect.	351	164	351	164	$40,665	1.94
Motors	BRK/ADM	Fan Motor	Eff. Motor	RI	2a	Elect.	Elect.	257	120	257	120	$29,765	1.94
Motors	MWR	Fan Motor	Eff. Motor	RI	15a	Elect.	Elect.	128	60	128	60	$14,867	1.94
Motors	SHOP-ELEC	Fan Motor	Eff. Motor	RI	22a	Elect.	Elect.	186	87	186	87	$21,632	1.94
Motors	HSG-FAM	Fan Motor	Eff. Motor	RI	12a	Elect.	Elect.	14	6	14	6	$1,595	1.94
Motors	HANGER	Fan Motor	Eff. Motor	RI	10a	Elect.	Elect.	129	60	129	60	$14,963	1.94
Motors	R&D	Fan Motor	Eff. Motor	RI	17a	Elect.	Elect.	61	29	61	29	$7,112	1.94
Motors	DINING	Fan Motor	Eff. Motor	RI	8a	Elect.	Elect.	91	43	91	43	$10,612	1.94
Motors	SHOP	Fan Motor	Eff. Motor	RI	21a	Elect.	Elect.	38	18	38	18	$4,370	1.94
Motors	SECURITY	Fan Motor	Eff. Motor	RI	20a	Elect.	Elect.	43	20	43	20	$4,980	1.94
Motors	MISC	Fan Motor	Eff. Motor	RI	13a	Elect.	Elect.	5	2	5	2	$544	1.94
Lighting	2	2F40ES STD	2F32T8 ELC	RI	3a	Elect.	Elect.	514	170	514	170	$65,417	1.93
HVAC	Family Housing	Air Source Ht. Pump	Grnd-Cpld Ht. Pump	ROF	1	Elect.	Elect.	0	NA	1,833	NA	$1,296,699	1.80
Motors	North Plant	Sewage Pump	Eff. Motor	RI	82a	Elect.	Elect.	21	NA	21	NA	$1,769	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	77a	Elect.	Elect.	11	NA	11	NA	$884	1.79
Motors	North Plant	Sewage Pump	Eff. Motor	RI	83a	Elect.	Elect.	5	NA	5	NA	$442	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	79a	Elect.	Elect.	37	NA	37	NA	$3,095	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	72a	Elect.	Elect.	2	NA	2	NA	$177	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	71a	Elect.	Elect.	1	NA	1	NA	$88	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	76a	Elect.	Elect.	8	NA	8	NA	$663	1.79
Motors	REC	Chilled Water Pump	Eff. Motor	ROF	42b	Elect.	Elect.	0	NA	4	NA	$324	1.77
Motors	CLINIC	Chilled Water Pump	Eff. Motor	ROF	30b	Elect.	Elect.	0	NA	3	NA	$265	1.77
Motors	MISC	Chilled Water Pump	Eff. Motor	ROF	38b	Elect.	Elect.	0	NA	3	NA	$265	1.77
Motors	SHOP-ELEC	Chilled Water Pump	Eff. Motor	ROF	44b	Elect.	Elect.	0	NA	17	NA	$1,351	1.77
Motors	CHAPEL	Chilled Water Pump	Eff. Motor	ROF	29b	Elect.	Elect.	0	NA	9	NA	$662	1.77
Motors	DGR	Chilled Water Pump	Eff. Motor	ROF	33b	Elect.	Elect.	0	NA	36	NA	$2,820	1.77
Motors	SECURITY	Chilled Water Pump	Eff. Motor	ROF	43b	Elect.	Elect.	0	NA	6	NA	$497	1.77
Motors	R&D	Chilled Water Pump	Eff. Motor	ROF	41b	Elect.	Elect.	0	NA	20	NA	$1,536	1.77
Motors	ADMIN	Chilled Water Pump	Eff. Motor	ROF	27b	Elect.	Elect.	0	NA	281	NA	$21,752	1.77
Motors	WHS	Condenser Pump	Eff. Motor	ROF	63b	Elect.	Elect.	0	NA	5	NA	$397	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	55b	Elect.	Elect.	0	NA	5	NA	$397	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	56b	Elect.	Elect.	0	NA	5	NA	$397	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	50b	Elect.	Elect.	0	NA	41	NA	$3,177	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	57b	Elect.	Elect.	0	NA	5	NA	$397	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	52b	Elect.	Elect.	0	NA	5	NA	$397	1.77
Motors	DGR	Condenser Pump	Eff. Motor	ROF	58b	Elect.	Elect.	0	NA	9	NA	$728	1.77
Motors	MWR	Condenser Pump	Eff. Motor	ROF	61b	Elect.	Elect.	0	NA	9	NA	$662	1.77
Motors	TRAING	Condenser Pump	Eff. Motor	ROF	62b	Elect.	Elect.	0	NA	4	NA	$331	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	51b	Elect.	Elect.	0	NA	6	NA	$463	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	54b	Elect.	Elect.	0	NA	39	NA	$3,012	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	49b	Elect.	Elect.	0	NA	52	NA	$4,038	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	53b	Elect.	Elect.	0	NA	92	NA	$7,116	1.77
Motors	HOSPITL	Condenser Pump	Eff. Motor	ROF	60b	Elect.	Elect.	0	NA	27	NA	$2,118	1.77

Table 3.6
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Motors	DINING	Condenser Pump	Eff. Motor	ROF	59b	Elect.	Elect.	0	NA	7	NA	$530	1.77
Motors	PLT-BLD	Chilled Water Pump	Eff. Motor	ROF	40b	Elect.	Elect.	0	NA	68	NA	$5,230	1.77
Motors	WHS	Chilled Water Pump	Eff. Motor	ROF	48b	Elect.	Elect.	0	NA	49	NA	$3,773	1.77
Motors	BRK/ADM	Chilled Water Pump	Eff. Motor	ROF	28b	Elect.	Elect.	0	NA	65	NA	$5,037	1.77
Motors	MWR	Chilled Water Pump	Eff. Motor	ROF	39b	Elect.	Elect.	0	NA	36	NA	$2,780	1.77
Motors	DINING	Chilled Water Pump	Eff. Motor	ROF	34b	Elect.	Elect.	0	NA	27	NA	$2,072	1.77
Motors	COMCATN	Chilled Water Pump	Eff. Motor	ROF	32b	Elect.	Elect.	0	NA	6	NA	$463	1.77
Motors	GROCERY	Chilled Water Pump	Eff. Motor	ROF	35b	Elect.	Elect.	0	NA	14	NA	$1,059	1.77
Motors	HOSPITL	Chilled Water Pump	Eff. Motor	ROF	37b	Elect.	Elect.	0	NA	27	NA	$2,118	1.77
Motors	HANGER	Chilled Water Pump	Eff. Motor	ROF	36b	Elect.	Elect.	0	NA	16	NA	$1,258	1.77
Motors	TERMINL	Chilled Water Pump	Eff. Motor	ROF	46b	Elect.	Elect.	0	NA	15	NA	$1,191	1.77
Motors	TRAING	Chilled Water Pump	Eff. Motor	ROF	47b	Elect.	Elect.	0	NA	15	NA	$1,191	1.77
Motors	STOR-UH	Chilled Water Pump	Eff. Motor	ROF	45b	Elect.	Elect.	0	NA	3	NA	$231	1.77
Motors	CLUB	Chilled Water Pump	Eff. Motor	ROF	31b	Elect.	Elect.	0	NA	3	NA	$198	1.77
Lighting	3	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	7	7	7	7	$896	1.74
Lighting	2	4F40ES STD	3F40ES ELC REF	RI	8a	Elect.	Elect.	2,417	1,849	2,417	1,849	$305,099	1.73
Wtr. Heating	Capehart Hsg	Water Heater	Desuperheater	RI	1	Elect.	Elect.	6,710	NA	6,710	NA	$252,964	1.72
Lighting	4	4F40ES STD	3F40ES ELC REF	RI	4	Elect.	Elect.	81	62	81	62	$10,093	1.72
Envelope	TRAING	Heating/Cooling	Weath. Package	RI	4d	Elect.	Elect.	44	NA	44	NA	$3,068	1.71
Lighting	1	1F40ES STD	1F32T8 ELC	RI	1	Elect.	Elect.	7	4	7	4	$835	1.70
AC	536	Chiller	Eff. Chiller&TES	RI	52	Elect.	Elect.	41	725	41	725	$30,041	1.66
AC	534	Chiller	Eff. Chiller&TES	RI	49	Elect.	Elect.	30	518	30	518	$21,458	1.66
AC	431	Chiller	Eff. Chiller&TES	RI	38	Elect.	Elect.	59	1,036	59	1,036	$42,915	1.66
Lighting	3	4F40ES STD	3F40ES ELC REF	RI	5	Elect.	Elect.	383	316	383	316	$46,068	1.65
Lighting	4	3F40ES STD	2F40ES ELC REF	RI	3	Elect.	Elect.	145	175	145	175	$19,160	1.62
AC	533	Chiller	Eff. Chiller&TES	RI	47	Elect.	Elect.	56	452	56	452	$16,165	1.59
Envelope	FAM HSG	Heating/Cooling	Weath. Package	RI	4e	Elect.	Elect.	2,005	NA	2,005	NA	$126,182	1.59
AC	800	Chiller	Eff. Chiller&TES	RI	87	Elect.	Elect.	2	847	2	847	$33,975	1.58
AC	967	Chiller	Eff. Chiller&TES	RI	101	Elect.	Elect.	0	188	0	188	$7,550	1.58
AC	329	Chiller	Eff. Chiller&TES	RI	19	Elect.	Elect.	0	188	0	188	$7,550	1.58
AC	312	Chiller	Eff. Chiller&TES	RI	14	Elect.	Elect.	1	292	1	292	$11,703	1.58
AC	330	Chiller	Eff. Chiller&TES	RI	21	Elect.	Elect.	1	565	1	565	$22,650	1.58
AC	425	Chiller	Eff. Chiller&TES	RI	34	Elect.	Elect.	0	235	0	235	$9,438	1.58
AC	561	Chiller	Eff. Chiller&TES	RI	62	Elect.	Elect.	1	518	1	518	$20,763	1.58
AC	562	Chiller	Eff. Chiller&TES	RI	63	Elect.	Elect.	1	518	1	518	$20,763	1.58
AC	535	Chiller	Eff. Chiller&TES	RI	50	Elect.	Elect.	26	290	26	290	$9,996	1.55
AC	535	Chiller	Eff. Chiller&TES	RI	51	Elect.	Elect.	47	518	47	518	$17,851	1.55
AC	1364	Chiller	Gas Chiller/Cogen.	RI	122	Elect.	NG	1,489	1,441	1,489	1,441	$97,991	1.53
AC	501	Chiller	Eff. Chiller&TES	RI	40	Elect.	Elect.	43	607	43	607	$20,417	1.52
AC	502	Chiller	Eff. Chiller&TES	RI	41	Elect.	Elect.	43	607	43	607	$20,417	1.52
AC	503	Chiller	Eff. Chiller&TES	RI	42	Elect.	Elect.	43	607	43	607	$20,417	1.52
AC	313	Chiller	Eff. Chiller&TES	RI	15	Elect.	Elect.	(191)	1,601	(191)	1,601	$59,451	1.45
AC	800	Chiller	Eff. Chiller&TES	RI	88	Elect.	Elect.	(168)	1,412	(168)	1,412	$52,456	1.45
AC	722	Chiller	Eff. Chiller&TES	RI	78	Elect.	Elect.	(66)	549	(66)	549	$20,400	1.45
AC	732	Chiller	Eff. Chiller&TES	RI	80	Elect.	Elect.	(46)	384	(46)	384	$14,280	1.45
AC	629	Chiller	Eff. Chiller&TES	RI	69	Elect.	Elect.	(33)	275	(33)	275	$10,200	1.45
AC	710	Chiller	Eff. Chiller&TES	RI	77	Elect.	Elect.	(33)	275	(33)	275	$10,200	1.45
AC	408	Chiller	Eff. Chiller&TES	RI	30	Elect.	Elect.	(37)	314	(37)	314	$11,657	1.45
AC	430	Chiller	Eff. Chiller&TES	RI	37	Elect.	Elect.	(37)	314	(37)	314	$11,657	1.45
AC	575	Chiller	Eff. Chiller&TES	RI	64	Elect.	Elect.	(70)	589	(70)	589	$21,857	1.45
AC	967	Chiller	Eff. Chiller&TES	RI	102	Elect.	Elect.	(82)	691	(82)	691	$25,645	1.45

Table 3.6
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
AC	750	Chiller	Eff. Chiller&TES	RI	85	Elect.	Elect.	(117)	981	(117)	981	$36,428	1.45
AC	946	Chiller	Eff. Chiller&TES	RI	97	Elect.	Elect.	(94)	785	(94)	785	$29,142	1.45
AC	330	Chiller	Eff. Chiller&TES	RI	20	Elect.	Elect.	(47)	392	(47)	392	$14,571	1.45
AC	560	Chiller	Eff. Chiller&TES	RI	61	Elect.	Elect.	(47)	392	(47)	392	$14,571	1.45
AC	751	Chiller	Eff. Chiller&TES	RI	86	Elect.	Elect.	(61)	510	(61)	510	$18,943	1.45
AC	425	Chiller	Eff. Chiller&TES	RI	35	Elect.	Elect.	(51)	432	(51)	432	$16,028	1.45
AC	250	Chiller	Eff. Chiller&TES	RI	9	Elect.	Elect.	(136)	1,138	(136)	1,138	$42,257	1.45
AC	318	Chiller	Eff. Chiller&TES	RI	17	Elect.	Elect.	(47)	392	(47)	392	$14,571	1.45
AC	984	Chiller	Eff. Chiller&TES	RI	104	Elect.	Elect.	(56)	471	(56)	471	$17,485	1.45
AC	559	Chiller	Eff. Chiller&TES	RI	60	Elect.	Elect.	(56)	471	(56)	471	$17,485	1.45
AC	673	Chiller	Eff. Chiller&TES	RI	73	Elect.	Elect.	(28)	235	(28)	235	$8,743	1.45
AC	530	Chiller	Eff. Chiller&TES	RI	46	Elect.	Elect.	(56)	471	(56)	471	$17,485	1.45
AC	945	Chiller	Eff. Chiller&TES	RI	96	Elect.	Elect.	(56)	471	(56)	471	$17,485	1.45
AC	991	Chiller	Eff. Chiller&TES	RI	111	Elect.	Elect.	1	226	1	226	$6,963	1.45
AC	1493	Chiller	Eff. Chiller&TES	RI	130	Elect.	Elect.	1	264	1	264	$8,123	1.45
AC	810	Chiller	Eff. Chiller&TES	RI	89	Elect.	Elect.	1	188	1	188	$5,802	1.45
AC	402	Chiller	Eff. Chiller&TES	RI	28	Elect.	Elect.	1	188	1	188	$5,802	1.45
AC	969	Chiller	Eff. Chiller&TES	RI	106	Elect.	Elect.	3	1,036	3	1,036	$31,914	1.45
AC	424	Chiller	Eff. Chiller&TES	RI	33	Elect.	Elect.	1	188	1	188	$5,802	1.45
AC	957	Chiller	Eff. Chiller&TES	RI	98	Elect.	Elect.	1	188	1	188	$5,802	1.45
AC	990	Chiller	Eff. Chiller&TES	RI	109	Elect.	Elect.	1	282	1	282	$8,704	1.45
AC	1369	Chiller	Eff. Chiller&TES	RI	124	Elect.	Elect.	1	282	1	282	$8,704	1.45
AC	965	Chiller	Eff. Chiller&TES	RI	100	Elect.	Elect.	1	471	1	471	$14,506	1.45
AC	3656	Chiller	Eff. Chiller&TES	RI	133	Elect.	Elect.	1	235	1	235	$7,253	1.45
Lighting	1	2F40ES STD	2F32T8 ELC	RI	2a	Elect.	Elect.	309	174	309	174	$31,220	1.43
Lighting	2	2F96 STD	2F96ES ELC REF	RI	5	Elect.	Elect.	51	43	51	43	$4,214	1.42
Lighting	3	2F96 STD	2F96ES ELC REF	RI	3	Elect.	Elect.	1,628	1,346	1,628	1,346	$131,717	1.42
Lighting	2	1F40ES STD	1F32T8 ELC	RI	1	Elect.	Elect.	202	184	202	184	$19,480	1.38
AC	440	Chiller	Eff. Chiller&TES	RI	39	Elect.	Elect.	(71)	353	(71)	353	$12,419	1.38
AC	537	Chiller	Eff. Chiller&TES	RI	53	Elect.	Elect.	(57)	599	(57)	599	$16,017	1.35
AC	523	Chiller	Eff. Chiller&TES	RI	45	Elect.	Elect.	(45)	198	(45)	198	$6,583	1.34
Lighting	4	2F40ES STD	2F32T8 ELC	RI	1	Elect.	Elect.	56	37	56	37	$4,826	1.32
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	81b	Elect.	Elect.	0	NA	7	NA	$373	1.29
AC	969	Chiller	Eff. Chiller&TES	RI	103	Elect.	Elect.	(48)	251	(48)	251	$5,717	1.27
AC	990	Chiller	Eff. Chiller&TES	RI	110	Elect.	Elect.	(75)	392	(75)	392	$8,932	1.27
AC	576	Chiller	Eff. Chiller&TES	RI	65	Elect.	Elect.	(75)	392	(75)	392	$8,932	1.27
AC	533	Chiller	Eff. Chiller&TES	RI	48	Elect.	Elect.	(262)	1,373	(262)	1,373	$31,262	1.27
AC	3655	Chiller	Eff. Chiller&TES	RI	132	Elect.	Elect.	(75)	392	(75)	392	$8,932	1.27
AC	989	Chiller	Eff. Chiller&TES	RI	107	Elect.	Elect.	(793)	4,159	(793)	4,159	$94,680	1.27
AC	265	Chiller	Eff. Chiller&TES	RI	12	Elect.	Elect.	(112)	589	(112)	589	$13,398	1.27
AC	734	Chiller	Eff. Chiller&TES	RI	81	Elect.	Elect.	(46)	243	(46)	243	$5,538	1.27
AC	1316	Chiller	Eff. Chiller&TES	RI	118	Elect.	Elect.	(60)	314	(60)	314	$7,146	1.27
AC	558	Chiller	Eff. Chiller&TES	RI	59	Elect.	Elect.	(120)	628	(120)	628	$14,291	1.27
AC	400	Chiller	Eff. Chiller&TES	RI	26	Elect.	Elect.	(120)	628	(120)	628	$14,291	1.27
AC	1353	Chiller	Eff. Chiller&TES	RI	119	Elect.	Elect.	(60)	314	(60)	314	$7,146	1.27
AC	1365	Chiller	Eff. Chiller&TES	RI	123	Elect.	Elect.	(239)	1,256	(239)	1,256	$28,583	1.27
AC	996	Chiller	Eff. Chiller&TES	RI	115	Elect.	Elect.	(60)	314	(60)	314	$7,146	1.27
AC	727	Chiller	Eff. Chiller&TES	RI	79	Elect.	Elect.	(90)	471	(90)	471	$10,719	1.27
AC	1492	Chiller	Eff. Chiller&TES	RI	129	Elect.	Elect.	(45)	235	(45)	235	$5,359	1.27
AC	992	Chiller	Eff. Chiller&TES	RI	113	Elect.	Elect.	(45)	235	(45)	235	$5,359	1.27
AC	423	Chiller	Eff. Chiller&TES	RI	32	Elect.	Elect.	291	4,691	291	4,691	$96,637	1.24

Table 3.6
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Wtr. Heating	Temp.Lod.Fac.	WH-1	Solar Water Heater	RI	4	Elect.	Elect.	362	NA	362	NA	$8,333	1.24
Wtr. Heating	Wherry Hsg	WH-1	Solar Water Heater	RI	3	Elect.	Elect.	4,008	NA	4,008	NA	$92,325	1.24
Wtr. Heating	APPR PFY50	WH-1	Solar Water Heater	RI	1	Elect.	Elect.	22	NA	22	NA	$500	1.24
AC	3659	Chiller	Eff. Chiller&TES	RI	135	Elect.	Elect.	(141)	706	(141)	706	$14,792	1.23
Wtr. Heating	504	Water Heater	Solar Water Heater	RI	1d	Elect.	Elect.	204	NA	204	NA	$4,250	1.21
Wtr. Heating	502	Water Heater	Solar Water Heater	RI	1b	Elect.	Elect.	204	NA	204	NA	$4,216	1.21
Wtr. Heating	503	Water Heater	Solar Water Heater	RI	1c	Elect.	Elect.	204	NA	204	NA	$4,216	1.21
Wtr. Heating	501	Water Heater	Solar Water Heater	RI	1a	Elect.	Elect.	204	NA	204	NA	$4,216	1.21
Lighting	2	1F40 STD	1F32T8 ELC REF	RI	2	Elect.	Elect.	481	174	481	174	$17,491	1.21
Wtr. Heating	505	Water Heater	Solar Water Heater	RI	1e	Elect.	Elect.	184	NA	184	NA	$3,387	1.18
Wtr. Heating	506	Water Heater	Solar Water Heater	RI	1f	Elect.	Elect.	184	NA	184	NA	$3,387	1.18
AC	404	Chiller	Eff. Chiller&TES	RI	29	Elect.	Elect.	(140)	419	(140)	419	$7,040	1.18
Controls	WHS	E-9	EMCS(exist. chill.)	RI	9	Elect.	Elect.	57	NA	57	NA	$1,171	1.18
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	86b	Elect.	Elect.	0	NA	14	NA	$550	1.16
AC	546	Chiller	Eff. Chiller&TES	RI	55	Elect.	Elect.	(145)	636	(145)	636	$10,294	1.16
AC	330	Chiller	Eff. Chiller&TES	RI	22	Elect.	Elect.	(43)	2,001	(43)	2,001	$30,741	1.16
AC	425	Chiller	Eff. Chiller&TES	RI	36	Elect.	Elect.	(69)	3,202	(69)	3,202	$49,186	1.16
AC	415	Chiller	Eff. Chiller&TES	RI	31	Elect.	Elect.	(16)	734	(16)	734	$11,272	1.16
AC	556	Chiller	Eff. Chiller&TES	RI	57	Elect.	Elect.	(72)	198	(72)	198	$2,838	1.15
AC	557	Chiller	Eff. Chiller&TES	RI	58	Elect.	Elect.	(23)	63	(23)	63	$792	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	91b	Elect.	Elect.	0	NA	33	NA	$1,070	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	89b	Elect.	Elect.	0	NA	22	NA	$714	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	88b	Elect.	Elect.	0	NA	17	NA	$550	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	90b	Elect.	Elect.	0	NA	10	NA	$306	1.12
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	85b	Elect.	Elect.	0	NA	3	NA	$93	1.11
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	51	Elect.	Elect.	0	0	15	6	$514	1.10
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	65	Elect.	Elect.	0	0	8	3	$257	1.10
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	116	Elect.	Elect.	0	0	8	3	$257	1.10
AC	1380	Chiller	Eff. Chiller&TES	RI	125	Elect.	Elect.	49	2,260	49	2,260	$19,808	1.10
AC	989	Chiller	Eff. Chiller&TES	RI	108	Elect.	Elect.	164	7,592	164	7,592	$66,542	1.10
Lighting	2	2F40 STD	2F40ES ELC REF	RI	4	Elect.	Elect.	29	26	29	26	$707	1.08
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	16	Elect.	Elect.	0	0	22	9	$1,017	1.08
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	95	Elect.	Elect.	0	0	22	9	$957	1.08
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	117	Elect.	Elect.	0	0	8	3	$168	1.08
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	48	Elect.	Elect.	0	0	3	1	$150	1.07
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	118	Elect.	Elect.	0	0	8	3	$147	1.07
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	92	Elect.	Elect.	0	0	6	2	$240	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	12	Elect.	Elect.	0	0	12	5	$479	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	93	Elect.	Elect.	0	0	18	7	$678	1.06
AC	998	Chiller	Eff. Chiller&TES	RI	117	Elect.	Elect.	25	867	25	867	$5,316	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	49	Elect.	Elect.	0	0	5	2	$118	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	96	Elect.	Elect.	0	0	37	15	$896	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	17	Elect.	Elect.	0	0	97	39	$2,330	1.06
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	80b	Elect.	Elect.	0	NA	5	NA	$97	1.06
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	87b	Elect.	Elect.	0	NA	21	NA	$388	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	43	Elect.	Elect.	0	0	22	9	$491	1.06
AC	929	Chiller	Eff. Chiller&TES	RI	94	Elect.	Elect.	(55)	1,601	(55)	1,601	$8,167	1.05
AC	925	Chiller	Eff. Chiller&TES	RI	92	Elect.	Elect.	(126)	3,668	(126)	3,668	$18,716	1.05
AC	505	Chiller	Eff. Chiller&TES	RI	43	Elect.	Elect.	(63)	1,834	(63)	1,834	$9,358	1.05
AC	986	Chiller	Eff. Chiller&TES	RI	105	Elect.	Elect.	(46)	1,334	(46)	1,334	$6,806	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	71	Elect.	Elect.	0	0	22	9	$638	1.05

Table 3.6
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ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	61	Elect.	Elect.	0	0	22	9	$638	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	13	Elect.	Elect.	0	0	78	31	$1,666	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	64	Elect.	Elect.	0	0	25	10	$479	1.05
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	97	Elect.	Elect.	0	0	22	9	$399	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	14	Elect.	Elect.	0	0	36	14	$636	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	72	Elect.	Elect.	0	0	22	9	$353	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	62	Elect.	Elect.	0	0	66	26	$1,059	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	32	Elect.	Elect.	0	0	3	1	$95	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	73	Elect.	Elect.	0	0	22	9	$294	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	33	Elect.	Elect.	0	0	3	1	$85	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	47	Elect.	Elect.	0	0	10	4	$255	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	7	Elect.	Elect.	0	0	21	8	$509	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	87	Elect.	Elect.	0	0	10	4	$241	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	113	Elect.	Elect.	0	0	10	4	$241	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	69	Elect.	Elect.	0	0	18	7	$247	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	58	Elect.	Elect.	0	0	18	7	$247	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	76	Elect.	Elect.	0	0	67	27	$499	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	82	Elect.	Elect.	0	0	2	1	$37	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	2	Elect.	Elect.	0	0	2	1	$33	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	127	Elect.	Elect.	0	0	18	7	$207	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	59	Elect.	Elect.	0	0	18	7	$207	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	138	Elect.	Elect.	0	0	18	7	$187	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	115	Elect.	Elect.	0	0	5	2	$33	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	18	Elect.	Elect.	0	0	45	18	$302	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	77	Elect.	Elect.	0	0	38	15	$285	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	119	Elect.	Elect.	0	0	8	3	$34	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	130	Elect.	Elect.	0	0	38	15	$338	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	107	Elect.	Elect.	0	0	6	2	$36	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	35	Elect.	Elect.	0	0	12	5	$189	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	89	Elect.	Elect.	0	0	12	5	$171	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	9	Elect.	Elect.	0	0	23	9	$343	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	90	Elect.	Elect.	0	0	12	5	$157	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	79	Elect.	Elect.	0	0	44	18	$232	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	131	Elect.	Elect.	0	0	38	15	$262	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	10	Elect.	Elect.	0	0	12	5	$106	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	38	Elect.	Elect.	0	0	27	11	$248	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	74	Elect.	Elect.	0	0	22	9	$104	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	139	Elect.	Elect.	0	0	18	7	$93	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	91	Elect.	Elect.	0	0	12	5	$82	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	128	Elect.	Elect.	0	0	37	15	$149	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	29	Elect.	Elect.	0	0	7	3	$84	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	30	Elect.	Elect.	0	0	2	1	$28	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	103	Elect.	Elect.	0	0	5	2	$56	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	112	Elect.	Elect.	0	0	2	1	$28	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	5	Elect.	Elect.	0	0	7	3	$78	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	23	Elect.	Elect.	0	0	1	1	$11	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	100	Elect.	Elect.	0	0	4	2	$32	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	50	Elect.	Elect.	0	0	5	2	$16	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	134	Elect.	Elect.	0	0	9	4	$32	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	6	Elect.	Elect.	0	0	7	3	$52	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	110	Elect.	Elect.	0	0	52	21	$172	1.01

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Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	44	Elect.	Elect.	0	0	22	9	$74	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	20	Elect.	Elect.	0	0	15	6	$49	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	94	Elect.	Elect.	0	0	24	10	$71	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	108	Elect.	Elect.	0	0	286	115	$853	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	39	Elect.	Elect.	0	0	36	14	$107	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	120	Elect.	Elect.	0	0	15	6	$34	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	52	Elect.	Elect.	0	0	15	6	$34	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	31	Elect.	Elect.	0	0	2	1	$10	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	75	Elect.	Elect.	0	0	22	9	$51	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	66	Elect.	Elect.	0	0	22	9	$51	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	85	Elect.	Elect.	0	0	2	1	$8	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	36	Elect.	Elect.	0	0	12	5	$34	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	40	Elect.	Elect.	0	0	5	2	$31	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	3	Elect.	Elect.	0	0	4	1	$21	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	25	Elect.	Elect.	0	0	2	1	$6	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	84	Elect.	Elect.	0	0	2	1	$11	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	27	Elect.	Elect.	0	0	2	1	$11	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	19	Elect.	Elect.	0	0	67	27	$110	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	88	Elect.	Elect.	0	0	21	8	$43	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	8	Elect.	Elect.	0	0	10	4	$21	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	34	Elect.	Elect.	0	0	42	17	$85	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	105	Elect.	Elect.	0	0	80	32	$163	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	109	Elect.	Elect.	0	0	6	2	$9	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	15	Elect.	Elect.	0	0	36	14	$53	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	83	Elect.	Elect.	0	0	3	1	$6	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	63	Elect.	Elect.	0	0	22	9	$25	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	24	Elect.	Elect.	0	0	2	1	$3	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	106	Elect.	Elect.	0	0	232	93	$340	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	37	Elect.	Elect.	0	0	62	25	$91	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	41	Elect.	Elect.	0	0	12	5	$17	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	132	Elect.	Elect.	0	0	44	18	$43	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	60	Elect.	Elect.	0	0	18	7	$18	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	129	Elect.	Elect.	0	0	37	15	$37	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	70	Elect.	Elect.	0	0	18	7	$18	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	81	Elect.	Elect.	0	0	31	13	$47	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	78	Elect.	Elect.	0	0	226	91	$212	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	22	Elect.	Elect.	0	0	11	5	$14	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	101	Elect.	Elect.	0	0	9	3	$11	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	104	Elect.	Elect.	0	0	30	12	$36	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	28	Elect.	Elect.	0	0	15	6	$18	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	86	Elect.	Elect.	0	0	7	3	$9	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	80	Elect.	Elect.	0	0	26	10	$33	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	1	Elect.	Elect.	0	0	2	1	$1	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	102	Elect.	Elect.	0	0	7	3	$7	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	11	Elect.	Elect.	0	0	4	2	$3	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	42	Elect.	Elect.	0	0	12	5	$9	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	121	Elect.	Elect.	0	0	11	4	$9	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	122	Elect.	Elect.	0	0	11	4	$7	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	53	Elect.	Elect.	0	0	11	4	$8	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	26	Elect.	Elect.	0	0	2	1	$1	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	4	Elect.	Elect.	0	0	2	1	$1	1.00

Table 3.6
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	123	Elect.	Elect.	0	0	11	4	$2	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	135	Elect.	Elect.	0	0	11	4	$2	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	67	Elect.	Elect.	0	0	11	4	$2	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	133	Elect.	Elect.	0	0	43	17	$8	1.00
Totals								91,735	95,855	97,763	97,069	$17,461,995	2.05

(a): NA denotes EROs where demand reductions were not considered because of uncertainty about contribution to the monthly peak.

Table 3.7
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Controls	R&D	E-6	EMCS(exist. chill.)	RI	6	Elect.	Elect.	$8,800	$119,184	NA (a)	$0	-$1,316	$117,869	$109,069	13.39
Lighting	2	INC 2x60 Ceil	CFL 2-11 CEIL FIXT	RI	13	Elect.	Elect.	$1,693	$14,809	$2,810	$4,970	$0	$22,589	$20,895	13.34
Lighting	3	INC 2x60 ceil	CFL 2-11 CEIL FIXT	RI	10	Elect.	Elect.	$192,685	$1,544,463	$319,737	$521,510	$0	$2,385,709	$2,193,024	12.38
Envelope	CLUB	Heating/Cooling	Weath. Package	RI	4c	Elect.	Elect.	$2,573	$20,468	NA	$0	$0	$20,468	$17,895	7.96
Lighting	2	INC 60 Ceil	CFL 11 CEIL FIXT	RI	15	Elect.	Elect.	$26,350	$117,020	$26,523	$48,706	$0	$192,249	$165,899	7.30
Controls	DGR	E-3	EMCS(exist. chill.)	RI	3	Elect.	Elect.	$4,400	$32,711	NA	$0	-$658	$32,053	$27,653	7.28
Lighting	1	2F40ES STD	SENS	RI	2b	Elect.	Elect.	$11,968	$40,013	$14,140	$32,360	$0	$86,513	$74,545	7.23
Lighting	3	INC 75 Ceil	CFL 2-9 + BLST	RI	12	Elect.	Elect.	$133,192	$672,749	$139,273	-$6,442	$0	$805,580	$672,388	6.05
Lighting	2	INC 75 Ceil	CFL 2-9 + BLST	RI	16	Elect.	Elect.	$3,069	$14,158	$3,209	-$69	$0	$17,298	$14,230	5.64
Controls	ADMIN	E-1	EMCS(exist. chill.)	RI	1	Elect.	Elect.	$13,200	$75,447	NA	$0	-$1,973	$73,473	$60,273	5.57
Lighting	2	EXIT INC (2x15)	LED	RI	11	Elect.	Elect.	$4,872	$4,314	$1,091	$21,447	$0	$26,853	$21,981	5.51
Lighting	1	EXIT INC(2x15)	LED	RI	8	Elect.	Elect.	$72,799	$64,458	$16,308	$320,461	$0	$401,227	$328,429	5.51
Lighting	5	INC 2-60	CFL 2-15 CEIL	RI	2	Elect.	Elect.	$173,899	$438,100	$223,084	$242,107	$0	$903,291	$729,393	5.19
Lighting	2	3F40ES STD	2F40ES ELC REF SENS	RI	7b	Elect.	Elect.	$13,479	$43,293	$8,218	$15,194	$0	$66,705	$53,225	4.95
Lighting	1	INC 75 Can	CFL 20 + BLST	RI	9	Elect.	Elect.	$53,331	$156,297	$58,710	$44,781	$0	$259,788	$206,458	4.87
Envelope	Wherry	Heating/Cooling	Ceiling Insulation	RI	1b	Elect.	Elect.	$416,680	$1,945,937	NA	$0	$0	$1,945,937	$1,529,257	4.67
Envelope	FAM HSG	Heating/Cooling	Refl. Window Trtmnt	RI	2b	Elect.	Elect.	$448,892	$2,068,113	NA	$0	$0	$2,068,113	$1,619,221	4.61
Lighting	2	3F40ES STD	2F40ES ELC REF	RI	7a	Elect.	Elect.	$19,451	$57,368	$10,890	$18,986	$0	$87,243	$67,793	4.49
Lighting	5	INC 1-60	CFL 15 CEIL	RI	3	Elect.	Elect.	$73,319	$207,959	$55,771	$61,499	$0	$325,229	$251,910	4.44
Controls	COMCATN	E-2	EMCS(exist. chill.)	RI	2	Elect.	Elect.	$24,200	$109,608	NA	$0	-$3,618	$105,990	$81,790	4.38
Lighting	2	4F40 STD	3F32T8 ELC REF	RI	9	Elect.	Elect.	$74,937	$240,094	$45,935	$26,533	$0	$312,561	$237,624	4.17
Controls	SHOP-ELC	E-8	EMCS(exist. chill.)	RI	8	Elect.	Elect.	$2,200	$9,349	NA	$0	-$329	$9,020	$6,820	4.10
Lighting	2	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	$9,990	$27,017	$6,124	$3,429	$0	$36,570	$26,580	3.66
Lighting	2	EXIT 2xPL9	LED	RI	10	Elect.	Elect.	$55,088	$33,168	$8,392	$137,547	$0	$179,107	$124,019	3.25
Controls	MISC	E-4	EMCS(exist. chill.)	RI	4	Elect.	Elect.	$2,200	$7,428	NA	$0	-$329	$7,099	$4,899	3.23
Lighting	1	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	$126,567	$288,098	$7[illegible],583	$42,490	$0	$408,171	$281,604	3.22
Lighting	3	INC 100 Ceil	CFL 2-11 CEIL FIXT	RI	8	Elect.	Elect.	$3,537	$6,400	$4,565	$352	$0	$11,318	$7,781	3.20
Lighting	2	2F40ES STD	2F32T8 ELC SENS	RI	3b	Elect.	Elect.	$32,379	$62,496	$13,038	$27,596	$0	$103,130	$70,751	3.19
Controls	REC	E-7	EMCS(exist. chill.)	RI	7	Elect.	Elect.	$6,600	$21,654	NA	$0	-$987	$20,668	$14,068	3.13
Envelope	BRK/ADM	Heating/Cooling	Weath. Package	RI	4b	Elect.	Elect.	$35,857	$102,142	NA	$0	$0	$102,142	$66,285	2.85
Lighting	1	3F40ES STD	2F40ES ELC REF SENS	RI	5b	Elect.	Elect.	$460,312	$744,557	$280,199	$276,869	$0	$1,301,624	$841,312	2.83
Lighting	2	EXIT INC (2x20)	LED	RI	12	Elect.	Elect.	$6,969	$8,638	$2,186	$8,712	$0	$19,536	$12,568	2.80
Lighting	3	EXIT INC(2x20)	LED	RI	7	Elect.	Elect.	$3,604	$4,468	$1,130	$4,506	$0	$10,104	$6,500	2.80
Lighting	1	3F40ES STD	2F40ES ELC REF	RI	5a	Elect.	Elect.	$608,955	$905,958	$340,938	$345,493	$0	$1,592,390	$983,435	2.61
Lighting	3	2F40 STD	2F40ES ELC REF SENS	RI	2b	Elect.	Elect.	$7,405	$13,121	$2,865	$3,351	$0	$19,337	$11,932	2.61
Envelope	ADMIN	Heating/Cooling	Weath. Package	RI	4a	Elect.	Elect.	$99,440	$243,189	NA	$0	$0	$243,189	$143,750	2.45
Envelope	TLF	Heating/Cooling	Refl. Window Trtmnt	RI	2a	Elect.	Elect.	$166,002	$395,584	NA	$0	$0	$395,584	$229,582	2.38
Lighting	1	4F40ES STD	3F40ES ELC REF	RI	4	Elect.	Elect.	$34,655	$46,694	$15,301	$15,130	$0	$77,125	$42,470	2.23
Boilers	Multiple	All Boilers	Tune-up 50	RI	3	NG,F Oil	NG,F Oil	$17,500	$49,675	$0	-$7,811	-$4,630	$37,234	$19,734	2.13
Lighting	2	4F40ES STD	3F40ES ELC REF SENS	RI	8b	Elect.	Elect.	$12,592	$14,209	$6,821	$5,301	$0	$26,331	$13,738	2.09
Lighting	3	3F40 STD	2F40 STD REF	RI	4b	Elect.	Elect.	$1,559	$1,600	$1,142	$361	$0	$3,103	$1,544	1.99
Lighting	3	3F40 STD	2F40 STD REF	RI	4a	Elect.	Elect.	$1,559	$1,599	$1,141	$361	$0	$3,101	$1,543	1.99
Lighting	3	2F40 STD	2F40ES ELC REF	RI	2a	Elect.	Elect.	$168,781	$236,671	$51,677	$45,048	$0	$333,396	$164,615	1.98
Transport.	Vehicles	Various	CNG Vehicle	RI		Gas/Diesel	NG,Diesel	$1,287,000	$1,113,696	$0	$1,841,609	-$413,570	$2,541,734	$1,254,734	1.97
Motors	CLUB	Fan Motor	Eff. Motor	RI	5a	Elect.	Elect.	$2,037	$2,662	$775	$0	$538	$3,975	$1,938	1.95
Motors	PLT-BLD	Fan Motor	Eff. Motor	RI	16a	Elect.	Elect.	$638	$827	$241	$0	$169	$1,237	$599	1.94
Motors	RESTRNT	Fan Motor	Eff. Motor	RI	19a	Elect.	Elect.	$450	$582	$170	$0	$120	$872	$422	1.94
Motors	CHAPEL	Fan Motor	Eff. Motor	RI	3a	Elect.	Elect.	$1,632	$2,113	$615	$0	$433	$3,162	$1,530	1.94
Motors	CLINIC	Fan Motor	Eff. Motor	RI	4a	Elect.	Elect.	$944	$1,222	$356	$0	$251	$1,829	$885	1.94
Motors	TRAING	Fan Motor	Eff. Motor	RI	25a	Elect.	Elect.	$5,407	$6,999	$2,038	$0	$1,436	$10,473	$5,066	1.94
Motors	STOR-UH	Fan Motor	Eff. Motor	RI	23a	Elect.	Elect.	$5,836	$7,555	$2,200	$0	$1,549	$11,304	$5,468	1.94
Motors	TERMINL	Fan Motor	Eff. Motor	RI	24a	Elect.	Elect.	$11,962	$15,483	$4,510	$0	$3,177	$23,170	$11,208	1.94
Motors	COMCATN	Fan Motor	Eff. Motor	RI	6a	Elect.	Elect.	$11,468	$14,844	$4,323	$0	$3,046	$22,213	$10,745	1.94
Motors	GROCERY	Fan Motor	Eff. Motor	RI	9a	Elect.	Elect.	$11,637	$15,063	$4,387	$0	$3,091	$22,540	$10,903	1.94
Motors	HOSPITL	Fan Motor	Eff. Motor	RI	11a	Elect.	Elect.	$10,165	$13,157	$3,832	$0	$2,700	$19,689	$9,524	1.94
Motors	REC	Fan Motor	Eff. Motor	RI	18a	Elect.	Elect.	$5,940	$7,689	$2,239	$0	$1,577	$11,505	$5,565	1.94
Motors	DGR	Fan Motor	Eff. Motor	RI	7a	Elect.	Elect.	$20,660	$26,741	$7,788	$0	$5,487	$40,017	$19,357	1.94
Motors	MTRPOOL	Fan Motor	Eff. Motor	RI	14a	Elect.	Elect.	$7,085	$9,170	$2,671	$0	$1,882	$13,723	$6,638	1.94
Motors	ADMIN	Fan Motor	Eff. Motor	RI	1a	Elect.	Elect.	$122,024	$157,936	$46,000	$0	$32,410	$236,345	$114,321	1.94
Motors	WHS	Fan Motor	Eff. Motor	RI	26a	Elect.	Elect.	$43,405	$56,179	$16,363	$0	$11,528	$84,070	$40,665	1.94
Motors	BRK/ADM	Fan Motor	Eff. Motor	RI	2a	Elect.	Elect.	$31,771	$41,122	$11,977	$0	$8,438	$61,536	$29,765	1.94
Motors	MWR	Fan Motor	Eff. Motor	RI	15a	Elect.	Elect.	$15,869	$20,539	$5,982	$0	$4,214	$30,736	$14,867	1.94
Motors	SHOP-ELEC	Fan Motor	Eff. Motor	RI	22a	Elect.	Elect.	$23,090	$29,885	$8,704	$0	$6,133	$44,722	$21,632	1.94

Table 3.7
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Motors	HSG-FAM	Fan Motor	Eff. Motor	RI	12a	Elect.	Elect.	$1,703	$2,204	$642	$0	$452	$3,298	$1,595	1.94
Motors	HANGER	Fan Motor	Eff. Motor	RI	10a	Elect.	Elect.	$15,972	$20,672	$6,021	$0	$4,242	$30,935	$14,963	1.94
Motors	R&D	Fan Motor	Eff. Motor	RI	17a	Elect.	Elect.	$7,592	$9,826	$2,862	$0	$2,017	$14,704	$7,112	1.94
Motors	DINING	Fan Motor	Eff. Motor	RI	8a	Elect.	Elect.	$11,328	$14,661	$4,270	$0	$3,009	$21,940	$10,612	1.94
Motors	SHOP	Fan Motor	Eff. Motor	RI	21a	Elect.	Elect.	$4,665	$6,037	$1,758	$0	$1,239	$9,035	$4,370	1.94
Motors	SECURITY	Fan Motor	Eff. Motor	RI	20a	Elect.	Elect.	$5,317	$6,880	$2,004	$0	$1,413	$10,297	$4,980	1.94
Motors	MISC	Fan Motor	Eff. Motor	RI	13a	Elect.	Elect.	$581	$752	$219	$0	$154	$1,125	$544	1.94
Lighting	2	2F40ES STD	2F32T8 ELC	RI	3a	Elect.	Elect.	$70,630	$81,162	$16,932	$37,953	$0	$136,047	$65,417	1.93
HVAC	Family Housing	Air Source Ht. Pump	Gmd-Cpld Ht. Pump	ROF	1	Elect.	Elect.	$1,629,326	$143,938	NA	$0	$2,782,086	$2,926,025	$1,296,699	1.80
Motors	North Plant	Sewage Pump	Eff. Motor	RI	82a	Elect.	Elect.	$2,251	$3,422	NA	$0	$598	$4,019	$1,769	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	77a	Elect.	Elect.	$1,125	$1,711	NA	$0	$299	$2,010	$884	1.79
Motors	North Plant	Sewage Pump	Eff. Motor	RI	83a	Elect.	Elect.	$563	$855	NA	$0	$149	$1,005	$442	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	79a	Elect.	Elect.	$3,939	$5,988	NA	$0	$1,046	$7,034	$3,095	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	72a	Elect.	Elect.	$225	$342	NA	$0	$60	$402	$177	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	71a	Elect.	Elect.	$113	$171	NA	$0	$30	$201	$88	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	76a	Elect.	Elect.	$844	$1,283	NA	$0	$224	$1,507	$663	1.79
Motors	REC	Chilled Water Pump	Eff. Motor	ROF	42b	Elect.	Elect.	$419	$432	NA	$0	$311	$743	$324	1.77
Motors	CLINIC	Chilled Water Pump	Eff. Motor	ROF	30b	Elect.	Elect.	$342	$352	NA	$0	$255	$607	$265	1.77
Motors	MISC	Chilled Water Pump	Eff. Motor	ROF	38b	Elect.	Elect.	$342	$352	NA	$0	$255	$607	$265	1.77
Motors	SHOP-ELEC	Chilled Water Pump	Eff. Motor	ROF	44b	Elect.	Elect.	$1,744	$1,797	NA	$0	$1,298	$3,095	$1,351	1.77
Motors	CHAPEL	Chilled Water Pump	Eff. Motor	ROF	29b	Elect.	Elect.	$855	$881	NA	$0	$636	$1,517	$662	1.77
Motors	DGR	Chilled Water Pump	Eff. Motor	ROF	33b	Elect.	Elect.	$3,643	$3,753	NA	$0	$2,710	$6,463	$2,820	1.77
Motors	SECURITY	Chilled Water Pump	Eff. Motor	ROF	43b	Elect.	Elect.	$641	$661	NA	$0	$477	$1,138	$497	1.77
Motors	R&D	Chilled Water Pump	Eff. Motor	ROF	41b	Elect.	Elect.	$1,984	$2,044	NA	$0	$1,476	$3,520	$1,536	1.77
Motors	ADMIN	Chilled Water Pump	Eff. Motor	ROF	27b	Elect.	Elect.	$28,101	$28,948	NA	$0	$20,906	$49,853	$21,752	1.77
Motors	WHS	Condenser Pump	Eff. Motor	ROF	63b	Elect.	Elect.	$513	$529	NA	$0	$382	$910	$397	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	55b	Elect.	Elect.	$513	$529	NA	$0	$382	$910	$397	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	56b	Elect.	Elect.	$513	$529	NA	$0	$382	$910	$397	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	50b	Elect.	Elect.	$4,105	$4,228	NA	$0	$3,054	$7,282	$3,177	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	57b	Elect.	Elect.	$513	$529	NA	$0	$382	$910	$397	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	52b	Elect.	Elect.	$513	$529	NA	$0	$382	$910	$397	1.77
Motors	DGR	Condenser Pump	Eff. Motor	ROF	58b	Elect.	Elect.	$941	$969	NA	$0	$700	$1,669	$728	1.77
Motors	MWR	Condenser Pump	Eff. Motor	ROF	61b	Elect.	Elect.	$855	$881	NA	$0	$636	$1,517	$662	1.77
Motors	TRAING	Condenser Pump	Eff. Motor	ROF	62b	Elect.	Elect.	$428	$440	NA	$0	$318	$759	$331	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	51b	Elect.	Elect.	$599	$617	NA	$0	$445	$1,062	$463	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	54b	Elect.	Elect.	$3,891	$4,008	NA	$0	$2,895	$6,903	$3,012	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	49b	Elect.	Elect.	$5,217	$5,374	NA	$0	$3,881	$9,255	$4,038	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	53b	Elect.	Elect.	$9,193	$9,470	NA	$0	$6,839	$16,309	$7,116	1.77
Motors	HOSPITL	Condenser Pump	Eff. Motor	ROF	60b	Elect.	Elect.	$2,737	$2,819	NA	$0	$2,036	$4,855	$2,118	1.77
Motors	DINING	Condenser Pump	Eff. Motor	ROF	59b	Elect.	Elect.	$684	$705	NA	$0	$509	$1,214	$530	1.77
Motors	PLT-BLD	Chilled Water Pump	Eff. Motor	ROF	40b	Elect.	Elect.	$6,756	$6,959	NA	$0	$5,027	$11,986	$5,230	1.77
Motors	WHS	Chilled Water Pump	Eff. Motor	ROF	48b	Elect.	Elect.	$4,875	$5,021	NA	$0	$3,627	$8,648	$3,773	1.77
Motors	BRK/ADM	Chilled Water Pump	Eff. Motor	ROF	28b	Elect.	Elect.	$6,508	$6,704	NA	$0	$4,841	$11,545	$5,037	1.77
Motors	MWR	Chilled Water Pump	Eff. Motor	ROF	39b	Elect.	Elect.	$3,591	$3,700	NA	$0	$2,672	$6,371	$2,780	1.77
Motors	DINING	Chilled Water Pump	Eff. Motor	ROF	34b	Elect.	Elect.	$2,677	$2,757	NA	$0	$1,992	$4,749	$2,072	1.77
Motors	COMCATN	Chilled Water Pump	Eff. Motor	ROF	32b	Elect.	Elect.	$599	$617	NA	$0	$446	$1,062	$463	1.77
Motors	GROCERY	Chilled Water Pump	Eff. Motor	ROF	35b	Elect.	Elect.	$1,369	$1,410	NA	$0	$1,018	$2,428	$1,059	1.77
Motors	HOSPITL	Chilled Water Pump	Eff. Motor	ROF	37b	Elect.	Elect.	$2,736	$2,819	NA	$0	$2,036	$4,854	$2,118	1.77
Motors	HANGER	Chilled Water Pump	Eff. Motor	ROF	36b	Elect.	Elect.	$1,625	$1,674	NA	$0	$1,209	$2,883	$1,258	1.77
Motors	TERMINL	Chilled Water Pump	Eff. Motor	ROF	46b	Elect.	Elect.	$1,540	$1,585	NA	$0	$1,145	$2,730	$1,191	1.77
Motors	TRAING	Chilled Water Pump	Eff. Motor	ROF	47b	Elect.	Elect.	$1,540	$1,585	NA	$0	$1,145	$2,730	$1,191	1.77
Motors	STOR-UH	Chilled Water Pump	Eff. Motor	ROF	45b	Elect.	Elect.	$299	$308	NA	$0	$222	$531	$231	1.77
Motors	CLUB	Chilled Water Pump	Eff. Motor	ROF	31b	Elect.	Elect.	$257	$264	NA	$0	$191	$455	$198	1.77
Lighting	3	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	$1,204	$1,034	$738	$327	$0	$2,100	$896	1.74
Lighting	2	4F40ES STD	3F40ES ELC REF	RI	8a	Elect.	Elect.	$417,010	$383,518	$184,115	$154,476	$0	$722,109	$305,099	1.73
Wtr. Heating	Capehart Hsg	Water Heater	Desuperheater	RI	1	Elect.	Elect.	$349,650	$1,064,261	NA	$0	-$461,648	$602,614	$252,964	1.72
Lighting	4	4F40ES STD	3F40ES ELC REF	RI	4	Elect.	Elect.	$14,040	$12,750	$6,199	$5,184	$0	$24,133	$10,093	1.72
Envelope	TRAING	Heating/Cooling	Weath. Package	RI	4d	Elect.	Elect.	$4,334	$7,402	NA	$0	$0	$7,402	$3,068	1.71
Lighting	1	1F40ES STD	1F32T8 ELC	RI	1	Elect.	Elect.	$1,187	$1,169	$426	$426	$0	$2,021	$835	1.70
AC	536	Chiller	Eff. Chiller&TES	RI	52	Elect.	Elect.	$45,500	-$8,323	$54,428	$6,889	$22,547	$75,541	$30,041	1.66
AC	534	Chiller	Eff. Chiller&TES	RI	49	Elect.	Elect.	$32,500	-$5,945	$38,877	$4,921	$16,105	$53,958	$21,458	1.66
AC	431	Chiller	Eff. Chiller&TES	RI	38	Elect.	Elect.	$65,000	-$11,891	$77,754	$9,842	$32,210	$107,915	$42,915	1.66
Lighting	3	4F40ES STD	3F40ES ELC REF	RI	5	Elect.	Elect.	$71,370	$60,348	$31,511	$25,580	$0	$117,438	$46,068	1.65

Table 3.7

EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Lighting	4	3F40ES STD	2F40ES ELC REF	RI	3	Elect	Elect	$31,091	$22,934	$17,407	$9,911	$0	$50,251	$19,160	1 62
AC	533	Chiller	Eff Chiller&TES	RI	47	Elect	Elect	$27,300	-$7,310	$33,113	$4,134	$13,528	$43,465	$16,165	1 59
Envelope	FAM HSG	Heating/Cooling	Weath Package	RI	4e	Elect	Elect	$213,156	$339,338	NA	$0	$0	$339,338	$126,182	1 59
AC	800	Chiller	Eff Chiller&TES	RI	97	Elect	Elect	$58,500	-$13,001	$67,629	$8,858	$28,989	$92,475	$33,975	1 58
AC	967	Chiller	Eff Chiller&TES	RI	101	Elect	Elect	$13,000	-$2,889	$15,029	$1,968	$6,442	$20,550	$7,550	1 58
AC	329	Chiller	Eff Chiller&TES	RI	19	Elect	Elect	$13,000	-$2,889	$15,029	$1,968	$6,442	$20,550	$7,550	1 58
AC	312	Chiller	Eff Chiller&TES	RI	14	Elect	Elect	$20,150	-$4,478	$23,295	$3,051	$9,985	$31,853	$11,703	1 58
AC	330	Chiller	Eff Chiller&TES	RI	21	Elect	Elect	$39,000	-$8,667	$45,086	$5,905	$19,326	$61,650	$22,650	1 58
AC	425	Chiller	Eff Chiller&TES	RI	34	Elect	Elect	$16,250	-$3,611	$18,786	$2,460	$8,052	$25,688	$9,438	1 58
AC	561	Chiller	Eff Chiller&TES	RI	62	Elect	Elect	$35,750	-$7,945	$41,329	$5,413	$17,715	$56,513	$20,763	1 58
AC	562	Chiller	Eff Chiller&TES	RI	63	Elect	Elect	$35,750	-$7,945	$41,329	$5,413	$17,715	$56,513	$20,763	1 58
AC	535	Chiller	Eff Chiller&TES	RI	50	Elect	Elect	$18,200	-$5,349	$21,771	$2,756	$9,019	$28,196	$9,996	1 55
AC	535	Chiller	Eff Chiller&TES	RI	51	Elect	Elect	$32,500	-$9,552	$38,877	$4,921	$16,105	$50,351	$17,851	1 55
AC	1364	Chiller	Gas Chiller/Cogen	RI	122	Elect	NG	$183,600	$192,108	$117,862	-$87,734	$59,355	$281,591	$97,991	1 53
AC	501	Chiller	Eff Chiller&TES	RI	40	Elect	Elect	$39,000	-$12,075	$46,261	$5,905	$19,326	$59,417	$20,417	1 52
AC	502	Chiller	Eff Chiller&TES	RI	41	Elect	Elect	$39,000	-$12,075	$46,261	$5,905	$19,326	$59,417	$20,417	1 52
AC	503	Chiller	Eff Chiller&TES	RI	42	Elect	Elect	$39,000	-$12,075	$46,261	$5,905	$19,326	$59,417	$20,417	1 52
AC	313	Chiller	Eff Chiller&TES	RI	15	Elect	Elect	$132,600	-$38,154	$144,419	$20,077	$65,708	$192,051	$59,451	1 45
AC	800	Chiller	Eff Chiller&TES	RI	88	Elect	Elect	$117,000	-$33,665	$127,429	$17,715	$57,978	$169,456	$52,456	1 45
AC	722	Chiller	Eff Chiller&TES	RI	78	Elect	Elect	$45,500	-$13,092	$49,556	$6,889	$22,547	$65,900	$20,400	1 45
AC	732	Chiller	Eff Chiller&TES	RI	80	Elect	Elect	$31,850	-$9,164	$34,689	$4,823	$15,783	$46,130	$14,280	1 45
AC	629	Chiller	Eff Chiller&TES	RI	69	Elect	Elect	$22,750	-$6,546	$24,778	$3,445	$11,273	$32,950	$10,200	1 45
AC	710	Chiller	Eff Chiller&TES	RI	77	Elect	Elect	$22,750	-$6,546	$24,778	$3,445	$11,273	$32,950	$10,200	1 45
AC	408	Chiller	Eff Chiller&TES	RI	30	Elect	Elect	$26,000	-$7,481	$28,317	$3,937	$12,884	$37,657	$11,657	1 45
AC	430	Chiller	Eff Chiller&TES	RI	37	Elect	Elect	$26,000	-$7,481	$28,317	$3,937	$12,884	$37,657	$11,657	1 45
AC	575	Chiller	Eff Chiller&TES	RI	64	Elect	Elect	$48,750	-$14,027	$53,095	$7,381	$24,157	$70,607	$21,857	1 45
AC	967	Chiller	Eff Chiller&TES	RI	102	Elect	Elect	$57,200	-$16,459	$62,298	$8,661	$28,345	$82,845	$25,645	1 45
AC	750	Chiller	Eff Chiller&TES	RI	85	Elect	Elect	$81,250	-$23,379	$88,492	$12,302	$40,262	$117,678	$36,428	1 45
AC	946	Chiller	Eff Chiller&TES	RI	97	Elect	Elect	$65,000	-$18,703	$70,794	$9,842	$32,210	$94,142	$29,142	1 45
AC	330	Chiller	Eff Chiller&TES	RI	20	Elect	Elect	$32,500	-$9,351	$35,397	$4,921	$16,105	$47,071	$14,571	1 45
AC	560	Chiller	Eff Chiller&TES	RI	61	Elect	Elect	$32,500	-$9,351	$35,397	$4,921	$16,105	$47,071	$14,571	1 45
AC	751	Chiller	Eff Chiller&TES	RI	86	Elect	Elect	$42,250	-$12,157	$46,016	$6,397	$20,936	$61,193	$18,943	1 45
AC	425	Chiller	Eff Chiller&TES	RI	35	Elect	Elect	$35,750	-$10,287	$38,937	$5,413	$17,715	$51,778	$16,028	1 45
AC	250	Chiller	Eff Chiller&TES	RI	9	Elect	Elect	$94,250	-$27,119	$102,651	$14,271	$46,704	$136,507	$42,257	1 45
AC	318	Chiller	Eff Chiller&TES	RI	17	Elect	Elect	$32,500	-$9,351	$35,397	$4,921	$16,105	$47,071	$14,571	1 45
AC	984	Chiller	Eff Chiller&TES	RI	104	Elect	Elect	$39,000	-$11,222	$42,476	$5,905	$19,326	$56,485	$17,485	1 45
AC	559	Chiller	Eff Chiller&TES	RI	60	Elect	Elect	$39,000	-$11,222	$42,476	$5,905	$19,326	$56,485	$17,485	1 45
AC	673	Chiller	Eff Chiller&TES	RI	73	Elect	Elect	$19,500	-$5,611	$21,238	$2,953	$9,663	$28,243	$8,743	1 45
AC	530	Chiller	Eff Chiller&TES	RI	46	Elect	Elect	$39,000	-$11,222	$42,476	$5,905	$19,326	$56,485	$17,485	1 45
AC	945	Chiller	Eff Chiller&TES	RI	96	Elect	Elect	$39,000	-$11,222	$42,476	$5,905	$19,326	$56,485	$17,485	1 45
AC	991	Chiller	Eff Chiller&TES	RI	111	Elect	Elect	$15,600	-$5,564	$18,035	$2,362	$7,730	$22,563	$6,963	1 45
AC	1493	Chiller	Eff Chiller&TES	RI	130	Elect	Elect	$18,200	-$6,491	$21,040	$2,756	$9,019	$26,323	$8,123	1 45
AC	810	Chiller	Eff Chiller&TES	RI	89	Elect	Elect	$13,000	-$4,637	$15,029	$1,968	$6,442	$18,802	$5,802	1 45
AC	402	Chiller	Eff Chiller&TES	RI	28	Elect	Elect	$13,000	-$4,637	$15,029	$1,968	$6,442	$18,802	$5,802	1 45
AC	989	Chiller	Eff Chiller&TES	RI	106	Elect	Elect	$71,500	-$25,502	$82,658	$10,826	$35,431	$103,414	$31,914	1 45
AC	424	Chiller	Eff Chiller&TES	RI	33	Elect	Elect	$13,000	-$4,637	$15,029	$1,968	$6,442	$18,802	$5,802	1 45
AC	957	Chiller	Eff Chiller&TES	RI	98	Elect	Elect	$13,000	-$4,637	$15,029	$1,968	$6,442	$18,802	$5,802	1 45
AC	990	Chiller	Eff Chiller&TES	RI	109	Elect	Elect	$19,500	-$6,955	$22,543	$2,953	$9,663	$28,204	$8,704	1 45
AC	1369	Chiller	Eff Chiller&TES	RI	124	Elect	Elect	$19,500	-$6,955	$22,543	$2,953	$9,663	$28,204	$8,704	1 45
AC	965	Chiller	Eff Chiller&TES	RI	100	Elect	Elect	$32,500	-$11,592	$37,572	$4,921	$16,105	$47,006	$14,506	1 45
AC	3656	Chiller	Eff Chiller&TES	RI	133	Elect	Elect	$16,250	-$5,796	$18,786	$2,460	$8,052	$23,503	$7,253	1 45
Lighting	1	2F40ES STD	2F32T8 ELC	RI	2a	Elect	Elect	$72,340	$49,073	$17,342	$37,144	$0	$103,560	$31,220	1 43
Lighting	2	2F96 STD	2F96ES ELC REF	RI	5	Elect	Elect	$9,970	$8,175	$4,259	$1,750	$0	$14,184	$4,214	1 42
Lighting	3	2F96 STD	2F96ES ELC REF	RI	3	Elect	Elect	$313,746	$256,688	$134,029	$54,745	$0	$445,463	$131,717	1 42
Lighting	2	1F40ES STD	1F32T8 ELC	RI	1	Elect	Elect	$50,908	$32,128	$18,289	$19,970	$0	$70,388	$19,480	1 38
AC	440	Chiller	Eff Chiller&TES	RI	39	Elect	Elect	$32,500	-$10,416	$34,309	$4,921	$16,105	$44,919	$12,419	1 38
AC	537	Chiller	Eff Chiller&TES	RI	53	Elect	Elect	$45,500	-$18,846	$50,926	$6,889	$22,547	$61,517	$16,017	1 35
AC	523	Chiller	Eff Chiller&TES	RI	45	Elect	Elect	$19,500	-$6,219	$19,687	$2,953	$9,663	$26,083	$6,583	1 34
Lighting	4	2F40ES STD	2F32T8 ELC	RI	1	Elect	Elect	$15,251	$8,772	$3,656	$7,649	$0	$20,077	$4,826	1 32
Motors	North Plant	Sewage Pump	Eff Motor	ROF	81b	Elect	Elect	$1,283	$702	NA	$0	$954	$1,656	$373	1 29
AC	969	Chiller	Eff Chiller&TES	RI	103	Elect	Elect	$20,800	-$9,594	$22,654	$3,149	$10,307	$26,517	$5,717	1 27
AC	990	Chiller	Eff Chiller&TES	RI	110	Elect	Elect	$32,500	-$14,991	$35,397	$4,921	$16,105	$41,432	$8,932	1 27
AC	576	Chiller	Eff Chiller&TES	RI	65	Elect	Elect	$32,500	-$14,991	$35,397	$4,921	$16,105	$41,432	$8,932	1 27

Table 3.7
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
AC	533	Chiller	Eff. Chiller&TES	RI	48	Elect.	Elect.	$113,750	-$52,467	$123,889	$17,223	$56,367	$145,012	$31,262	1.27
AC	3655	Chiller	Eff. Chiller&TES	RI	132	Elect.	Elect.	$32,500	-$14,991	$35,397	$4,921	$16,105	$41,432	$8,932	1.27
AC	989	Chiller	Eff. Chiller&TES	RI	107	Elect.	Elect.	$344,500	-$158,901	$375,207	$52,162	$170,712	$439,180	$94,680	1.27
AC	265	Chiller	Eff. Chiller&TES	RI	12	Elect.	Elect.	$48,750	-$22,486	$53,095	$7,381	$24,157	$62,148	$13,398	1.27
AC	734	Chiller	Eff. Chiller&TES	RI	81	Elect.	Elect.	$20,150	-$9,294	$21,946	$3,051	$9,985	$25,688	$5,538	1.27
AC	1316	Chiller	Eff. Chiller&TES	RI	118	Elect.	Elect.	$26,000	-$11,992	$28,317	$3,937	$12,884	$33,146	$7,146	1.27
AC	558	Chiller	Eff. Chiller&TES	RI	59	Elect.	Elect.	$52,000	-$23,985	$56,635	$7,874	$25,768	$66,291	$14,291	1.27
AC	400	Chiller	Eff. Chiller&TES	RI	26	Elect.	Elect.	$52,000	-$23,985	$56,635	$7,874	$25,768	$66,291	$14,291	1.27
AC	1353	Chiller	Eff. Chiller&TES	RI	119	Elect.	Elect.	$26,000	-$11,992	$28,317	$3,937	$12,884	$33,146	$7,146	1.27
AC	1365	Chiller	Eff. Chiller&TES	RI	123	Elect.	Elect.	$104,000	-$47,970	$113,270	$15,747	$51,536	$132,583	$28,583	1.27
AC	996	Chiller	Eff. Chiller&TES	RI	115	Elect.	Elect.	$26,000	-$11,992	$28,317	$3,937	$12,884	$33,146	$7,146	1.27
AC	727	Chiller	Eff. Chiller&TES	RI	79	Elect.	Elect.	$39,000	-$17,989	$42,476	$5,905	$19,326	$49,719	$10,719	1.27
AC	1492	Chiller	Eff. Chiller&TES	RI	129	Elect.	Elect.	$19,500	-$8,994	$21,238	$2,953	$9,663	$24,859	$5,359	1.27
AC	992	Chiller	Eff. Chiller&TES	RI	113	Elect.	Elect.	$19,500	-$8,994	$21,238	$2,953	$9,663	$24,859	$5,359	1.27
AC	423	Chiller	Eff. Chiller&TES	RI	32	Elect.	Elect.	$396,500	-$52,193	$350,099	$60,036	$135,195	$493,137	$96,637	1.24
Wtr. Heating	Temp.Lod Fac.	WH-1	Solar Water Heater	RI	4	Elect.	Elect.	$34,900	$57,369	NA	$0	-$14,137	$43,233	$8,333	1.24
Wtr. Heating	Wherry Hsg	WH-1	Solar Water Heater	RI	3	Elect.	Elect.	$386,692	$635,653	NA	$0	-$156,636	$479,017	$92,325	1.24
Wtr. Heating	APPR PFY50	WH-1	Solar Water Heater	RI	1	Elect.	Elect.	$2,094	$3,442	NA	$0	-$848	$2,594	$500	1.24
AC	3659	Chiller	Eff. Chiller&TES	RI	135	Elect.	Elect.	$65,000	-$20,832	$68,619	$9,842	$22,163	$79,792	$14,792	1.23
Wtr. Heating	504	Water Heater	Solar Water Heater	RI	1d	Elect.	Elect.	$20,125	$32,527	NA	$0	-$8,152	$24,375	$4,250	1.21
Wtr. Heating	502	Water Heater	Solar Water Heater	RI	1b	Elect.	Elect.	$20,125	$32,493	NA	$0	-$8,152	$24,341	$4,216	1.21
Wtr. Heating	503	Water Heater	Solar Water Heater	RI	1c	Elect.	Elect.	$20,125	$32,493	NA	$0	-$8,152	$24,341	$4,216	1.21
Wtr. Heating	501	Water Heater	Solar Water Heater	RI	1a	Elect.	Elect.	$20,125	$32,493	NA	$0	-$8,152	$24,341	$4,216	1.21
Lighting	2	1F40 STD	1F32T8 ELC REF	RI	2	Elect.	Elect.	$85,271	$76,280	$17,289	$9,193	$0	$102,762	$17,491	1.21
Wtr. Heating	505	Water Heater	Solar Water Heater	RI	1e	Elect.	Elect.	$18,477	$29,348	NA	$0	-$7,484	$21,864	$3,387	1.18
Wtr. Heating	506	Water Heater	Solar Water Heater	RI	1f	Elect.	Elect.	$18,477	$29,348	NA	$0	-$7,484	$21,864	$3,387	1.18
AC	404	Chiller	Eff. Chiller&TES	RI	29	Elect.	Elect.	$39,000	-$20,232	$41,041	$5,905	$19,326	$46,040	$7,040	1.18
Controls	WHS	E-9	EMCS(exist. chill.)	RI	9	Elect.	Elect.	$6,600	$8,758	NA	$0	-$987	$7,771	$1,171	1.18
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	86b	Elect.	Elect.	$3,421	$1,426	NA	$0	$2,545	$3,971	$550	1.16
AC	546	Chiller	Eff. Chiller&TES	RI	55	Elect.	Elect.	$65,000	-$19,990	$63,279	$9,842	$22,163	$75,294	$10,294	1.16
AC	330	Chiller	Eff. Chiller&TES	RI	22	Elect.	Elect.	$195,000	-$33,971	$163,697	$29,526	$66,490	$225,741	$30,741	1.16
AC	425	Chiller	Eff. Chiller&TES	RI	36	Elect.	Elect.	$312,000	-$54,354	$261,915	$47,241	$106,383	$361,186	$49,186	1.16
AC	415	Chiller	Eff. Chiller&TES	RI	31	Elect.	Elect.	$71,500	-$12,456	$60,022	$10,826	$24,379	$82,772	$11,272	1.16
AC	556	Chiller	Eff. Chiller&TES	RI	57	Elect.	Elect.	$19,500	-$9,964	$19,687	$2,953	$9,663	$22,338	$2,838	1.15
AC	557	Chiller	Eff. Chiller&TES	RI	58	Elect.	Elect.	$6,500	-$3,163	$6,250	$984	$3,221	$7,292	$792	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	91b	Elect.	Elect.	$8,979	$3,369	NA	$0	$6,680	$10,050	$1,070	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	89b	Elect.	Elect.	$5,986	$2,246	NA	$0	$4,454	$6,700	$714	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	88b	Elect.	Elect.	$4,618	$1,733	NA	$0	$3,436	$5,168	$550	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	90b	Elect.	Elect.	$2,566	$963	NA	$0	$1,909	$2,871	$306	1.12
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	85b	Elect.	Elect.	$855	$312	NA	$0	$636	$948	$93	1.11
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	51	Elect.	Elect.	$5,227	$988	$247	$0	$4,505	$5,741	$514	1.10
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	65	Elect.	Elect.	$2,614	$494	$124	$0	$2,253	$2,870	$257	1.10
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	116	Elect.	Elect.	$2,614	$494	$124	$0	$2,253	$2,870	$257	1.10
AC	1380	Chiller	Eff. Chiller&TES	RI	125	Elect.	Elect.	$208,000	-$52,699	$178,090	$31,494	$70,922	$227,808	$19,808	1.10
AC	989	Chiller	Eff. Chiller&TES	RI	108	Elect.	Elect.	$698,750	-$177,035	$598,272	$105,801	$238,254	$765,292	$66,542	1.10
Lighting	2	2F40 STD	2F40ES ELC REF	RI	4	Elect.	Elect.	$8,464	$4,553	$2,592	$2,027	$0	$9,171	$707	1.08
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	16	Elect.	Elect.	$13,155	$2,938	$735	$0	$10,499	$14,172	$1,017	1.08
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	95	Elect.	Elect.	$12,649	$2,749	$688	$0	$10,169	$13,607	$957	1.08
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	117	Elect.	Elect.	$2,234	$318	$80	$0	$2,004	$2,402	$168	1.08
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	48	Elect.	Elect.	$2,154	$468	$117	$0	$1,719	$2,304	$150	1.07
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	118	Elect.	Elect.	$2,148	$278	$70	$0	$1,948	$2,296	$147	1.07
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	92	Elect.	Elect.	$3,720	$786	$197	$0	$2,977	$3,960	$240	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	12	Elect.	Elect.	$7,440	$1,573	$394	$0	$5,953	$7,919	$479	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	93	Elect.	Elect.	$10,731	$2,207	$552	$0	$8,649	$11,409	$678	1.06
AC	998	Chiller	Eff. Chiller&TES	RI	117	Elect.	Elect.	$84,500	-$19,795	$68,004	$12,794	$28,812	$89,816	$5,316	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	49	Elect.	Elect.	$1,953	$306	$77	$0	$1,689	$2,071	$118	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	96	Elect.	Elect.	$15,405	$2,436	$610	$0	$13,255	$16,301	$896	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	17	Elect.	Elect.	$40,052	$6,334	$1,585	$0	$34,463	$42,382	$2,330	1.06
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	80b	Elect.	Elect.	$1,710	$535	NA	$0	$1,272	$1,807	$97	1.06
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	87b	Elect.	Elect.	$6,841	$2,139	NA	$0	$5,090	$7,229	$388	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	43	Elect.	Elect.	$8,887	$1,325	$332	$0	$7,722	$9,378	$491	1.06
AC	929	Chiller	Eff. Chiller&TES	RI	94	Elect.	Elect.	$156,000	-$43,603	$130,958	$23,621	$53,192	$164,167	$8,167	1.05
AC	925	Chiller	Eff. Chiller&TES	RI	92	Elect.	Elect.	$357,500	-$99,923	$300,111	$54,131	$121,897	$376,216	$18,716	1.05

Table 3.7
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
AC	505	Chiller	Eff Chiller&TES	RI	43	Elect.	Elect.	$178,750	-$49,962	$150,056	$27,065	$60,949	$188,108	$9,358	1.05
AC	986	Chiller	Eff Chiller&TES	RI	105	Elect.	Elect.	$130,000	-$36,336	$109,131	$19,684	$44,326	$136,806	$6,806	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	71	Elect.	Elect.	$13,000	$2,897	$725	$0	$10,016	$13,638	$638	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	61	Elect.	Elect.	$13,000	$2,897	$725	$0	$10,016	$13,638	$638	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	13	Elect.	Elect.	$33,978	$5,085	$1,273	$0	$29,285	$35,643	$1,666	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	64	Elect.	Elect.	$9,827	$1,631	$408	$0	$8,267	$10,306	$479	1.05
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	97	Elect.	Elect.	$8,217	$1,064	$266	$0	$7,285	$8,616	$399	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	14	Elect.	Elect.	$14,499	$1,914	$479	$0	$12,742	$15,135	$636	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	72	Elect.	Elect.	$9,134	$1,441	$361	$0	$7,685	$9,487	$353	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	62	Elect.	Elect.	$27,402	$4,323	$1,082	$0	$23,055	$28,460	$1,059	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	32	Elect.	Elect.	$2,711	$521	$130	$0	$2,154	$2,806	$95	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	73	Elect.	Elect.	$8,445	$1,175	$294	$0	$7,270	$8,739	$294	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	33	Elect.	Elect.	$2,507	$458	$115	$0	$2,019	$2,591	$85	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	47	Elect.	Elect.	$7,520	$1,374	$344	$0	$6,056	$7,774	$255	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	7	Elect.	Elect.	$15,039	$2,748	$688	$0	$12,112	$15,548	$509	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	87	Elect.	Elect.	$7,230	$1,286	$322	$0	$5,864	$7,472	$241	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	113	Elect.	Elect.	$7,230	$1,286	$322	$0	$5,864	$7,472	$241	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	69	Elect.	Elect.	$7,969	$1,208	$302	$0	$6,706	$8,216	$247	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	58	Elect.	Elect.	$7,969	$1,208	$302	$0	$6,706	$8,216	$247	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	76	Elect.	Elect.	$16,354	$1,154	$289	$0	$15,409	$16,853	$499	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	82	Elect.	Elect.	$1,285	$229	$57	$0	$1,035	$1,322	$37	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	2	Elect.	Elect.	$1,188	$201	$50	$0	$969	$1,221	$33	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	127	Elect.	Elect.	$7,368	$985	$247	$0	$6,343	$7,575	$207	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	59	Elect.	Elect.	$7,368	$985	$247	$0	$6,343	$7,575	$207	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	138	Elect.	Elect.	$7,084	$879	$220	$0	$6,172	$7,272	$187	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	115	Elect.	Elect.	$1,372	$80	$20	$0	$1,305	$1,405	$33	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	18	Elect.	Elect.	$12,988	$768	$192	$0	$12,329	$13,290	$302	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	77	Elect.	Elect.	$13,292	$1,390	$348	$0	$11,840	$13,577	$285	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	119	Elect.	Elect.	$1,698	$63	$16	$0	$1,653	$1,732	$34	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	130	Elect.	Elect.	$16,889	$2,471	$618	$0	$14,137	$17,226	$338	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	107	Elect.	Elect.	$1,836	$103	$26	$0	$1,744	$1,873	$36	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	35	Elect.	Elect.	$9,579	$1,742	$436	$0	$7,590	$9,768	$189	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	89	Elect.	Elect.	$8,856	$1,531	$383	$0	$7,113	$9,028	$171	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	9	Elect.	Elect.	$17,713	$3,063	$767	$0	$14,226	$18,055	$343	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	90	Elect.	Elect.	$8,188	$1,338	$335	$0	$6,673	$8,345	$157	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	79	Elect.	Elect.	$12,231	$758	$190	$0	$11,516	$12,463	$232	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	131	Elect.	Elect.	$15,014	$1,799	$450	$0	$13,027	$15,276	$262	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	10	Elect.	Elect.	$6,222	$762	$191	$0	$5,376	$6,328	$106	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	38	Elect.	Elect.	$14,519	$1,777	$445	$0	$12,544	$14,766	$248	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	74	Elect.	Elect.	$6,417	$379	$95	$0	$6,047	$6,521	$104	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	139	Elect.	Elect.	$5,823	$403	$101	$0	$5,411	$5,916	$93	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	91	Elect.	Elect.	$5,532	$555	$139	$0	$4,921	$5,614	$82	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	128	Elect.	Elect.	$11,198	$635	$159	$0	$10,552	$11,346	$149	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	29	Elect.	Elect.	$6,462	$1,111	$278	$0	$5,157	$6,547	$84	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	30	Elect.	Elect.	$2,154	$370	$93	$0	$1,719	$2,182	$28	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	103	Elect.	Elect.	$4,308	$741	$185	$0	$3,438	$4,364	$56	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	112	Elect.	Elect.	$2,154	$370	$93	$0	$1,719	$2,182	$28	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	5	Elect.	Elect.	$5,975	$977	$244	$0	$4,831	$6,052	$78	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	23	Elect.	Elect.	$834	$93	$23	$0	$728	$845	$11	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	100	Elect.	Elect.	$2,503	$280	$70	$0	$2,185	$2,535	$32	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	50	Elect.	Elect.	$1,269	$39	$10	$0	$1,236	$1,285	$16	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	134	Elect.	Elect.	$2,538	$78	$19	$0	$2,473	$2,570	$32	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	6	Elect.	Elect.	$4,198	$486	$122	$0	$3,642	$4,250	$52	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	110	Elect.	Elect.	$14,009	$433	$108	$0	$13,640	$14,181	$172	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	44	Elect.	Elect.	$6,004	$185	$46	$0	$5,846	$6,078	$74	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	20	Elect.	Elect.	$4,003	$124	$31	$0	$3,897	$4,052	$49	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	94	Elect.	Elect.	$6,791	$199	$50	$0	$6,614	$6,862	$71	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	108	Elect.	Elect.	$81,494	$2,382	$596	$0	$79,368	$82,346	$853	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	39	Elect.	Elect.	$10,187	$298	$75	$0	$9,921	$10,293	$107	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	120	Elect.	Elect.	$3,265	$62	$15	$0	$3,222	$3,299	$34	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	52	Elect.	Elect.	$3,265	$62	$15	$0	$3,222	$3,299	$34	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	31	Elect.	Elect.	$1,106	$78	$20	$0	$1,018	$1,116	$10	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	75	Elect.	Elect.	$5,933	$183	$46	$0	$5,755	$5,984	$51	1.01

Table 3.7
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	66	Elect.	Elect.	$5,933	$183	$46	$0	$5,755	$5,984	$51	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	85	Elect.	Elect.	$1,048	$115	$29	$0	$913	$1,057	$8	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	36	Elect.	Elect.	$4,372	$200	$50	$0	$4,156	$4,406	$34	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	40	Elect.	Elect.	$4,477	$695	$174	$0	$3,638	$4,508	$31	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	3	Elect.	Elect.	$2,984	$464	$116	$0	$2,425	$3,005	$21	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	25	Elect.	Elect.	$862	$65	$16	$0	$787	$868	$6	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	84	Elect.	Elect.	$1,614	$264	$66	$0	$1,295	$1,625	$11	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	27	Elect.	Elect.	$1,614	$264	$66	$0	$1,295	$1,625	$11	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	19	Elect.	Elect.	$17,319	$274	$69	$0	$17,086	$17,429	$110	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	88	Elect.	Elect.	$6,864	$173	$43	$0	$6,689	$6,906	$43	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	8	Elect.	Elect.	$3,432	$87	$22	$0	$3,345	$3,453	$21	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	34	Elect.	Elect.	$13,727	$347	$87	$0	$13,379	$13,812	$85	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	105	Elect.	Elect.	$26,311	$665	$166	$0	$25,642	$26,474	$163	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	109	Elect.	Elect.	$1,632	$24	$6	$0	$1,611	$1,641	$9	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	15	Elect.	Elect.	$9,795	$147	$37	$0	$9,665	$9,848	$53	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	83	Elect.	Elect.	$1,084	$25	$6	$0	$1,058	$1,090	$6	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	63	Elect.	Elect.	$5,705	$90	$23	$0	$5,618	$5,730	$25	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	24	Elect.	Elect.	$737	$30	$8	$0	$702	$740	$3	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	106	Elect.	Elect.	$80,838	$1,933	$484	$0	$78,761	$81,178	$340	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	37	Elect.	Elect.	$21,557	$515	$129	$0	$21,003	$21,647	$91	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	41	Elect.	Elect.	$4,042	$97	$24	$0	$3,938	$4,059	$17	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	132	Elect.	Elect.	$11,640	$180	$45	$0	$11,458	$11,683	$43	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	60	Elect.	Elect.	$4,977	$75	$19	$0	$4,901	$4,996	$18	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	129	Elect.	Elect.	$9,955	$151	$38	$0	$9,803	$9,991	$37	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	70	Elect.	Elect.	$4,977	$75	$19	$0	$4,901	$4,996	$18	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	81	Elect.	Elect.	$12,853	$129	$32	$0	$12,739	$12,900	$47	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	78	Elect.	Elect.	$60,605	$926	$232	$0	$59,659	$60,817	$212	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	22	Elect.	Elect.	$4,336	$95	$24	$0	$4,232	$4,351	$14	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	101	Elect.	Elect.	$3,252	$71	$18	$0	$3,174	$3,263	$11	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	104	Elect.	Elect.	$10,907	$247	$62	$0	$10,634	$10,943	$36	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	28	Elect.	Elect.	$5,453	$123	$31	$0	$5,317	$5,471	$18	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	86	Elect.	Elect.	$2,727	$62	$15	$0	$2,659	$2,736	$9	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	80	Flect.	Elect.	$11,202	$106	$26	$0	$11,103	$11,235	$33	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	1	Elect.	Elect.	$521	$6	$2	$0	$515	$523	$1	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	102	Elect.	Elect.	$2,724	$59	$15	$0	$2,657	$2,731	$7	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	11	Elect.	Elect.	$1,295	$16	$4	$0	$1,279	$1,298	$3	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	42	Elect.	Elect.	$3,886	$48	$12	$0	$3,836	$3,895	$9	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	121	Elect.	Elect.	$4,533	$352	$88	$0	$4,102	$4,542	$9	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	122	Elect.	Elect.	$4,030	$191	$48	$0	$3,798	$4,037	$7	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	53	Elect.	Elect.	$4,903	$469	$117	$0	$4,326	$4,911	$8	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	26	Elect.	Elect.	$655	$7	$2	$0	$647	$656	$1	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	4	Elect.	Elect.	$655	$7	$2	$0	$647	$656	$1	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	123	Elect.	Elect.	$3,583	$45	$11	$0	$3,528	$3,585	$2	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	135	Elect.	Elect.	$3,583	$45	$11	$0	$3,528	$3,585	$2	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	67	Elect.	Elect.	$5,736	$727	$182	$0	$4,829	$5,738	$2	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	133	Elect.	Elect.	$24,045	$178	$44	$0	$23,830	$24,052	$8	1.00
Totals								$16,693,883	$14,934,335	$8,429,275	$5,293,533	$5,498,736	$34,155,878	$17,461,995	2.05

(a): NA Denotes EROs where demand reductions were not considered because of uncertainty about contribution to the monthly peak.

Table 3.8
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Annualized Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Annualized Installed Cost (1993 $)	Annualized Energy Savings (1993 $)	Annualized Demand Savings (1993 $)	Annualized O&M Savings (1993 $)	Annualized Replacement Cost Savings (1993 $)	Annualized Total Savings (1993 $)	Annualized Net Savings (1993 $)	Savings to Investment Ratio
Controls	R&D	E-6	EMCS(exist. chill.)	RI	6	Elect.	Elect.	$563	$7,629	$0	$0	-$84	$7,545	$6,982	13.39
Lighting	2	INC 2x60 Ceil	CFL 2-11 CEIL FIXT	RI	13	Elect.	Elect.	$108	$948	$180	$318	$0	$1,446	$1,338	13.34
Lighting	3	INC 2x60 ceil	CFL 2-11 CEIL FIXT	RI	10	Elect.	Elect.	$12,334	$98,864	$20,467	$33,383	$0	$152,714	$140,380	12.38
Envelope	CLUB	Heating/Cooling	Weath. Package	RI	4c	Elect.	Elect.	$165	$1,310	$0	$0	$0	$1,310	$1,146	7.96
Lighting	2	INC 60 Ceil	CFL 11 CEIL FIXT	RI	15	Elect.	Elect.	$1,687	$7,491	$1,698	$3,118	$0	$12,306	$10,620	7.30
Controls	DGR	E-3	EMCS(exist. chill.)	RI	3	Elect.	Elect.	$282	$2,094	$0	$0	-$42	$2,052	$1,770	7.28
Lighting	1	2F40ES STD	SENS	RI	2b	Elect.	Elect.	$766	$2,561	$905	$2,071	$0	$5,538	$4,772	7.23
Lighting	3	INC 75 Ceil	CFL 2-9 + BLST	RI	12	Elect.	Elect.	$8,526	$43,064	$8,915	-$412	$0	$51,567	$43,041	6.05
Lighting	2	INC 75 Ceil	CFL 2-9 + BLST	RI	16	Elect.	Elect.	$196	$906	$205	-$4	$0	$1,107	$911	5.64
Controls	ADMIN	E-1	EMCS(exist. chill.)	RI	1	Elect.	Elect.	$845	$4,830	$0	$0	-$126	$4,703	$3,858	5.57
Lighting	2	EXIT INC (2x15)	LED	RI	1:	Elect.	Elect.	$312	$276	$70	$1,373	$0	$1,719	$1,407	5.51
Lighting	1	EXIT INC(2x15)	LED	RI	8	Elect.	Elect.	$4,660	$4,126	$1,044	$20,513	$0	$25,683	$21,023	5.51
Lighting	5	INC 2-60	CFL 2-15 CEIL	RI	2	Elect.	Elect.	$11,132	$28,044	$14,280	$15,498	$0	$57,821	$46,690	5.19
Lighting	2	3F40ES STD	2F40ES ELC REF SENS	RI	7b	Elect.	Elect.	$863	$2,771	$526	$973	$0	$4,270	$3,407	4.95
Lighting	1	INC 75 Can	CFL 20 + BLST	RI	9	Elect.	Elect.	$3,414	$10,005	$3,758	$2,867	$0	$16,630	$13,216	4.87
Envelope	Wherry	Heating/Cooling	Ceiling Insulation	RI	1b	Elect.	Elect.	$26,673	$124,563	$0	$0	$0	$124,563	$97,891	4.67
Envelope	FAM HSG	Heating/Cooling	Refl. Window Trtmnt	RI	2b	Elect.	Elect.	$28,734	$132,384	$0	$0	$0	$132,384	$103,650	4.61
Lighting	2	3F40ES STD	2F40ES ELC REF	RI	7a	Elect.	Elect.	$1,245	$3,672	$697	$1,215	$0	$5,585	$4,340	4.49
Lighting	5	INC 1-60	CFL 15 CEIL	RI	3	Elect.	Elect.	$4,693	$13,312	$3,570	$3,937	$0	$20,819	$16,125	4.44
Controls	COMCATN	E-2	EMCS(exist. chill.)	RI	2	Elect.	Elect.	$1,549	$7,016	$0	$0	-$232	$6,785	$5,236	4.38
Lighting	2	4F40 STD	3F32T8 ELC REF	RI	9	Elect.	Elect.	$4,797	$15,369	$2,940	$1,698	$0	$20,008	$15,211	4.17
Controls	SHOP-ELC	E-8	EMCS(exist. chill.)	RI	8	Elect.	Elect.	$141	$598	$0	$0	-$21	$577	$437	4.10
Lighting	2	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	$639	$1,729	$392	$220	$0	$2,341	$1,701	3.66
Lighting	2	EXIT 2xPL9	LED	RI	10	Elect.	Elect.	$3,526	$2,123	$537	$8,805	$0	$11,465	$7,939	3.25
Controls	MISC	E-4	EMCS(exist. chill.)	RI	4	Elect.	Elect.	$141	$476	$0	$0	-$21	$454	$314	3.23
Lighting	1	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	$8,102	$18,442	$4,966	$2,720	$0	$26,128	$18,026	3.22
Lighting	3	INC 100 Ceil	CFL 2-11 CEIL FIXT	RI	8	Elect.	Elect.	$226	$410	$292	$23	$0	$724	$498	3.20
Lighting	2	2F40ES STD	2F32T8 ELC SENS	RI	3b	Elect.	Elect.	$2,073	$4,001	$835	$1,766	$0	$6,602	$4,529	3.19
Controls	REC	E-7	EMCS(exist. chill.)	RI	7	Elect.	Elect.	$422	$1,386	$0	$0	-$63	$1,323	$900	3.13
Envelope	BRK/ADM	Heating/Cooling	Weath. Package	RI	4b	Elect.	Elect.	$2,295	$6,538	$0	$0	$0	$6,538	$4,243	2.85
Lighting	1	3F40ES STD	2F40ES ELC REF SENS	RI	5b	Elect.	Elect.	$29,465	$47,661	$17,936	$17,723	$0	$83,320	$53,854	2.83
Lighting	2	EXIT INC (2x20)	LED	RI	12	Elect.	Elect.	$446	$553	$140	$558	$0	$1,251	$804	2.80
Lighting	3	EXIT INC(2x20)	LED	RI	7	Elect.	Elect.	$231	$286	$72	$288	$0	$647	$416	2.80
Lighting	1	3F40ES STD	2F40ES ELC REF	RI	5a	Elect.	Elect.	$38,980	$57,992	$21,824	$22,116	$0	$101,932	$62,952	2.61
Lighting	3	2F40 STD	2F40ES ELC REF SENS	RI	2b	Elect.	Elect.	$474	$840	$183	$215	$0	$1,238	$764	2.61
Envelope	ADMIN	Heating/Cooling	Weath. Package	RI	4a	Elect.	Elect.	$6,365	$15,567	$0	$0	$0	$15,567	$9,202	2.45
Envelope	TLF	Heating/Cooling	Refl. Window Trtmnt	RI	2a	Elect.	Elect.	$10,626	$25,322	$0	$0	$0	$25,322	$14,696	2.38
Lighting	1	4F40ES STD	3F40ES ELC REF	RI	4	Elect.	Elect.	$2,218	$2,989	$979	$968	$0	$4,937	$2,719	2.23
Boilers	Multiple	All Boilers	Tune-up 50	RI	3	NG,F.Oil	NG,F.Oil	$1,120	$3,180	$0	-$500	-$296	$2,383	$1,263	2.13
Lighting	2	4F40ES STD	3F40ES ELC REF SENS	RI	8b	Elect.	Elect.	$806	$910	$437	$339	$0	$1,685	$879	2.09
Lighting	3	3F40 STD	2F40 STD REF	RI	4b	Elect.	Elect.	$100	$102	$73	$23	$0	$199	$99	1.99
Lighting	3	3F40 STD	2F40 STD REF	RI	4a	Elect.	Elect.	$100	$102	$73	$23	$0	$199	$99	1.99
Lighting	3	2F40 STD	2F40ES ELC REF	RI	2a	Elect.	Elect.	$10,804	$15,150	$3,308	$2,884	$0	$21,341	$10,537	1.98
Transport.	Vehicles	Various	CNG Vehicle	RI		Gas/Diesel	NG,Diesel	$82,383	$71,290	$0	$117,885	-$26,473	$162,701	$80,318	1.97
Motors	CLUB	Fan Motor	Eff. Motor	RI	5a	Elect.	Elect.	$130	$170	$50	$0	$34	$254	$124	1.95
Motors	PLT-BLD	Fan Motor	Eff. Motor	RI	16a	Elect.	Elect.	$41	$53	$15	$0	$11	$79	$38	1.94
Motors	RESTRNT	Fan Motor	Eff. Motor	RI	19a	Elect.	Elect.	$29	$37	$11	$0	$8	$56	$27	1.94
Motors	CHAPEL	Fan Motor	Eff. Motor	RI	3a	Elect.	Elect.	$104	$135	$39	$0	$28	$202	$98	1.94
Motors	CLINIC	Fan Motor	Eff. Motor	RI	4a	Elect.	Elect.	$60	$78	$23	$0	$16	$117	$57	1.94
Motors	TRAING	Fan Motor	Eff. Motor	RI	25a	Elect.	Elect.	$346	$448	$130	$0	$92	$670	$324	1.94
Motors	STOR-UH	Fan Motor	Eff. Motor	RI	23a	Elect.	Elect.	$374	$484	$141	$0	$99	$724	$350	1.94
Motors	TERMINL	Fan Motor	Eff. Motor	RI	24a	Elect.	Elect.	$766	$991	$289	$0	$203	$1,483	$717	1.94
Motors	COMCATN	Fan Motor	Eff. Motor	RI	6a	Elect.	Elect.	$734	$950	$277	$0	$195	$1,422	$688	1.94
Motors	GROCERY	Fan Motor	Eff. Motor	RI	9a	Elect.	Elect.	$745	$964	$281	$0	$198	$1,443	$698	1.94
Motors	HOSPITL	Fan Motor	Eff. Motor	RI	11a	Elect.	Elect.	$651	$842	$245	$0	$173	$1,260	$610	1.94
Motors	REC	Fan Motor	Eff. Motor	RI	18a	Elect.	Elect.	$380	$492	$143	$0	$101	$736	$356	1.94
Motors	DGR	Fan Motor	Eff. Motor	RI	7a	Elect.	Elect.	$1,322	$1,712	$499	$0	$351	$2,562	$1,239	1.94
Motors	MTRPOOL	Fan Motor	Eff. Motor	RI	14a	Elect.	Elect.	$454	$587	$171	$0	$120	$878	$425	1.94
Motors	ADMIN	Fan Motor	Eff. Motor	RI	1a	Elect.	Elect.	$7,811	$10,110	$2,945	$0	$2,075	$15,129	$7,318	1.94
Motors	WHS	Fan Motor	Eff. Motor	RI	26a	Elect.	Elect.	$2,778	$3,596	$1,047	$0	$738	$5,381	$2,603	1.94
Motors	BRK/ADM	Fan Motor	Eff. Motor	RI	2a	Elect.	Elect.	$2,034	$2,632	$767	$0	$540	$3,939	$1,905	1.94
Motors	MWR	Fan Motor	Eff. Motor	RI	15a	Elect.	Elect.	$1,016	$1,315	$383	$0	$270	$1,967	$952	1.94
Motors	SHOP-ELEC	Fan Motor	Eff. Motor	RI	22a	Elect.	Elect.	$1,478	$1,913	$557	$0	$393	$2,863	$1,385	1.94
Motors	HSG-FAM	Fan Motor	Eff. Motor	RI	12a	Elect.	Elect.	$109	$141	$41	$0	$29	$211	$102	1.94
Motors	HANGER	Fan Motor	Eff. Motor	RI	10a	Elect.	Elect.	$1,022	$1,323	$385	$0	$272	$1,980	$958	1.94
Motors	R&D	Fan Motor	Eff. Motor	RI	17a	Elect.	Elect.	$486	$629	$183	$0	$129	$941	$455	1.94

Table 3.8
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Annualized Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Annualized Installed Cost (1993 $)	Annualized Energy Savings (1993 $)	Annualized Demand Savings (1993 $)	Annualized O&M Savings (1993 $)	Annualized Replacement Cost Savings (1993 $)	Annualized Total Savings (1993 $)	Annualized Net Savings (1993 $)	Savings to Investment Ratio
Motors	DINING	Fan Motor	Eff. Motor	RI	8a	Elect.	Elect.	$725	$938	$273	$0	$193	$1,404	$679	1.94
Motors	SHOP	Fan Motor	Eff. Motor	RI	21a	Elect.	Elect.	$299	$386	$113	$0	$79	$578	$280	1.94
Motors	SECURITY	Fan Motor	Eff. Motor	RI	20a	Elect.	Elect.	$340	$440	$128	$0	$90	$659	$319	1.94
Motors	MISC	Fan Motor	Eff. Motor	RI	13a	Elect.	Elect.	$37	$48	$14	$0	$10	$72	$35	1.94
Lighting	2	2F40ES STD	2F32T8 ELC	RI	3a	Elect.	Elect.	$4,521	$5,195	$1,084	$2,429	$0	$8,709	$4,187	1.93
HVAC	Family Housing	Air Source Ht. Pump	Gmd-Cpld Ht. Pump	ROF	1	Elect.	Elect.	$104,296	$9,214	$0	$0	$178,087	$187,301	$83,004	1.80
Motors	North Plant	Sewage Pump	Eff. Motor	RI	82a	Elect.	Elect.	$144	$219	$0	$0	$38	$257	$113	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	77a	Elect.	Elect.	$72	$110	$0	$0	$19	$129	$57	1.79
Motors	North Plant	Sewage Pump	Eff. Motor	RI	83a	Elect.	Elect.	$36	$55	$0	$0	$10	$64	$28	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	79a	Elect.	Elect.	$252	$383	$0	$0	$67	$450	$198	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	72a	Elect.	Elect.	$14	$22	$0	$0	$4	$26	$11	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	71a	Elect.	Elect.	$7	$11	$0	$0	$2	$13	$6	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	76a	Elect.	Elect.	$54	$82	$0	$0	$14	$96	$42	1.79
Motors	REC	Chilled Water Pump	Eff. Motor	ROF	42b	Elect.	Elect.	$27	$28	$0	$0	$20	$48	$21	1.77
Motors	CLINIC	Chilled Water Pump	Eff. Motor	ROF	30b	Elect.	Elect.	$22	$23	$0	$0	$16	$39	$17	1.77
Motors	MISC	Chilled Water Pump	Eff. Motor	ROF	38b	Elect.	Elect.	$22	$23	$0	$0	$16	$39	$17	1.77
Motors	SHOP-ELEC	Chilled Water Pump	Eff. Motor	ROF	44b	Elect.	Elect.	$112	$115	$0	$0	$83	$198	$86	1.77
Motors	CHAPEL	Chilled Water Pump	Eff. Motor	ROF	29b	Elect.	Elect.	$55	$56	$0	$0	$41	$97	$42	1.77
Motors	DGR	Chilled Water Pump	Eff. Motor	ROF	33b	Elect.	Elect.	$233	$240	$0	$0	$173	$414	$181	1.77
Motors	SECURITY	Chilled Water Pump	Eff. Motor	ROF	43b	Elect.	Elect.	$41	$42	$0	$0	$31	$73	$32	1.77
Motors	R&D	Chilled Water Pump	Eff. Motor	ROF	41b	Elect.	Elect.	$127	$131	$0	$0	$94	$225	$98	1.77
Motors	ADMIN	Chilled Water Pump	Eff. Motor	ROF	27b	Elect.	Elect.	$1,799	$1,853	$0	$0	$1,338	$3,191	$1,392	1.77
Motors	WHS	Condenser Pump	Eff. Motor	ROF	63b	Elect.	Elect.	$33	$34	$0	$0	$24	$58	$25	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	55b	Elect.	Elect.	$33	$34	$0	$0	$24	$58	$25	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	56b	Elect.	Elect.	$33	$34	$0	$0	$24	$58	$25	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	50b	Elect.	Elect.	$263	$271	$0	$0	$195	$466	$203	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	57b	Elect.	Elect.	$33	$34	$0	$0	$24	$58	$25	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	52b	Elect.	Elect.	$33	$34	$0	$0	$24	$58	$25	1.77
Motors	DGR	Condenser Pump	Eff. Motor	ROF	58b	Elect.	Elect.	$60	$62	$0	$0	$45	$107	$47	1.77
Motors	MWR	Condenser Pump	Eff. Motor	ROF	61b	Elect.	Elect.	$55	$56	$0	$0	$41	$97	$42	1.77
Motors	TRAING	Condenser Pump	Eff. Motor	ROF	62b	Elect.	Elect.	$27	$28	$0	$0	$20	$49	$21	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	51b	Elect.	Elect.	$38	$39	$0	$0	$29	$68	$30	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	54b	Elect.	Elect.	$249	$257	$0	$0	$185	$442	$193	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	49b	Elect.	Elect.	$334	$344	$0	$0	$248	$592	$258	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	53b	Elect.	Elect.	$588	$606	$0	$0	$438	$1,044	$456	1.77
Motors	HOSPITL	Condenser Pump	Eff. Motor	ROF	60b	Elect.	Elect.	$175	$180	$0	$0	$130	$311	$136	1.77
Motors	DINING	Condenser Pump	Eff. Motor	ROF	59b	Elect.	Elect.	$44	$45	$0	$0	$33	$78	$34	1.77
Motors	PLT-BLD	Chilled Water Pump	Eff. Motor	ROF	40b	Elect.	Elect.	$432	$445	$0	$0	$322	$767	$335	1.77
Motors	WHS	Chilled Water Pump	Eff. Motor	ROF	48b	Elect.	Elect.	$312	$321	$0	$0	$232	$554	$242	1.77
Motors	BRK/ADM	Chilled Water Pump	Eff. Motor	ROF	26b	Elect.	Elect.	$417	$429	$0	$0	$310	$739	$322	1.77
Motors	MWR	Chilled Water Pump	Eff. Motor	ROF	39b	Elect.	Elect.	$230	$237	$0	$0	$171	$408	$178	1.77
Motors	DINING	Chilled Water Pump	Eff. Motor	ROF	34b	Elect.	Elect.	$171	$177	$0	$0	$128	$304	$133	1.77
Motors	COMCATN	Chilled Water Pump	Eff. Motor	ROF	32b	Elect.	Elect.	$38	$39	$0	$0	$29	$68	$30	1.77
Motors	GROCERY	Chilled Water Pump	Eff. Motor	ROF	35b	Elect.	Elect.	$88	$90	$0	$0	$65	$155	$68	1.77
Motors	HOSPITL	Chilled Water Pump	Eff. Motor	ROF	37b	Elect.	Elect.	$175	$180	$0	$0	$130	$311	$136	1.77
Motors	HANGER	Chilled Water Pump	Eff. Motor	ROF	36b	Elect.	Elect.	$104	$107	$0	$0	$77	$185	$81	1.77
Motors	TERMINL	Chilled Water Pump	Eff. Motor	ROF	46b	Elect.	Elect.	$99	$101	$0	$0	$73	$175	$76	1.77
Motors	TRAING	Chilled Water Pump	Eff. Motor	ROF	47b	Elect.	Elect.	$99	$101	$0	$0	$73	$175	$76	1.77
Motors	STOR-UH	Chilled Water Pump	Eff. Motor	ROF	45b	Elect.	Elect.	$19	$20	$0	$0	$14	$34	$15	1.77
Motors	CLUB	Chilled Water Pump	Eff. Motor	ROF	31b	Elect.	Elect.	$16	$17	$0	$0	$12	$29	$13	1.77
Lighting	3	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	$77	$66	$47	$21	$0	$134	$57	1.74
Lighting	2	4F40ES STD	3F40ES ELC REF	RI	8a	Elect.	Elect.	$26,694	$24,550	$11,766	$9,888	$0	$46,224	$19,530	1.73
Wtr. Heating	Capehart Hsg	Water Heater	Desuperheater	RI	1	Elect.	Elect.	$22,382	$68,125	$0	$0	-$29,551	$38,574	$16,193	1.72
Lighting	4	4F40ES STD	3F40ES ELC REF	RI	4	Elect.	Elect.	$899	$816	$397	$332	$0	$1,545	$646	1.72
Envelope	TRAING	Heating/Cooling	Weath. Package	RI	4d	Elect.	Elect.	$277	$474	$0	$0	$0	$474	$196	1.71
Lighting	1	1F40ES STD	1F32T8 ELC	RI	1	Elect.	Elect.	$76	$75	$27	$27	$0	$129	$53	1.70
AC	536	Chiller	Eff. Chiller&TES	RI	52	Elect.	Elect.	$2,913	-$533	$3,484	$441	$1,443	$4,835	$1,923	1.66
AC	534	Chiller	Eff. Chiller&TES	RI	49	Elect.	Elect.	$2,080	-$381	$2,489	$315	$1,031	$3,454	$1,374	1.66
AC	431	Chiller	Eff. Chiller&TES	RI	38	Elect.	Elect.	$4,161	-$761	$4,977	$630	$2,062	$6,908	$2,747	1.66
Lighting	3	4F40ES STD	3F40ES ELC REF	RI	5	Elect.	Elect.	$4,569	$3,863	$2,017	$1,637	$0	$7,517	$2,949	1.65
Lighting	4	3F40ES STD	2F40ES ELC REF	RI	3	Elect.	Elect.	$1,990	$1,468	$1,114	$634	$0	$3,217	$1,226	1.62
AC	533	Chiller	Eff. Chiller&TES	RI	47	Elect.	Elect.	$1,748	-$468	$2,120	$265	$866	$2,782	$1,035	1.59
Envelope	FAM HSG	Heating/Cooling	Weath. Package	RI	4e	Elect.	Elect.	$13,645	$21,722	$0	$0	$0	$21,722	$8,077	1.59
AC	800	Chiller	Eff. Chiller&TES	RI	87	Elect.	Elect.	$3,745	-$832	$4,329	$567	$1,856	$5,920	$2,175	1.58
AC	967	Chiller	Eff. Chiller&TES	RI	101	Elect.	Elect.	$832	-$185	$962	$126	$412	$1,315	$483	1.58
AC	329	Chiller	Eff. Chiller&TES	RI	19	Elect.	Elect.	$832	-$185	$962	$126	$412	$1,315	$483	1.58

Table 3.8
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Annualized Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Annualized Installed Cost (1993 $)	Annualized Energy Savings (1993 $)	Annualized Demand Savings (1993 $)	Annualized O&M Savings (1993 $)	Annualized Replacement Cost Savings (1993 $)	Annualized Total Savings (1993 $)	Annualized Net Savings (1993 $)	Savings to Investment Ratio
AC	312	Chiller	Eff. Chiller&TES	RI	14	Elect.	Elect.	$1,290	-$287	$1,491	$195	$639	$2,039	$749	1.58
AC	330	Chiller	Eff. Chiller&TES	RI	21	Elect.	Elect.	$2,496	-$555	$2,886	$378	$1,237	$3,946	$1,450	1.58
AC	425	Chiller	Eff. Chiller&TES	RI	34	Elect.	Elect.	$1,040	-$231	$1,203	$158	$515	$1,644	$604	1.58
AC	561	Chiller	Eff. Chiller&TES	RI	62	Elect.	Elect.	$2,288	-$509	$2,646	$347	$1,134	$3,617	$1,329	1.58
AC	562	Chiller	Eff. Chiller&TES	RI	63	Elect.	Elect.	$2,288	-$509	$2,646	$347	$1,134	$3,617	$1,329	1.58
AC	535	Chiller	Eff. Chiller&TES	RI	50	Elect.	Elect.	$1,165	-$342	$1,394	$176	$577	$1,805	$640	1.55
AC	535	Chiller	Eff. Chiller&TES	RI	51	Elect.	Elect.	$2,080	-$611	$2,489	$315	$1,031	$3,223	$1,143	1.55
AC	1364	Chiller	Gas Chiller/Cogen.	RI	122	Elect.	NG	$11,753	$12,297	$7,545	-$5,616	$3,799	$18,025	$6,273	1.53
AC	501	Chiller	Eff. Chiller&TES	RI	40	Elect.	Elect.	$2,496	-$773	$2,961	$378	$1,237	$3,803	$1,307	1.52
AC	502	Chiller	Eff. Chiller&TES	RI	41	Elect.	Elect.	$2,496	-$773	$2,961	$378	$1,237	$3,803	$1,307	1.52
AC	503	Chiller	Eff. Chiller&TES	RI	42	Elect.	Elect.	$2,496	-$773	$2,961	$378	$1,237	$3,803	$1,307	1.52
AC	313	Chiller	Eff. Chiller&TES	RI	15	Elect.	Elect.	$8,488	-$2,442	$9,245	$1,285	$4,206	$12,294	$3,806	1.45
AC	800	Chiller	Eff. Chiller&TES	RI	88	Elect.	Elect.	$7,489	-$2,155	$8,157	$1,134	$3,711	$10,847	$3,358	1.45
AC	722	Chiller	Eff. Chiller&TES	RI	78	Elect.	Elect.	$2,913	-$838	$3,172	$441	$1,443	$4,218	$1,306	1.45
AC	732	Chiller	Eff. Chiller&TES	RI	80	Elect.	Elect.	$2,039	-$587	$2,221	$309	$1,010	$2,953	$914	1.45
AC	629	Chiller	Eff. Chiller&TES	RI	69	Elect.	Elect.	$1,456	-$419	$1,586	$221	$722	$2,109	$653	1.45
AC	710	Chiller	Eff. Chiller&TES	RI	77	Elect.	Elect.	$1,456	-$419	$1,586	$221	$722	$2,109	$653	1.45
AC	408	Chiller	Eff. Chiller&TES	RI	30	Elect.	Elect.	$1,664	-$479	$1,813	$252	$825	$2,410	$746	1.45
AC	430	Chiller	Eff. Chiller&TES	RI	37	Elect.	Elect.	$1,664	-$479	$1,813	$252	$825	$2,410	$746	1.45
AC	575	Chiller	Eff. Chiller&TES	RI	64	Elect.	Elect.	$3,121	-$898	$3,399	$473	$1,546	$4,520	$1,399	1.45
AC	967	Chiller	Eff. Chiller&TES	RI	102	Elect.	Elect.	$3,661	-$1,054	$3,988	$554	$1,814	$5,303	$1,642	1.45
AC	750	Chiller	Eff. Chiller&TES	RI	85	Elect.	Elect.	$5,201	-$1,497	$5,665	$787	$2,577	$7,533	$2,332	1.45
AC	946	Chiller	Eff. Chiller&TES	RI	97	Elect.	Elect.	$4,161	-$1,197	$4,532	$630	$2,062	$6,026	$1,865	1.45
AC	330	Chiller	Eff. Chiller&TES	RI	20	Elect.	Elect.	$2,080	-$599	$2,266	$315	$1,031	$3,013	$933	1.45
AC	560	Chiller	Eff. Chiller&TES	RI	61	Elect.	Elect.	$2,080	-$599	$2,266	$315	$1,031	$3,013	$933	1.45
AC	751	Chiller	Eff. Chiller&TES	RI	86	Elect.	Elect.	$2,705	-$778	$2,946	$410	$1,340	$3,917	$1,213	1.45
AC	425	Chiller	Eff. Chiller&TES	RI	35	Elect.	Elect.	$2,288	-$658	$2,492	$347	$1,134	$3,314	$1,026	1.45
AC	250	Chiller	Eff. Chiller&TES	RI	9	Elect.	Elect.	$6,033	-$1,736	$6,571	$913	$2,990	$8,738	$2,705	1.45
AC	318	Chiller	Eff. Chiller&TES	RI	17	Elect.	Elect.	$2,080	-$599	$2,266	$315	$1,031	$3,013	$933	1.45
AC	984	Chiller	Eff. Chiller&TES	RI	104	Elect.	Elect.	$2,496	-$718	$2,719	$378	$1,237	$3,616	$1,119	1.45
AC	559	Chiller	Eff. Chiller&TES	RI	60	Elect.	Elect.	$2,496	-$718	$2,719	$378	$1,237	$3,616	$1,119	1.45
AC	673	Chiller	Eff. Chiller&TES	RI	73	Elect.	Elect.	$1,248	-$359	$1,359	$189	$619	$1,808	$560	1.45
AC	530	Chiller	Eff. Chiller&TES	RI	46	Elect.	Elect.	$2,496	-$718	$2,719	$378	$1,237	$3,616	$1,119	1.45
AC	945	Chiller	Eff. Chiller&TES	RI	96	Elect.	Elect.	$2,496	-$718	$2,719	$378	$1,237	$3,616	$1,119	1.45
AC	991	Chiller	Eff. Chiller&TES	RI	111	Elect.	Elect.	$999	-$356	$1,154	$151	$495	$1,444	$446	1.45
AC	1493	Chiller	Eff. Chiller&TES	RI	130	Elect.	Elect.	$1,165	-$416	$1,347	$176	$577	$1,685	$520	1.45
AC	810	Chiller	Eff. Chiller&TES	RI	89	Elect.	Elect.	$832	-$297	$962	$126	$412	$1,204	$371	1.45
AC	402	Chiller	Eff. Chiller&TES	RI	28	Elect.	Elect.	$832	-$297	$962	$126	$412	$1,204	$371	1.45
AC	989	Chiller	Eff. Chiller&TES	RI	106	Elect.	Elect.	$4,577	-$1,632	$5,291	$693	$2,268	$6,620	$2,043	1.45
AC	424	Chiller	Eff. Chiller&TES	RI	33	Elect.	Elect.	$832	-$297	$962	$126	$412	$1,204	$371	1.45
AC	957	Chiller	Eff. Chiller&TES	RI	98	Elect.	Elect.	$832	-$297	$962	$126	$412	$1,204	$371	1.45
AC	990	Chiller	Eff. Chiller&TES	RI	109	Elect.	Elect.	$1,248	-$445	$1,443	$189	$619	$1,805	$557	1.45
AC	1369	Chiller	Eff. Chiller&TES	RI	124	Elect.	Elect.	$1,248	-$445	$1,443	$189	$619	$1,805	$557	1.45
AC	965	Chiller	Eff. Chiller&TES	RI	100	Elect.	Elect.	$2,080	-$742	$2,405	$315	$1,031	$3,009	$929	1.45
AC	3656	Chiller	Eff. Chiller&TES	RI	133	Elect.	Elect.	$1,040	-$371	$1,203	$158	$515	$1,504	$464	1.45
Lighting	1	2F40ES STD	2F32T8 ELC	RI	2a	Elect.	Elect.	$4,631	$3,141	$1,110	$2,378	$0	$6,629	$1,998	1.43
Lighting	2	2F96 STD	2F96ES ELC REF	RI	5	Elect.	Elect.	$638	$523	$273	$112	$0	$908	$270	1.42
Lighting	3	2F96 STD	2F96ES ELC REF	RI	3	Elect.	Elect.	$20,083	$16,431	$8,579	$3,504	$0	$28,515	$8,431	1.42
Lighting	2	1F40ES STD	1F32T8 ELC	RI	1	Elect.	Elect.	$3,259	$2,057	$1,171	$1,278	$0	$4,506	$1,247	1.38
AC	440	Chiller	Eff. Chiller&TES	RI	39	Elect.	Elect.	$2,080	-$667	$2,196	$315	$1,031	$2,875	$795	1.38
AC	537	Chiller	Eff. Chiller&TES	RI	53	Elect.	Elect.	$2,913	-$1,206	$3,260	$441	$1,443	$3,938	$1,025	1.35
AC	523	Chiller	Eff. Chiller&TES	RI	45	Elect.	Elect.	$1,248	-$398	$1,260	$189	$619	$1,670	$421	1.34
Lighting	4	2F40ES STD	2F32T8 ELC	RI	1	Elect.	Elect.	$976	$562	$234	$490	$0	$1,285	$309	1.32
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	81b	Elect.	Elect.	$82	$45	$0	$0	$61	$106	$24	1.29
AC	969	Chiller	Eff. Chiller&TES	RI	103	Elect.	Elect.	$1,331	-$614	$1,450	$202	$660	$1,697	$366	1.27
AC	990	Chiller	Eff. Chiller&TES	RI	110	Elect.	Elect.	$2,080	-$960	$2,266	$315	$1,031	$2,652	$572	1.27
AC	576	Chiller	Eff. Chiller&TES	RI	65	Elect.	Elect.	$2,080	-$960	$2,266	$315	$1,031	$2,652	$572	1.27
AC	533	Chiller	Eff. Chiller&TES	RI	48	Elect.	Elect.	$7,281	-$3,359	$7,930	$1,103	$3,608	$9,283	$2,001	1.27
AC	3655	Chiller	Eff. Chiller&TES	RI	132	Elect.	Elect.	$2,080	-$960	$2,266	$315	$1,031	$2,652	$572	1.27
AC	989	Chiller	Eff. Chiller&TES	RI	107	Elect.	Elect.	$22,052	-$10,172	$24,016	$3,339	$10,928	$28,113	$6,061	1.27
AC	265	Chiller	Eff. Chiller&TES	RI	12	Elect.	Elect.	$3,121	-$1,439	$3,399	$473	$1,546	$3,978	$858	1.27
AC	734	Chiller	Eff. Chiller&TES	RI	81	Elect.	Elect.	$1,290	-$595	$1,405	$195	$639	$1,644	$354	1.27
AC	1316	Chiller	Eff. Chiller&TES	RI	118	Elect.	Elect.	$1,664	-$768	$1,813	$252	$825	$2,122	$457	1.27
AC	558	Chiller	Eff. Chiller&TES	RI	59	Elect.	Elect.	$3,329	-$1,535	$3,625	$504	$1,649	$4,243	$915	1.27
AC	400	Chiller	Eff. Chiller&TES	RI	26	Elect.	Elect.	$3,329	-$1,535	$3,625	$504	$1,649	$4,243	$915	1.27
AC	1353	Chiller	Eff. Chiller&TES	RI	119	Elect.	Elect.	$1,664	-$768	$1,813	$252	$825	$2,122	$457	1.27

Table 3.8
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Annualized Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Annualized Installed Cost (1993 $)	Annualized Energy Savings (1993 $)	Annualized Demand Savings (1993 $)	Annualized O&M Savings (1993 $)	Annualized Replacement Cost Savings (1993 $)	Annualized Total Savings (1993 $)	Annualized Net Savings (1993 $)	Savings to Investment Ratio
AC	1365	Chiller	Eff. Chiller&TES	RI	123	Elect.	Elect.	$6,657	-$3,071	$7,251	$1,008	$3,299	$8,487	$1,830	1.27
AC	996	Chiller	Eff. Chiller&TES	RI	115	Elect.	Elect.	$1,664	-$768	$1,813	$252	$825	$2,122	$457	1.27
AC	727	Chiller	Eff. Chiller&TES	RI	79	Elect.	Elect.	$2,496	-$1,151	$2,719	$378	$1,237	$3,183	$686	1.27
AC	1492	Chiller	Eff. Chiller&TES	RI	129	Elect.	Elect.	$1,248	-$576	$1,359	$189	$619	$1,591	$343	1.27
AC	992	Chiller	Eff. Chiller&TES	RI	113	Elect.	Elect.	$1,248	-$576	$1,359	$189	$619	$1,591	$343	1.27
AC	423	Chiller	Eff. Chiller&TES	RI	32	Elect.	Elect.	$25,381	-$3,341	$22,411	$3,843	$8,654	$31,587	$6,186	1.24
Wtr. Heating	Temp.Lod.Fac.	WH-1	Solar Water Heater	RI	4	Elect.	Elect.	$2,234	$3,672	$0	$0	-$905	$2,767	$533	1.24
Wtr. Heating	Wherry Hsg	WH-1	Solar Water Heater	RI	3	Elect.	Elect.	$24,753	$40,689	$0	$0	-$10,027	$30,663	$5,910	1.24
Wtr. Heating	APPR PFY50	WH-1	Solar Water Heater	RI	1	Elect.	Elect.	$134	$220	$0	$0	-$54	$166	$32	1.24
AC	3659	Chiller	Eff. Chiller&TES	RI	135	Elect.	Elect.	$4,161	-$1,333	$4,392	$630	$1,419	$5,108	$947	1.23
Wtr. Heating	504	Water Heater	Solar Water Heater	RI	1d	Elect.	Elect.	$1,288	$2,082	$0	$0	-$522	$1,560	$272	1.21
Wtr. Heating	502	Water Heater	Solar Water Heater	RI	1b	Elect.	Elect.	$1,288	$2,080	$0	$0	-$522	$1,558	$270	1.21
Wtr. Heating	503	Water Heater	Solar Water Heater	RI	1c	Elect.	Elect.	$1,288	$2,080	$0	$0	-$522	$1,558	$270	1.21
Wtr. Heating	501	Water Heater	Solar Water Heater	RI	1a	Elect.	Elect.	$1,288	$2,080	$0	$0	-$522	$1,558	$270	1.21
Lighting	2	1F40 STD	1F32T8 ELC REF	RI	2	Elect.	Elect.	$5,458	$4,883	$1,107	$588	$0	$6,578	$1,120	1.21
Wtr. Heating	505	Water Heater	Solar Water Heater	RI	1e	Elect.	Elect.	$1,183	$1,879	$0	$0	-$479	$1,400	$217	1.18
Wtr. Heating	506	Water Heater	Solar Water Heater	RI	1f	Elect.	Elect.	$1,183	$1,879	$0	$0	-$479	$1,400	$217	1.18
AC	404	Chiller	Eff. Chiller&TES	RI	29	Elect.	Elect.	$2,496	-$1,295	$2,627	$378	$1,237	$2,947	$451	1.18
Controls	WHS	E-9	EMCS(exist. chill.)	RI	9	Elect.	Elect.	$422	$561	$0	$0	-$63	$497	$75	1.18
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	86b	Elect.	Elect.	$219	$91	$0	$0	$163	$254	$35	1.16
AC	546	Chiller	Eff. Chiller&TES	RI	55	Elect.	Elect.	$4,161	-$1,280	$4,051	$630	$1,419	$4,820	$659	1.16
AC	330	Chiller	Eff. Chiller&TES	RI	22	Elect.	Elect.	$12,482	-$2,175	$10,479	$1,890	$4,256	$14,450	$1,968	1.16
AC	425	Chiller	Eff. Chiller&TES	RI	36	Elect.	Elect.	$19,972	-$3,479	$16,766	$3,024	$6,810	$23,120	$3,148	1.16
AC	415	Chiller	Eff. Chiller&TES	RI	31	Elect.	Elect.	$4,577	-$797	$3,842	$693	$1,561	$5,298	$722	1.16
AC	556	Chiller	Eff. Chiller&TES	RI	57	Elect.	Elect.	$1,248	-$638	$1,260	$189	$619	$1,430	$182	1.15
AC	557	Chiller	Eff. Chiller&TES	RI	58	Elect.	Elect.	$416	-$202	$400	$63	$206	$467	$51	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	91b	Elect.	Elect.	$575	$216	$0	$0	$428	$643	$69	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	89b	Elect.	Elect.	$383	$144	$0	$0	$285	$429	$46	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	88b	Elect.	Elect.	$296	$111	$0	$0	$220	$331	$35	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	90b	Elect.	Elect.	$164	$62	$0	$0	$122	$184	$20	1.12
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	85b	Elect.	Elect.	$55	$20	$0	$0	$41	$61	$6	1.11
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	51	Elect.	Elect.	$335	$63	$16	$0	$288	$367	$33	1.10
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	65	Elect.	Elect.	$167	$32	$8	$0	$144	$184	$16	1.10
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	116	Elect.	Elect.	$167	$32	$8	$0	$144	$184	$16	1.10
AC	1380	Chiller	Eff. Chiller&TES	RI	125	Elect.	Elect.	$13,314	-$3,373	$11,400	$2,016	$4,540	$14,582	$1,268	1.10
AC	989	Chiller	Eff. Chiller&TES	RI	108	Elect.	Elect.	$44,728	-$11,332	$38,297	$6,773	$15,251	$48,988	$4,260	1.10
Lighting	2	2F40 STD	2F40ES ELC REF	RI	4	Elect.	Elect.	$542	$291	$166	$130	$0	$587	$45	1.08
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	16	Elect.	Elect.	$842	$188	$47	$0	$672	$907	$65	1.08
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	95	Elect.	Elect.	$810	$176	$44	$0	$651	$871	$61	1.08
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	117	Elect.	Elect.	$143	$20	$5	$0	$128	$154	$11	1.08
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	48	Elect.	Elect.	$138	$30	$7	$0	$110	$147	$10	1.07
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	118	Elect.	Elect.	$138	$18	$4	$0	$125	$147	$9	1.07
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	92	Elect.	Elect.	$238	$50	$13	$0	$191	$253	$15	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	12	Elect.	Elect.	$476	$101	$25	$0	$381	$507	$31	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	93	Elect.	Elect.	$687	$141	$35	$0	$554	$730	$43	1.06
AC	998	Chiller	Eff. Chiller&TES	RI	117	Elect.	Elect.	$5,409	-$1,267	$4,353	$819	$1,844	$5,749	$340	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	49	Elect.	Elect.	$125	$20	$5	$0	$108	$133	$8	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	96	Elect.	Elect.	$986	$156	$39	$0	$848	$1,043	$57	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	17	Elect.	Elect.	$2,564	$405	$101	$0	$2,206	$2,713	$149	1.06
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	80b	Elect.	Elect.	$109	$34	$0	$0	$81	$116	$6	1.06
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	87b	Elect.	Elect.	$438	$137	$0	$0	$326	$463	$25	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	43	Elect.	Elect.	$569	$85	$21	$0	$494	$600	$31	1.06
AC	929	Chiller	Eff. Chiller&TES	RI	94	Elect.	Elect.	$9,986	-$2,791	$8,383	$1,512	$3,405	$10,509	$523	1.05
AC	925	Chiller	Eff. Chiller&TES	RI	92	Elect.	Elect.	$22,884	-$6,396	$19,211	$3,465	$7,803	$24,082	$1,198	1.05
AC	505	Chiller	Eff. Chiller&TES	RI	43	Elect.	Elect.	$11,442	-$3,198	$9,605	$1,733	$3,901	$12,041	$599	1.05
AC	986	Chiller	Eff. Chiller&TES	RI	105	Elect.	Elect.	$8,322	-$2,326	$6,986	$1,260	$2,837	$8,757	$436	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	71	Elect.	Elect.	$832	$185	$46	$0	$641	$873	$41	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	61	Elect.	Elect.	$832	$185	$46	$0	$641	$873	$41	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	13	Elect.	Elect.	$2,175	$326	$81	$0	$1,875	$2,282	$107	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	64	Elect.	Elect.	$629	$104	$26	$0	$529	$660	$31	1.05
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	97	Elect.	Elect.	$526	$68	$17	$0	$466	$552	$26	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	14	Elect.	Elect.	$928	$123	$31	$0	$816	$969	$41	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	72	Elect.	Elect.	$585	$92	$23	$0	$492	$607	$23	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	62	Elect.	Elect.	$1,754	$277	$69	$0	$1,476	$1,822	$68	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	32	Elect.	Elect.	$174	$33	$8	$0	$138	$180	$6	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	73	Elect.	Elect.	$541	$75	$19	$0	$465	$559	$19	1.03

Table 3.8
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Annualized Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Annualized Installed Cost (1993 $)	Annualized Energy Savings (1993 $)	Annualized Demand Savings (1993 $)	Annualized O&M Savings (1993 $)	Annualized Replacement Cost Savings (1993 $)	Annualized Total Savings (1993 $)	Annualized Net Savings (1993 $)	Savings to Investment Ratio
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	33	Elect.	Elect.	$160	$29	$7	$0	$129	$166	$5	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	47	Elect.	Elect.	$481	$88	$22	$0	$388	$498	$16	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	7	Elect.	Elect.	$963	$178	$44	$0	$775	$995	$33	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	87	Elect.	Elect.	$463	$82	$21	$0	$375	$478	$15	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	113	Elect.	Elect.	$463	$82	$21	$0	$375	$478	$15	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	69	Elect.	Elect.	$510	$77	$19	$0	$429	$526	$16	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	58	Elect.	Elect.	$510	$77	$19	$0	$429	$526	$16	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	76	Elect.	Elect.	$1,047	$74	$18	$0	$986	$1,079	$32	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	82	Elect.	Elect.	$82	$15	$4	$0	$66	$85	$2	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	2	Elect.	Elect.	$76	$13	$3	$0	$62	$78	$2	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	127	Elect.	Elect.	$472	$63	$16	$0	$406	$485	$13	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	59	Elect.	Elect.	$472	$63	$16	$0	$406	$485	$13	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	138	Elect.	Elect.	$453	$56	$14	$0	$395	$465	$12	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	115	Elect.	Elect.	$88	$5	$1	$0	$84	$90	$2	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	18	Elect.	Elect.	$831	$49	$12	$0	$789	$851	$19	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	77	Elect.	Elect.	$851	$89	$22	$0	$758	$869	$18	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	119	Elect.	Elect.	$109	$4	$1	$0	$106	$111	$2	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	130	Elect.	Elect.	$1,081	$158	$40	$0	$905	$1,103	$22	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	107	Elect.	Elect.	$118	$7	$2	$0	$112	$120	$2	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	35	Elect.	Elect.	$613	$112	$28	$0	$486	$625	$12	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	89	Elect.	Elect.	$567	$98	$25	$0	[illegible]	$578	$11	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	9	Elect.	Elect.	$1,134	$196	$49	$0	$911	$1,156	$22	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	90	Elect.	Elect.	$524	$86	$21	$0	$427	$534	$10	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	79	Elect.	Elect.	$783	$48	$12	$0	$737	$798	$15	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	131	Elect.	Elect.	$961	$115	$29	$0	$834	$978	$17	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	10	Elect.	Elect.	$398	$49	$12	$0	$344	$405	$7	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	38	Elect.	Elect.	$929	$114	$28	$0	$803	$945	$16	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	74	Elect.	Elect.	$411	$24	$6	$0	$387	$417	$7	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	139	Elect.	Elect.	$373	$26	$6	$0	$346	$379	$6	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	91	Elect.	Elect.	$354	$36	$9	$0	$315	$359	$5	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	128	Elect.	Elect.	$717	$41	$10	$0	$675	$726	$10	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	29	Elect.	Elect.	$414	$71	$18	$0	$330	$419	$5	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	30	Elect.	Elect.	$138	$24	$6	$0	$110	$140	$2	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	103	Elect.	Elect.	$276	$47	$12	$0	$220	$279	$4	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	112	Elect.	Elect.	$138	$24	$6	$0	$110	$140	$2	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	5	Elect.	Elect.	$382	$63	$16	$0	$309	$387	$5	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	23	Elect.	Elect.	$53	$6	$1	$0	$47	$54	$1	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	100	Elect.	Elect.	$160	$18	$4	$0	$140	$162	$2	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	50	Elect.	Elect.	$81	$2	$1	$0	$79	$82	$1	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	134	Elect.	Elect.	$162	$5	$1	$0	$158	$165	$2	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	6	Elect.	Elect.	$269	$31	$8	$0	$233	$272	$3	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	110	Elect.	Elect.	$897	$28	$7	$0	$873	$908	$11	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	44	Elect.	Elect.	$384	$12	$3	$0	$374	$389	$5	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	20	Elect.	Elect.	$256	$8	$2	$0	$249	$259	$3	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	94	Elect.	Elect.	$435	$13	$3	$0	$423	$439	$5	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	108	Elect.	Elect.	$5,217	$152	$38	$0	$5,080	$5,271	$55	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	39	Elect.	Elect.	$652	$19	$5	$0	$635	$659	$7	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	120	Elect.	Elect.	$209	$4	$1	$0	$206	$211	$2	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	52	Elect.	Elect.	$209	$4	$1	$0	$206	$211	$2	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	31	Elect.	Elect.	$71	$5	$1	$0	$65	$71	$1	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	75	Elect.	Elect.	$380	$12	$3	$0	$368	$383	$3	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	66	Elect.	Elect.	$380	$12	$3	$0	$368	$383	$3	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	85	Elect.	Elect.	$67	$7	$2	$0	$58	$68	$1	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	36	Elect.	Elect.	$280	$13	$3	$0	$266	$282	$2	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	40	Elect.	Elect.	$287	$45	$11	$0	$233	$289	$2	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	3	Elect.	Elect.	$191	$30	$7	$0	$155	$192	$1	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	25	Elect.	Elect.	$55	$4	$1	$0	$50	$56	$0	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	84	Elect.	Elect.	$103	$17	$4	$0	$83	$104	$1	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	27	Elect.	Elect.	$103	$17	$4	$0	$83	$104	$1	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	19	Elect.	Elect.	$1,109	$18	$4	$0	$1,094	$1,116	$7	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	88	Elect.	Elect.	$439	$11	$3	$0	$428	$442	$3	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	8	Elect.	Elect.	$220	$6	$1	$0	$214	$221	$1	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	34	Elect.	Elect.	$879	$22	$6	$0	$856	$884	$5	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	105	Elect.	Elect.	$1,684	$43	$11	$0	$1,641	$1,695	$10	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	109	Elect.	Elect.	$104	$2	$0	$0	$103	$105	$1	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	15	Elect.	Elect.	$627	$9	$2	$0	$619	$630	$3	1.01

Table 3.8
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Annualized Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Annualized Installed Cost (1993 $)	Annualized Energy Savings (1993 $)	Annualized Demand Savings (1993 $)	Annualized O&M Savings (1993 $)	Annualized Replacement Cost Savings (1993 $)	Annualized Total Savings (1993 $)	Annualized Net Savings (1993 $)	Savings to Investment Ratio
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	83	Elect.	Elect.	$69	$2	$0	$0	$68	$70	$0	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	63	Elect.	Elect.	$365	$6	$1	$0	$360	$367	$2	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	24	Elect.	Elect.	$47	$2	$0	$0	$45	$47	$0	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	106	Elect.	Elect.	$5,175	$124	$31	$0	$5,042	$5,196	$22	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	37	Elect.	Elect.	$1,380	$33	$8	$0	$1,344	$1,386	$6	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	41	Elect.	Elect.	$259	$6	$2	$0	$252	$260	$1	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	132	Elect.	Elect.	$745	$12	$3	$0	$733	$748	$3	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	60	Elect.	Elect.	$319	$5	$1	$0	$314	$320	$1	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	129	Elect.	Elect.	$637	$10	$2	$0	$627	$640	$2	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	70	Elect.	Elect.	$319	$5	$1	$0	$314	$320	$1	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	81	Elect.	Elect.	$823	$8	$2	$0	$815	$826	$3	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	78	Elect.	Elect.	$3,879	$59	$15	$0	$3,819	$3,893	$14	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	22	Elect.	Elect.	$278	$6	$2	$0	$271	$278	$1	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	101	Elect.	Elect.	$208	$5	$1	$0	$203	$209	$1	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	104	Elect.	Elect.	$698	$16	$4	$0	$681	$700	$2	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	28	Elect.	Elect.	$349	$8	$2	$0	$340	$350	$1	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	86	Elect.	Elect.	$175	$4	$1	$0	$170	$175	$1	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	80	Elect.	Elect.	$717	$7	$2	$0	$711	$719	$2	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	1	Elect.	Elect.	$33	$0	$0	$0	$33	$33	$0	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	102	Elect.	Elect.	$174	$4	$1	$0	$170	$175	$0	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	11	Elect.	Elect.	$83	$1	$0	$0	$82	$83	$0	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	42	Elect.	Elect.	$249	$3	$1	$0	$246	$249	$1	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	121	Elect.	Elect.	$290	$23	$8	$0	$263	$291	$1	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	122	Elect.	Elect.	$258	$12	$3	$0	$243	$258	$0	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	53	Elect.	Elect.	$314	$30	$8	$0	$277	$314	$1	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	26	Elect.	Elect.	$42	$0	$0	$0	$41	$42	$0	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	4	Elect.	Elect.	$42	$0	$0	$0	$41	$42	$0	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	123	Elect.	Elect.	$229	$3	$1	$0	$226	$229	$0	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	135	Elect.	Elect.	$229	$3	$1	$0	$226	$229	$0	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	67	Elect.	Elect.	$367	$47	$12	$0	$309	$367	$0	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	133	Elect.	Elect.	$1,539	$11	$3	$0	$1,525	$1,540	$0	1.00
Totals								$1,068,608	$955,976	$539,574	$338,849	$351,985	$2,186,385	$1,117,777	2.05

Table 3.9
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Cumulative Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Cumulative First-Year Energy Savings (MBtu)	Cumulative First-Year Demand Savings (kW-mo)	Cumulative Full Implement. Energy Savings (MBtu)	Cumulative Full Implement. Demand Savings (kW-mo)	Cumulative Net Present Value (1993 $)	Cumulative Savings to Investment Ratio	Individual ERO Savings to Investment Ratio
Controls	R&D	E-6	EMCS(exist. chill.)	RI	6	Elect.	Elect.	777	0	777	0	$109,069	13.39	13.39
Lighting	2	INC 2x60 Ceil	CFL 2-11 CEIL FIXT	RI	13	Elect.	Elect.	871	28	871	28	$129,964	13.39	13.34
Lighting	3	INC 2x60 ceil	CFL 2-11 CEIL FIXT	RI	10	Elect.	Elect.	10,650	3,240	10,650	3,240	$2,322,988	12.43	12.38
Envelope	CLUB	Heating/Cooling	Weath. Package	RI	4c	Elect.	Elect.	10,771	3,240	10,771	3,240	$2,340,884	12.38	7.96
Lighting	2	INC 60 Ceil	CFL 11 CEIL FIXT	RI	15	Elect.	Elect.	11,509	3,506	11,509	3,506	$2,506,783	11.80	7.30
Controls	DGR	E-3	EMCS(exist. chill.)	RI	3	Elect.	Elect.	11,722	3,506	11,722	3,506	$2,534,436	11.72	7.28
Lighting	1	2F40ES STD	SENS	RI	2b	Elect.	Elect.	11,974	3,648	11,974	3,648	$2,608,981	11.50	7.23
Lighting	3	INC 75 Ceil	CFL 2-9 + BLST	RI	12	Elect.	Elect.	16,234	5,047	16,234	5,047	$3,281,369	9.60	6.05
Lighting	2	INC 75 Ceil	CFL 2-9 + BLST	RI	16	Elect.	Elect.	16,323	5,079	16,323	5,079	$3,295,598	9.57	5.64
Controls	ADMIN	E-1	EMCS(exist. chill.)	RI	1	Elect.	Elect.	16,815	5,079	16,815	5,079	$3,355,872	9.43	5.57
Lighting	2	EXIT INC (2x15)	LED	RI	11	Elect.	Elect.	16,842	5,090	16,842	5,090	$3,377,853	9.39	5.51
Lighting	1	EXIT INC(2x15)	LED	RI	8	Elect.	Elect.	17,251	5,254	17,251	5,254	$3,706,281	8.79	5.51
Lighting	5	INC 2-60	CFL 2-15 CEIL	RI	2	Elect.	Elect.	20,007	7,495	20,007	7,495	$4,435,674	7.83	5.19
Lighting	2	3F40ES STD	2F40ES ELC REF SENS	RI	7b	Elect.	Elect.	20,281	7,577	20,281	7,577	$4,488,899	7.77	4.95
Lighting	1	INC 75 Can	CFL 20 + BLST	RI	9	Elect.	Elect.	21,266	8,167	21,266	8,167	$4,695,357	7.55	4.87
Envelope	Wherry	Heating/Cooling	Ceiling Insulation	RI	1b	Elect.	Elect.	32,764	8,167	32,764	8,167	$6,224,614	6.49	4.67
Envelope	FAM HSG	Heating/Cooling	Refl. Window Trtmnt	RI	2b	Elect.	Elect.	44,985	8,167	44,985	8,167	$7,843,835	5.96	4.61
Lighting	2	3F40ES STD	2F40ES ELC REF	RI	7a	Elect.	Elect.	45,348	8,276	45,348	8,276	$7,911,628	5.94	4.49
Lighting	5	INC 1-60	CFL 15 CEIL	RI	3	Elect.	Elect.	46,656	8,836	46,656	8,836	$8,163,538	5.87	4.44
Controls	COMCATN	E-2	EMCS(exist. chill.)	RI	2	Elect.	Elect.	47,371	8,836	47,371	8,836	$8,245,328	5.85	4.38
Lighting	2	4F40 STD	3F32T8 ELC REF	RI	9	Elect.	Elect.	48,891	9,298	48,891	9,298	$8,482,952	5.78	4.17
Controls	SHOP-ELC	E-8	EMCS(exist. chill.)	RI	8	Elect.	Elect.	48,952	9,298	48,952	9,298	$8,489,772	5.78	4.10
Lighting	2	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	49,122	9,359	49,122	9,359	$8,516,353	5.77	3.66
Lighting	2	EXIT 2xPL9	LED	RI	10	Elect.	Elect.	49,332	9,443	49,332	9,443	$8,640,371	5.69	3.25
Controls	MISC	E-4	EMCS(exist. chill.)	RI	4	Elect.	Elect.	49,381	9,443	49,381	9,443	$8,645,271	5.69	3.23
Lighting	1	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	51,201	10,223	51,201	10,223	$8,926,875	5.53	3.22
Lighting	3	INC 100 Ceil	CFL 2-11 CEIL FIXT	RI	8	Elect.	Elect.	51,241	10,269	51,241	10,269	$8,934,656	5.53	3.20
Lighting	2	2F40ES STD	2F32T8 ELC SENS	RI	3b	Elect.	Elect.	51,637	10,399	51,637	10,399	$9,005,407	5.49	3.19
Controls	REC	E-7	EMCS(exist. chill.)	RI	7	Elect.	Elect.	51,778	10,399	51,778	10,399	$9,019,475	5.48	3.13
Envelope	BRK/ADM	Heating/Cooling	Weath. Package	RI	4b	Elect.	Elect.	52,382	10,399	52,382	10,399	$9,085,760	5.44	2.85
Lighting	1	3F40ES STD	2F40ES ELC REF SENS	RI	5b	Elect.	Elect.	57,072	13,214	57,072	13,214	$9,927,072	4.96	2.83
Lighting	2	EXIT INC (2x20)	LED	RI	12	Elect.	Elect.	57,127	13,236	57,127	13,236	$9,939,640	4.95	2.80
Lighting	3	EXIT INC(2x20)	LED	RI	7	Elect.	Elect.	57,155	13,247	57,155	13,247	$9,946,140	4.95	2.80
Lighting	1	3F40ES STD	2F40ES ELC REF	RI	5a	Elect.	Elect.	62,863	16,671	62,863	16,671	$10,929,575	4.49	2.61
Lighting	3	2F40 STD	2F40ES ELC REF SENS	RI	2b	Elect.	Elect.	62,946	16,700	62,946	16,700	$10,941,507	4.49	2.61
Envelope	ADMIN	Heating/Cooling	Weath. Package	RI	4a	Elect.	Elect.	64,383	16,700	64,383	16,700	$11,085,256	4.43	2.45
Envelope	TLF	Heating/Cooling	Refl. Window Trtmnt	RI	2a	Elect.	Elect.	66,720	16,700	66,720	16,700	$11,314,838	4.33	2.38
Lighting	1	4F40ES STD	3F40ES ELC REF	RI	4	Elect.	Elect.	67,015	16,854	67,015	16,854	$11,357,308	4.31	2.23
Boilers	Multiple	All Boilers	Tune-up 50	RI	3	NG,F.Oil	NG,F.Oil	67,638	16,854	67,638	16,854	$11,377,042	4.29	2.13
Lighting	2	4F40ES STD	3F40ES ELC REF SENS	RI	8b	Elect.	Elect.	67,727	16,922	67,727	16,922	$11,390,780	4.29	2.09
Lighting	3	3F40 STD	2F40 STD REF	RI	4b	Elect.	Elect.	67,737	16,934	67,737	16,934	$11,392,324	4.29	1.99
Lighting	3	3F40 STD	2F40 STD REF	RI	4a	Elect.	Elect.	67,747	16,945	67,747	16,945	$11,393,866	4.28	1.99
Lighting	3	2F40 STD	2F40ES ELC REF	RI	2a	Elect.	Elect.	69,246	17,464	69,246	17,464	$11,558,482	4.18	1.98
Transport.	Vehicles	Various	CNG Vehicle	RI		Gas/Diesel	NG,Diesel	70,514	17,464	70,514	17,464	$12,813,216	3.60	1.97
Motors	CLUB	Fan Motor	Eff. Motor	RI	5a	Elect.	Elect.	70,531	17,472	70,531	17,472	$12,815,154	3.60	1.95
Motors	PLT-BLD	Fan Motor	Eff. Motor	RI	16a	Elect.	Elect.	70,536	17,475	70,536	17,475	$12,815,752	3.60	1.94
Motors	RESTRNT	Fan Motor	Eff. Motor	RI	19a	Elect.	Elect.	70,540	17,476	70,540	17,476	$12,816,174	3.60	1.94
Motors	CHAPEL	Fan Motor	Eff. Motor	RI	3a	Elect.	Elect.	70,553	17,482	70,553	17,482	$12,817,704	3.60	1.94
Motors	CLINIC	Fan Motor	Eff. Motor	RI	4a	Elect.	Elect.	70,560	17,486	70,560	17,486	$12,818,589	3.60	1.94
Motors	TRAING	Fan Motor	Eff. Motor	RI	25a	Elect.	Elect.	70,604	17,507	70,604	17,507	$12,823,655	3.60	1.94
Motors	STOR-UH	Fan Motor	Eff. Motor	RI	23a	Elect.	Elect.	70,651	17,529	70,651	17,529	$12,829,123	3.60	1.94
Motors	TERMINL	Fan Motor	Eff. Motor	RI	24a	Elect.	Elect.	70,748	17,574	70,748	17,574	$12,840,331	3.59	1.94
Motors	COMCATN	Fan Motor	Eff. Motor	RI	6a	Elect.	Elect.	70,841	17,617	70,841	17,617	$12,851,076	3.59	1.94
Motors	GROCERY	Fan Motor	Eff. Motor	RI	9a	Elect.	Elect.	70,935	17,661	70,935	17,661	$12,861,980	3.58	1.94
Motors	HOSPITL	Fan Motor	Eff. Motor	RI	11a	Elect.	Elect.	71,017	17,700	71,017	17,700	$12,871,504	3.58	1.94
Motors	REC	Fan Motor	Eff. Motor	RI	18a	Elect.	Elect.	71,065	17,722	71,065	17,722	$12,877,069	3.58	1.94
Motors	DGR	Fan Motor	Eff. Motor	RI	7a	Elect.	Elect.	71,232	17,801	71,232	17,801	$12,896,425	3.57	1.94
Motors	MTRPOOL	Fan Motor	Eff. Motor	RI	14a	Elect.	Elect.	71,289	17,827	71,289	17,827	$12,903,063	3.57	1.94
Motors	ADMIN	Fan Motor	Eff. Motor	RI	1a	Elect.	Elect.	72,274	18,290	72,274	18,290	$13,017,384	3.53	1.94

Table 3.9
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Cumulative Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Cumulative First-Year Energy Savings (MBtu)	Cumulative First-Year Demand Savings (kW-mo)	Cumulative Full Implement. Energy Savings (MBtu)	Cumulative Full Implement. Demand Savings (kW-mo)	Cumulative Net Present Value (1993 $)	Cumulative Savings to Investment Ratio	Individual ERO Savings to Investment Ratio
Motors	WHS	Fan Motor	Eff. Motor	RI	26a	Elect.	Elect.	72,625	18,454	72,625	18,454	$13,058,049	3.52	1.94
Motors	BRK/ADM	Fan Motor	Eff. Motor	RI	2a	Elect.	Elect.	72,882	18,574	72,882	18,574	$13,087,815	3.51	1.94
Motors	MWR	Fan Motor	Eff. Motor	RI	15a	Elect.	Elect.	73,010	18,634	73,010	18,634	$13,102,682	3.50	1.94
Motors	SHOP-ELEC	Fan Motor	Eff. Motor	RI	22a	Elect.	Elect.	73,196	18,722	73,196	18,722	$13,124,313	3.50	1.94
Motors	HSG-FAM	Fan Motor	Eff. Motor	RI	12a	Elect.	Elect.	73,210	18,728	73,210	18,728	$13,125,909	3.50	1.94
Motors	HANGER	Fan Motor	Eff. Motor	RI	10a	Elect.	Elect.	73,339	18,789	73,339	18,789	$13,140,872	3.49	1.94
Motors	R&D	Fan Motor	Eff. Motor	RI	17a	Elect.	Elect.	73,400	18,817	73,400	18,817	$13,147,984	3.49	1.94
Motors	DINING	Fan Motor	Eff. Motor	RI	8a	Elect.	Elect.	73,492	18,860	73,492	18,860	$13,158,597	3.49	1.94
Motors	SHOP	Fan Motor	Eff. Motor	RI	21a	Elect.	Elect.	73,529	18,878	73,529	18,878	$13,162,967	3.48	1.94
Motors	SECURITY	Fan Motor	Eff. Motor	RI	20a	Elect.	Elect.	73,572	18,898	73,572	18,898	$13,167,947	3.48	1.94
Motors	MISC	Fan Motor	Eff. Motor	RI	13a	Elect.	Elect.	73,577	18,900	73,577	18,900	$13,168,491	3.48	1.94
Lighting	2	2F40ES STD	2F32T8 ELC	RI	3a	Elect.	Elect.	74,091	19,070	74,091	19,070	$13,233,907	3.46	1.93
HVAC	Family Housing	Air Source Ht. Pump	Grnd-Cpld Ht. Pump	ROF	1	Elect.	Elect.	74,091	19,070	75,923	19,070	$14,530,606	3.07	1.80
Motors	North Plant	Sewage Pump	Eff. Motor	RI	82a	Elect.	Elect.	74,112	19,070	75,945	19,070	$14,532,375	3.07	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	77a	Elect.	Elect.	74,123	19,070	75,955	19,070	$14,533,259	3.07	1.79
Motors	North Plant	Sewage Pump	Eff. Motor	RI	83a	Elect.	Elect.	74,128	19,070	75,961	19,070	$14,533,702	3.07	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	79a	Elect.	Elect.	74,165	19,070	75,998	19,070	$14,536,797	3.07	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	72a	Elect.	Elect.	74,167	19,070	76,000	19,070	$14,536,974	3.07	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	71a	Elect.	Elect.	74,168	19,070	76,001	19,070	$14,537,062	3.07	1.79
Motors	South Plant	Sewage Pump	Eff. Motor	RI	76a	Elect.	Elect.	74,176	19,070	76,009	19,070	$14,537,725	3.07	1.79
Motors	REC	Chilled Water Pump	Eff. Motor	ROF	42b	Elect.	Elect.	74,176	19,070	76,013	19,070	$14,538,050	3.07	1.77
Motors	CLINIC	Chilled Water Pump	Eff. Motor	ROF	30b	Elect.	Elect.	74,176	19,070	76,016	19,070	$14,538,315	3.07	1.77
Motors	MISC	Chilled Water Pump	Eff. Motor	ROF	38b	Elect.	Elect.	74,176	19,070	76,020	19,070	$14,538,579	3.07	1.77
Motors	SHOP-ELEC	Chilled Water Pump	Eff. Motor	ROF	44b	Elect.	Elect.	74,176	19,070	76,037	19,070	$14,539,930	3.07	1.77
Motors	CHAPEL	Chilled Water Pump	Eff. Motor	ROF	29b	Elect.	Elect.	74,176	19,070	76,046	19,070	$14,540,592	3.07	1.77
Motors	DGR	Chilled Water Pump	Eff. Motor	ROF	33b	Elect.	Elect.	74,176	19,070	76,082	19,070	$14,543,412	3.07	1.77
Motors	SECURITY	Chilled Water Pump	Eff. Motor	ROF	43b	Elect.	Elect.	74,176	19,070	76,089	19,070	$14,543,909	3.07	1.77
Motors	R&D	Chilled Water Pump	Eff. Motor	ROF	41b	Elect.	Elect.	74,176	19,070	76,109	19,070	$14,545,445	3.07	1.77
Motors	ADMIN	Chilled Water Pump	Eff. Motor	ROF	27b	Elect.	Elect.	74,176	19,070	76,390	19,070	$14,567,197	3.07	1.77
Motors	WHS	Condenser Pump	Eff. Motor	ROF	63b	Elect.	Elect.	74,176	19,070	76,395	19,070	$14,567,594	3.07	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	55b	Elect.	Elect.	74,176	19,070	76,400	19,070	$14,567,992	3.07	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	56b	Elect.	Elect.	74,176	19,070	76,405	19,070	$14,568,389	3.07	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	50b	Elect.	Elect.	74,176	19,070	76,446	19,070	$14,571,566	3.07	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	57b	Elect.	Elect.	74,176	19,070	76,451	19,070	$14,571,963	3.06	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	52b	Elect.	Elect.	74,176	19,070	76,456	19,070	$14,572,361	3.06	1.77
Motors	DGR	Condenser Pump	Eff. Motor	ROF	58b	Elect.	Elect.	74,176	19,070	76,466	19,070	$14,573,089	3.06	1.77
Motors	MWR	Condenser Pump	Eff. Motor	ROF	61b	Elect.	Elect.	74,176	19,070	76,474	19,070	$14,573,751	3.06	1.77
Motors	TRAING	Condenser Pump	Eff. Motor	ROF	62b	Elect.	Elect.	74,176	19,070	76,479	19,070	$14,574,082	3.06	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	51b	Elect.	Elect.	74,176	19,070	76,485	19,070	$14,574,545	3.06	1.77
Motors	BRK/ADM	Condenser Pump	Eff. Motor	ROF	54b	Elect.	Elect.	74,176	19,070	76,523	19,070	$14,577,557	3.06	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	49b	Elect.	Elect.	74,176	19,070	76,576	19,070	$14,581,595	3.06	1.77
Motors	ADMIN	Condenser Pump	Eff. Motor	ROF	53b	Elect.	Elect.	74,176	19,070	76,668	19,070	$14,588,711	3.06	1.77
Motors	HOSPITL	Condenser Pump	Eff. Motor	ROF	60b	Elect.	Elect.	74,176	19,070	76,695	19,070	$14,590,829	3.06	1.77
Motors	DINING	Condenser Pump	Eff. Motor	ROF	59b	Elect.	Elect.	74,176	19,070	76,702	19,070	$14,591,359	3.06	1.77
Motors	PLT-BLD	Chilled Water Pump	Eff. Motor	ROF	40b	Elect.	Elect.	74,176	19,070	76,769	19,070	$14,596,589	3.06	1.77
Motors	WHS	Chilled Water Pump	Eff. Motor	ROF	48b	Elect.	Elect.	74,176	19,070	76,818	19,070	$14,600,362	3.06	1.77
Motors	BRK/ADM	Chilled Water Pump	Eff. Motor	ROF	28b	Elect.	Elect.	74,176	19,070	76,883	19,070	$14,605,400	3.06	1.77
Motors	MWR	Chilled Water Pump	Eff. Motor	ROF	39b	Elect.	Elect.	74,176	19,070	76,919	19,070	$14,608,179	3.06	1.77
Motors	DINING	Chilled Water Pump	Eff. Motor	ROF	34b	Elect.	Elect.	74,176	19,070	76,946	19,070	$14,610,252	3.06	1.77
Motors	COMCATN	Chilled Water Pump	Eff. Motor	ROF	32b	Elect.	Elect.	74,176	19,070	76,952	19,070	$14,610,715	3.06	1.77
Motors	GROCERY	Chilled Water Pump	Eff. Motor	ROF	35b	Elect.	Elect.	74,176	19,070	76,966	19,070	$14,611,774	3.06	1.77
Motors	HOSPITL	Chilled Water Pump	Eff. Motor	ROF	37b	Elect.	Elect.	74,176	19,070	76,993	19,070	$14,613,892	3.06	1.77
Motors	HANGER	Chilled Water Pump	Eff. Motor	ROF	36b	Elect.	Elect.	74,176	19,070	77,009	19,070	$14,615,150	3.05	1.77
Motors	TERMINL	Chilled Water Pump	Eff. Motor	ROF	46b	Elect.	Elect.	74,176	19,070	77,025	19,070	$14,616,341	3.05	1.77
Motors	TRAING	Chilled Water Pump	Eff. Motor	ROF	47b	Elect.	Elect.	74,176	19,070	77,040	19,070	$14,617,532	3.05	1.77
Motors	STOR-UH	Chilled Water Pump	Eff. Motor	ROF	45b	Elect.	Elect.	74,176	19,070	77,043	19,070	$14,617,763	3.05	1.77
Motors	CLUB	Chilled Water Pump	Eff. Motor	ROF	31b	Elect.	Elect.	74,176	19,070	77,046	19,070	$14,617,961	3.05	1.77
Lighting	3	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	74,183	19,078	77,052	19,078	$14,618,858	3.05	1.74
Lighting	2	4F40ES STD	3F40ES ELC REF	RI	8a	Elect.	Elect.	76,600	20,927	79,469	20,927	$14,923,956	2.98	1.73

Table 3.9
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Cumulative Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Cumulative First-Year Energy Savings (MBtu)	Cumulative First-Year Demand Savings (kW-mo)	Cumulative Full Implement. Energy Savings (MBtu)	Cumulative Full Implement. Demand Savings (kW-mo)	Cumulative Net Present Value (1993 $)	Cumulative Savings to Investment Ratio	Individual ERO Savings to Investment Ratio
Wtr. Heating	Capehart Hsg	Water Heater	Desuperheater	RI	1	Elect.	Elect.	83,310	20,927	86,179	20,927	$15,176,920	2.92	1.72
Lighting	4	4F40ES STD	3F40ES ELC REF	RI	4	Elect.	Elect.	83,391	20,989	86,260	20,989	$15,187,013	2.92	1.72
Envelope	TRAING	Heating/Cooling	Weath. Package	RI	4d	Elect.	Elect.	83,435	20,989	86,304	20,989	$15,190,081	2.92	1.71
Lighting	1	1F40ES STD	1F32T8 ELC	RI	1	Elect.	Elect.	83,442	20,993	86,311	20,993	$15,190,916	2.92	1.70
AC	536	Chiller	Eff. Chiller&TES	RI	52	Elect.	Elect.	83,483	21,719	86,353	21,719	$15,220,956	2.91	1.66
AC	534	Chiller	Eff. Chiller&TES	RI	49	Elect.	Elect.	83,513	22,236	86,382	22,236	$15,242,414	2.91	1.66
AC	431	Chiller	Eff. Chiller&TES	RI	38	Elect.	Elect.	83,572	23,272	86,441	23,272	$15,285,329	2.90	1.66
Lighting	3	4F40ES STD	3F40ES ELC REF	RI	5	Elect.	Elect.	83,954	23,589	86,824	23,589	$15,331,397	2.89	1.65
Lighting	4	3F40ES STD	2F40ES ELC REF	RI	3	Elect.	Elect.	84,100	23,764	86,969	23,764	$15,350,557	2.88	1.62
AC	533	Chiller	Eff. Chiller&TES	RI	47	Elect.	Elect.	84,155	24,215	87,025	24,215	$15,366,722	2.88	1.59
Envelope	FAM HSG	Heating/Cooling	Weath. Package	RI	4e	Elect.	Elect.	86,160	24,215	89,030	24,215	$15,492,904	2.85	1.59
AC	800	Chiller	Eff. Chiller&TES	RI	87	Elect.	Elect.	86,162	25,063	89,031	25,063	$15,526,880	2.84	1.58
AC	967	Chiller	Eff. Chiller&TES	RI	101	Elect.	Elect.	86,162	25,251	89,032	25,251	$15,534,430	2.84	1.58
AC	329	Chiller	Eff. Chiller&TES	RI	19	Elect.	Elect.	86,163	25,439	89,032	25,439	$15,541,980	2.83	1.58
AC	312	Chiller	Eff. Chiller&TES	RI	14	Elect.	Elect.	86,163	25,731	89,033	25,731	$15,553,682	2.83	1.58
AC	330	Chiller	Eff. Chiller&TES	RI	21	Elect.	Elect.	86,164	26,296	89,034	26,296	$15,576,332	2.83	1.58
AC	425	Chiller	Eff. Chiller&TES	RI	34	Elect.	Elect.	86,165	26,531	89,034	26,531	$15,585,770	2.82	1.58
AC	561	Chiller	Eff. Chiller&TES	RI	62	Elect.	Elect.	86,166	27,049	89,035	27,049	$15,606,533	2.82	1.58
AC	562	Chiller	Eff. Chiller&TES	RI	63	Elect.	Elect.	86,167	27,567	89,036	27,567	$15,627,295	2.81	1.58
AC	535	Chiller	Eff. Chiller&TES	RI	50	Elect.	Elect.	86,193	27,857	89,062	27,857	$15,637,292	2.81	1.55
AC	535	Chiller	Eff. Chiller&TES	RI	51	Elect.	Elect.	86,240	28,375	89,110	28,375	$15,655,142	2.81	1.55
AC	1364	Chiller	Gas Chiller/Cogen.	RI	122	Elect.	NG	87,730	29,816	90,599	29,816	$15,753,133	2.78	1.53
AC	501	Chiller	Eff. Chiller&TES	RI	40	Elect.	Elect.	87,772	30,423	90,642	30,423	$15,773,551	2.77	1.52
AC	502	Chiller	Eff. Chiller&TES	RI	41	Elect.	Elect.	87,815	31,031	90,685	31,031	$15,793,968	2.77	1.52
AC	503	Chiller	Eff. Chiller&TES	RI	42	Elect.	Elect.	87,858	31,638	90,727	31,638	$15,814,385	2.76	1.52
AC	313	Chiller	Eff. Chiller&TES	RI	15	Elect.	Elect.	87,667	33,239	90,537	33,239	$15,873,836	2.74	1.45
AC	800	Chiller	Eff. Chiller&TES	RI	88	Elect.	Elect.	87,499	34,651	90,368	34,651	$15,926,292	2.73	1.45
AC	722	Chiller	Eff. Chiller&TES	RI	78	Elect.	Elect.	87,433	35,200	90,303	35,200	$15,946,692	2.72	1.45
AC	732	Chiller	Eff. Chiller&TES	RI	80	Elect.	Elect.	87,387	35,585	90,257	35,585	$15,960,972	2.72	1.45
AC	629	Chiller	Eff. Chiller&TES	RI	69	Elect.	Elect.	87,355	35,860	90,224	35,860	$15,971,172	2.71	1.45
AC	710	Chiller	Eff. Chiller&TES	RI	77	Elect.	Elect.	87,322	36,134	90,191	36,134	$15,981,372	2.71	1.45
AC	408	Chiller	Eff. Chiller&TES	RI	30	Elect.	Elect.	87,285	36,448	90,154	36,448	$15,993,029	2.71	1.45
AC	430	Chiller	Eff. Chiller&TES	RI	37	Elect.	Elect.	87,247	36,762	90,116	36,762	$16,004,685	2.70	1.45
AC	575	Chiller	Eff. Chiller&TES	RI	64	Elect.	Elect.	87,177	37,350	90,046	37,350	$16,026,542	2.70	1.45
AC	967	Chiller	Eff. Chiller&TES	RI	102	Elect.	Elect.	87,095	38,041	89,964	38,041	$16,052,188	2.69	1.45
AC	750	Chiller	Eff. Chiller&TES	RI	85	Elect.	Elect.	86,978	39,022	89,847	39,022	$16,088,616	2.68	1.45
AC	946	Chiller	Eff. Chiller&TES	RI	97	Elect.	Elect.	86,884	39,806	89,753	39,806	$16,117,758	2.67	1.45
AC	330	Chiller	Eff. Chiller&TES	RI	20	Elect.	Elect.	86,837	40,199	89,706	40,199	$16,132,329	2.67	1.45
AC	560	Chiller	Eff. Chiller&TES	RI	61	Elect.	Elect.	86,790	40,591	89,660	40,591	$16,146,901	2.66	1.45
AC	751	Chiller	Eff. Chiller&TES	RI	86	Elect.	Elect.	86,730	41,101	89,599	41,101	$16,165,843	2.66	1.45
AC	425	Chiller	Eff. Chiller&TES	RI	35	Elect.	Elect.	86,678	41,533	89,547	41,533	$16,181,871	2.65	1.45
AC	250	Chiller	Eff. Chiller&TES	RI	9	Elect.	Elect.	86,542	42,671	89,412	42,671	$16,224,128	2.64	1.45
AC	318	Chiller	Eff. Chiller&TES	RI	17	Elect.	Elect.	86,496	43,063	89,365	43,063	$16,238,699	2.64	1.45
AC	984	Chiller	Eff. Chiller&TES	RI	104	Elect.	Elect.	86,439	43,534	89,309	43,534	$16,256,185	2.63	1.45
AC	559	Chiller	Eff. Chiller&TES	RI	60	Elect.	Elect.	86,383	44,005	89,253	44,005	$16,273,670	2.63	1.45
AC	673	Chiller	Eff. Chiller&TES	RI	73	Elect.	Elect.	86,355	44,240	89,225	44,240	$16,282,413	2.63	1.45
AC	530	Chiller	Eff. Chiller&TES	RI	46	Elect.	Elect.	86,299	44,711	89,168	44,711	$16,299,898	2.62	1.45
AC	945	Chiller	Eff. Chiller&TES	RI	96	Elect.	Elect.	86,243	45,182	89,112	45,182	$16,317,384	2.62	1.45
AC	991	Chiller	Eff. Chiller&TES	RI	111	Elect.	Elect.	86,244	45,408	89,113	45,408	$16,324,347	2.61	1.45
AC	1493	Chiller	Eff. Chiller&TES	RI	130	Elect.	Elect.	86,244	45,671	89,114	45,671	$16,332,470	2.61	1.45
AC	810	Chiller	Eff. Chiller&TES	RI	89	Elect.	Elect.	86,245	45,860	89,114	45,860	$16,338,273	2.61	1.45
AC	402	Chiller	Eff. Chiller&TES	RI	28	Elect.	Elect.	86,246	46,048	89,115	46,048	$16,344,075	2.61	1.45
AC	989	Chiller	Eff. Chiller&TES	RI	106	Elect.	Elect.	86,249	47,084	89,118	47,084	$16,375,989	2.60	1.45
AC	424	Chiller	Eff. Chiller&TES	RI	33	Elect.	Elect.	86,249	47,272	89,119	47,272	$16,381,791	2.60	1.45
AC	957	Chiller	Eff. Chiller&TES	RI	98	Elect.	Elect.	86,250	47,460	89,119	47,460	$16,387,593	2.60	1.45
AC	990	Chiller	Eff. Chiller&TES	RI	109	Elect.	Elect.	86,251	47,743	89,120	47,743	$16,396,297	2.60	1.45
AC	1369	Chiller	Eff. Chiller&TES	RI	124	Elect.	Elect.	86,252	48,025	89,121	48,025	$16,405,001	2.59	1.45
AC	965	Chiller	Eff. Chiller&TES	RI	100	Elect.	Elect.	86,253	48,496	89,122	48,496	$16,419,507	2.59	1.45
AC	3656	Chiller	Eff. Chiller&TES	RI	133	Elect.	Elect.	86,254	48,732	89,123	48,732	$16,426,760	2.59	1.45

Table 3.9
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Cumulative Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Cumulative First-Year Energy Savings (MBtu)	Cumulative First-Year Demand Savings (kW-mo)	Cumulative Full Implement. Energy Savings (MBtu)	Cumulative Full Implement. Demand Savings (kW-mo)	Cumulative Net Present Value (1993 $)	Cumulative Savings to Investment Ratio	Individual ERO Savings to Investment Ratio
Lighting	1	2F40ES STD	2F32T8 ELC	RI	2a	Elect.	Elect.	86,563	48,906	89,432	48,906	$16,457,980	2.58	1.43
Lighting	2	2F96 STD	2F96ES ELC REF	RI	5	Elect.	Elect.	86,614	48,948	89,483	48,948	$16,462,194	2.58	1.42
Lighting	3	2F96 STD	2F96ES ELC REF	RI	3	Elect.	Elect.	88,242	50,295	91,111	50,295	$16,593,911	2.55	1.42
Lighting	2	1F40ES STD	1F32T8 ELC	RI	1	Elect.	Elect.	88,444	50,478	91,313	50,478	$16,613,390	2.54	1.38
AC	440	Chiller	Eff. Chiller&TES	RI	39	Elect.	Elect.	88,373	50,831	91,243	50,831	$16,625,810	2.54	1.38
AC	537	Chiller	Eff. Chiller&TES	RI	53	Elect.	Elect.	88,317	51,430	91,186	51,430	$16,641,826	2.53	1.35
AC	523	Chiller	Eff. Chiller&TES	RI	45	Elect.	Elect.	88,272	51,628	91,141	51,628	$16,648,409	2.53	1.34
Lighting	4	2F40ES STD	2F32T8 ELC	RI	1	Elect.	Elect.	88,327	51,665	91,196	51,665	$16,653,235	2.53	1.32
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	81b	Elect.	Elect.	88,327	51,665	91,203	51,665	$16,653,608	2.53	1.29
AC	969	Chiller	Eff. Chiller&TES	RI	103	Elect.	Elect.	88,279	51,916	91,156	51,916	$16,659,325	2.53	1.27
AC	990	Chiller	Eff. Chiller&TES	RI	110	Elect.	Elect.	88,205	52,308	91,081	52,308	$16,668,257	2.52	1.27
AC	576	Chiller	Eff. Chiller&TES	RI	65	Elect.	Elect.	88,130	52,700	91,006	52,700	$16,677,189	2.52	1.27
AC	533	Chiller	Eff. Chiller&TES	RI	48	Elect.	Elect.	87,868	54,074	90,744	54,074	$16,708,452	2.51	1.27
AC	3655	Chiller	Eff. Chiller&TES	RI	132	Elect.	Elect.	87,793	54,466	90,670	54,466	$16,717,384	2.50	1.27
AC	989	Chiller	Eff. Chiller&TES	RI	107	Elect.	Elect.	87,001	58,625	89,877	58,625	$16,812,064	2.46	1.27
AC	265	Chiller	Eff. Chiller&TES	RI	12	Elect.	Elect.	86,889	59,213	89,765	59,213	$16,825,462	2.46	1.27
AC	734	Chiller	Eff. Chiller&TES	RI	81	Elect.	Elect.	86,842	59,457	89,718	59,457	$16,831,000	2.46	1.27
AC	1316	Chiller	Eff. Chiller&TES	RI	118	Elect.	Elect.	86,782	59,770	89,659	59,770	$16,838,146	2.46	1.27
AC	558	Chiller	Eff. Chiller&TES	RI	59	Elect.	Elect.	86,663	60,398	89,539	60,398	$16,852,437	2.45	1.27
AC	400	Chiller	Eff. Chiller&TES	RI	26	Elect.	Elect.	86,543	61,026	89,419	61,026	$16,866,728	2.44	1.27
AC	1353	Chiller	Eff. Chiller&TES	RI	119	Elect.	Elect.	86,483	61,340	89,360	61,340	$16,873,874	2.44	1.27
AC	1365	Chiller	Eff. Chiller&TES	RI	123	Elect.	Elect.	86,244	62,595	89,120	62,595	$16,902,457	2.43	1.27
AC	996	Chiller	Eff. Chiller&TES	RI	115	Elect.	Elect.	86,184	62,909	89,060	62,909	$16,909,602	2.43	1.27
AC	727	Chiller	Eff. Chiller&TES	RI	79	Elect.	Elect.	86,095	63,380	88,971	63,380	$16,920,321	2.43	1.27
AC	1492	Chiller	Eff. Chiller&TES	RI	129	Elect.	Elect.	86,050	63,615	88,926	63,615	$16,925,680	2.42	1.27
AC	992	Chiller	Eff. Chiller&TES	RI	113	Elect.	Elect.	86,005	63,851	88,881	63,851	$16,931,039	2.42	1.27
AC	423	Chiller	Eff. Chiller&TES	RI	32	Elect.	Elect.	86,296	68,542	89,172	68,542	$17,027,676	2.38	1.24
Wtr. Heating	Temp.Lod.Fac.	WH-1	Solar Water Heater	RI	4	Elect.	Elect.	86,657	68,542	89,534	68,542	$17,036,009	2.38	1.24
Wtr. Heating	Wherry Hsg	WH-1	Solar Water Heater	RI	3	Elect.	Elect.	90,665	68,542	93,541	68,542	$17,128,334	2.35	1.24
Wtr. Heating	APPR PFY50	WH-1	Solar Water Heater	RI	1	Elect.	Elect.	90,687	68,542	93,563	68,542	$17,128,834	2.35	1.24
AC	3659	Chiller	Eff. Chiller&TES	RI	135	Elect.	Elect.	90,546	69,248	93,422	69,248	$17,143,626	2.34	1.23
Wtr. Heating	504	Water Heater	Solar Water Heater	RI	1d	Elect.	Elect.	90,749	69,248	93,626	69,248	$17,147,875	2.34	1.21
Wtr. Heating	502	Water Heater	Solar Water Heater	RI	1b	Elect.	Elect.	90,953	69,248	93,829	69,248	$17,152,091	2.34	1.21
Wtr. Heating	503	Water Heater	Solar Water Heater	RI	1c	Elect.	Elect.	91,156	69,248	94,033	69,248	$17,156,307	2.33	1.21
Wtr. Heating	501	Water Heater	Solar Water Heater	RI	1a	Elect.	Elect.	91,360	69,248	94,236	69,248	$17,160,523	2.33	1.21
Lighting	2	1F40 STD	1F32T8 ELC REF	RI	2	Elect.	Elect.	91,841	69,422	94,717	69,422	$17,178,014	2.33	1.21
Wtr. Heating	505	Water Heater	Solar Water Heater	RI	1e	Elect.	Elect.	92,024	69,422	94,901	69,422	$17,181,401	2.32	1.18
Wtr. Heating	506	Water Heater	Solar Water Heater	RI	1f	Elect.	Elect.	92,208	69,422	95,085	69,422	$17,184,788	2.32	1.18
AC	404	Chiller	Eff. Chiller&TES	RI	29	Elect.	Elect.	92,068	69,841	94,944	69,841	$17,191,827	2.32	1.18
Controls	WHS	E-9	EMCS(exist. chill.)	RI	9	Elect.	Elect.	92,125	69,841	95,002	69,841	$17,192,999	2.32	1.18
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	86b	Elect.	Elect.	92,125	69,841	95,016	69,841	$17,193,549	2.32	1.16
AC	546	Chiller	Eff. Chiller&TES	RI	55	Elect.	Elect.	91,981	70,476	94,871	70,476	$17,203,843	2.31	1.16
AC	330	Chiller	Eff. Chiller&TES	RI	22	Elect.	Elect.	91,938	72,477	94,828	72,477	$17,234,584	2.30	1.16
AC	425	Chiller	Eff. Chiller&TES	RI	36	Elect.	Elect.	91,869	75,679	94,759	75,679	$17,283,770	2.27	1.16
AC	415	Chiller	Eff. Chiller&TES	RI	31	Elect.	Elect.	91,853	76,412	94,744	76,412	$17,295,041	2.26	1.16
AC	556	Chiller	Eff. Chiller&TES	RI	57	Elect.	Elect.	91,781	76,610	94,672	76,610	$17,297,880	2.26	1.15
AC	557	Chiller	Eff. Chiller&TES	RI	58	Elect.	Elect.	91,758	76,673	94,649	76,673	$17,298,671	2.26	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	91b	Elect.	Elect.	91,758	76,673	94,682	76,673	$17,299,742	2.26	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	89b	Elect.	Elect.	91,758	76,673	94,704	76,673	$17,300,455	2.26	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	88b	Elect.	Elect.	91,758	76,673	94,722	76,673	$17,301,006	2.26	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	90b	Elect.	Elect.	91,758	76,673	94,731	76,673	$17,301,311	2.26	1.12
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	85b	Elect.	Elect.	91,758	76,673	94,734	76,673	$17,301,404	2.26	1.11
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	51	Elect.	Elect.	91,758	76,673	94,749	76,679	$17,301,918	2.26	1.10
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	65	Elect.	Elect.	91,758	76,673	94,757	76,682	$17,302,175	2.26	1.10
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	116	Elect.	Elect.	91,758	76,673	94,764	76,685	$17,302,432	2.26	1.10
AC	1380	Chiller	Eff. Chiller&TES	RI	125	Elect.	Elect.	91,807	78,933	94,813	78,945	$17,322,240	2.24	1.10
AC	989	Chiller	Eff. Chiller&TES	RI	108	Elect.	Elect.	91,971	86,525	94,977	86,537	$17,388,782	2.19	1.10
Lighting	2	2F40 STD	2F40ES ELC REF	RI	4	Elect.	Elect.	92,000	86,551	95,006	86,563	$17,389,489	2.19	1.08
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	16	Elect.	Elect.	92,000	86,551	95,028	86,572	$17,390,506	2.18	1.08

Table 3.9
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Cumulative Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Cumulative First-Year Energy Savings (MBtu)	Cumulative First-Year Demand Savings (kW-mo)	Cumulative Full Implement. Energy Savings (MBtu)	Cumulative Full Implement. Demand Savings (kW-mo)	Cumulative Net Present Value (1993 $)	Cumulative Savings to Investment Ratio	Individual ERO Savings to Investment Ratio
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	95	Elect.	Elect.	92,000	86,551	95,050	86,581	$17,391,463	2.18	1.08
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	117	Elect.	Elect.	92,000	86,551	95,058	86,584	$17,391,632	2.18	1.08
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	48	Elect.	Elect.	92,000	86,551	95,061	86,585	$17,391,781	2.18	1.07
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	118	Elect.	Elect.	92,000	86,551	95,068	86,588	$17,391,929	2.18	1.07
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	92	Elect.	Elect.	92,000	86,551	95,074	86,590	$17,392,169	2.18	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	12	Elect.	Elect.	92,000	86,551	95,086	86,595	$17,392,648	2.18	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	93	Elect.	Elect.	92,000	86,551	95,104	86,602	$17,393,326	2.18	1.06
AC	998	Chille	Eff. Chiller&TES	RI	117	Elect.	Elect.	92,024	87,418	95,129	87,469	$17,398,642	2.18	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	49	Elect.	Elect.	92,024	87,418	95,134	87,471	$17,398,760	2.18	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	96	Elect.	Elect.	92,024	87,418	95,171	87,486	$17,399,656	2.17	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	17	Elect.	Elect.	92,024	87,418	95,267	87,525	$17,401,986	2.17	1.06
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	80b	Elect.	Elect.	92,024	87,418	95,273	87,525	$17,402,083	2.17	1.06
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	87b	Elect.	Elect.	92,024	87,418	95,294	87,525	$17,402,471	2.17	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	43	Elect.	Elect.	92,024	87,418	95,316	87,534	$17,402,962	2.17	1.06
AC	929	Chiller	Eff. Chiller&TES	RI	94	Elect.	Elect.	91,969	89,018	95,261	89,135	$17,411,129	2.16	1.05
AC	925	Chiller	Eff. Chiller&TES	RI	92	Elect.	Elect.	91,844	92,687	95,136	92,803	$17,429,845	2.13	1.05
AC	505	Chiller	Eff. Chiller&TES	RI	43	Elect.	Elect.	91,781	94,521	95,073	94,637	$17,439,203	2.12	1.05
AC	986	Chiller	Eff. Chiller&TES	RI	105	Elect.	Elect.	91,735	95,855	95,027	95,971	$17,446,009	2.11	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	71	Elect.	Elect.	91,735	95,855	95,049	95,980	$17,446,647	2.11	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	61	Elect.	Elect.	91,735	95,855	95,071	95,989	$17,447,285	2.11	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	13	Elect.	Elect.	91,735	95,855	95,149	96,020	$17,448,950	2.11	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	64	Elect.	Elect.	91,735	95,855	95,173	96,030	$17,449,429	2.11	1.05
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	97	Elect.	Elect.	91,735	95,855	95,196	96,039	$17,449,829	2.11	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	14	Elect.	Elect.	91,735	95,855	95,232	96,053	$17,450,465	2.10	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	72	Elect.	Elect.	91,735	95,855	95,253	96,062	$17,450,818	2.10	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	62	Elect.	Elect.	91,735	95,855	95,319	96,089	$17,451,877	2.10	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	32	Elect.	Elect.	91,735	95,855	95,323	96,090	$17,451,972	2.10	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	73	Elect.	Elect.	91,735	95,855	95,345	96,099	$17,452,266	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	33	Elect.	Elect.	91,735	95,855	95,348	96,100	$17,452,351	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	47	Elect.	Elect.	91,735	95,855	95,359	96,104	$17,452,605	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	7	Elect.	Elect.	91,735	95,855	95,380	96,113	$17,453,115	2.10	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	87	Elect.	Elect.	91,735	95,855	95,390	96,117	$17,453,356	2.10	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	113	Elect.	Elect.	91,735	95,855	95,400	96,121	$17,453,597	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	69	Elect.	Elect.	91,735	95,855	95,419	96,128	$17,453,844	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	58	Elect.	Elect.	91,735	95,855	95,437	96,136	$17,454,091	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	76	Elect.	Elect.	91,735	95,855	95,504	96,163	$17,454,590	2.10	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	82	Elect.	Elect.	91,735	95,855	95,506	96,163	$17,454,628	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	2	Elect.	Elect.	91,735	95,855	95,507	96,164	$17,454,661	2.10	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	127	Elect.	Elect.	91,735	95,855	95,526	96,171	$17,454,868	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	59	Elect.	Elect.	91,735	95,855	95,544	96,179	$17,455,075	2.10	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	138	Elect.	Elect.	91,735	95,855	95,563	96,186	$17,455,263	2.10	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	115	Elect.	Elect.	91,735	95,855	95,567	96,188	$17,455,296	2.10	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	18	Elect.	Elect.	91,735	95,855	95,612	96,206	$17,455,597	2.09	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	77	Elect.	Elect.	91,735	95,855	95,649	96,221	$17,455,883	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	119	Elect.	Elect.	91,735	95,855	95,657	96,224	$17,455,917	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	130	Elect.	Elect.	91,735	95,855	95,695	96,239	$17,456,254	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	107	Elect.	Elect.	91,735	95,855	95,701	96,242	$17,456,291	2.09	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	35	Elect.	Elect.	91,735	95,855	95,712	96,246	$17,456,480	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	89	Elect.	Elect.	91,735	95,855	95,724	96,251	$17,456,651	2.09	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	9	Elect.	Elect.	91,735	95,855	95,747	96,260	$17,456,994	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	90	Elect.	Elect.	91,735	95,855	95,759	96,265	$17,457,152	2.09	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	79	Elect.	Elect.	91,735	95,855	95,803	96,283	$17,457,384	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	131	Elect.	Elect.	91,735	95,855	95,840	96,298	$17,457,646	2.09	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	10	Elect.	Elect.	91,735	95,855	95,852	96,302	$17,457,752	2.09	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	38	Elect.	Elect.	91,735	95,855	95,879	96,313	$17,458,000	2.09	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	74	Elect.	Elect.	91,735	95,855	95,901	96,322	$17,458,104	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	139	Elect.	Elect.	91,735	95,855	95,919	96,329	$17,458,196	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	91	Elect.	Elect.	91,735	95,855	95,931	96,334	$17,458,279	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	128	Elect.	Elect.	91,735	95,855	95,968	96,349	$17,458,427	2.08	1.01

Table 3.9
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Cumulative Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Cumulative First-Year Energy Savings (MBtu)	Cumulative First-Year Demand Savings (kW-mo)	Cumulative Full Implement. Energy Savings (MBtu)	Cumulative Full Implement. Demand Savings (kW-mo)	Cumulative Net Present Value (1993 $)	Cumulative Savings to Investment Ratio	Individual ERO Savings to Investment Ratio
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	29	Elect.	Elect.	91,735	95,855	95,975	96,352	$17,458,512	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	30	Elect.	Elect.	91,735	95,855	95,978	96,353	$17,458,540	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	103	Elect.	Elect.	91,735	95,855	95,983	96,355	$17,458,596	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	112	Elect.	Elect.	91,735	95,855	95,985	96,356	$17,458,625	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	5	Elect.	Elect.	91,735	95,855	95,993	96,359	$17,458,702	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	23	Elect.	Elect.	91,735	95,855	95,994	96,359	$17,458,713	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	100	Elect.	Elect.	91,735	95,855	95,998	96,361	$17,458,745	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	50	Elect.	Elect.	91,735	95,855	96,003	96,363	$17,458,761	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	134	Elect.	Elect.	91,735	95,855	96,012	96,367	$17,458,793	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	6	Elect.	Elect.	91,735	95,855	96,020	96,370	$17,458,845	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	110	Elect.	Elect.	91,735	95,855	96,072	96,391	$17,459,017	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	44	Elect.	Elect.	91,735	95,855	96,094	96,399	$17,459,091	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	20	Elect.	Elect.	91,735	95,855	96,109	96,405	$17,459,140	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	94	Elect.	Elect.	91,735	95,855	96,133	96,415	$17,459,211	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	108	Elect.	Elect.	91,735	95,855	96,419	96,530	$17,460,063	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	39	Elect.	Elect.	91,735	95,855	96,455	96,544	$17,460,170	2.07	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	120	Elect.	Elect.	91,735	95,855	96,470	96,550	$17,460,204	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	52	Elect.	Elect.	91,735	95,855	96,485	96,556	$17,460,238	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	31	Elect.	Elect.	91,735	95,855	96,487	96,557	$17,460,248	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	75	Elect.	Elect.	91,735	95,855	96,509	96,566	$17,460,299	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	66	Elect.	Elect.	91,735	95,855	96,531	96,575	$17,460,349	2.07	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	85	Elect.	Elect.	91,735	95,855	96,533	96,576	$17,460,358	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	36	Elect.	Elect.	91,735	95,855	96,545	96,580	$17,460,392	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	40	Elect.	Elect.	91,735	95,855	96,550	96,582	$17,460,423	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	3	Elect.	Elect.	91,735	95,855	96,554	96,584	$17,460,444	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	25	Elect.	Elect.	91,735	95,855	96,555	96,585	$17,460,450	2.07	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	84	Elect.	Elect.	91,735	95,855	96,557	96,585	$17,460,461	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	27	Elect.	Elect.	91,735	95,855	96,559	96,586	$17,460,471	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	19	Elect.	Elect.	91,735	95,855	96,626	96,613	$17,460,581	2.07	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	88	Elect.	Elect.	91,735	95,855	96,647	96,621	$17,460,624	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	8	Elect.	Elect.	91,735	95,855	96,657	96,625	$17,460,645	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	34	Elect.	Elect.	91,735	95,855	96,699	96,642	$17,460,730	2.07	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	105	Elect.	Elect.	91,735	95,855	96,779	96,674	$17,460,893	2.07	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	109	Elect.	Elect.	91,735	95,855	96,784	96,677	$17,460,902	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	15	Elect.	Elect.	91,735	95,855	96,820	96,691	$17,460,955	2.07	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	83	Elect.	Elect.	91,735	95,855	96,823	96,692	$17,460,961	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	63	Elect.	Elect.	91,735	95,855	96,845	96,701	$17,460,986	2.07	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	24	Elect.	Elect.	91,735	95,855	96,847	96,702	$17,460,989	2.07	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	106	Elect.	Elect.	91,735	95,855	97,079	96,795	$17,461,330	2.06	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	37	Elect.	Elect.	91,735	95,855	97,141	96,820	$17,461,420	2.06	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	41	Elect.	Elect.	91,735	95,855	97,153	96,824	$17,461,437	2.06	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	132	Elect.	Elect.	91,735	95,855	97,197	96,842	$17,461,481	2.06	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	60	Elect.	Elect.	91,735	95,855	97,215	96,850	$17,461,499	2.06	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	129	Elect.	Elect.	91,735	95,855	97,252	96,864	$17,461,536	2.06	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	70	Elect.	Elect.	91,735	95,855	97,271	96,872	$17,461,554	2.06	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	81	Elect.	Elect.	91,735	95,855	97,302	96,884	$17,461,602	2.06	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	78	Elect.	Elect.	91,735	95,855	97,528	96,975	$17,461,814	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	22	Elect.	Elect.	91,735	95,855	97,539	96,980	$17,461,828	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	101	Elect.	Elect.	91,735	95,855	97,548	96,983	$17,461,839	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	104	Elect.	Elect.	91,735	95,855	97,578	96,995	$17,461,875	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	28	Elect.	Elect.	91,735	95,855	97,592	97,001	$17,461,893	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	86	Elect.	Elect.	91,735	95,855	97,600	97,004	$17,461,902	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	80	Elect.	Elect.	91,735	95,855	97,626	97,014	$17,461,935	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	1	Elect.	Elect.	91,735	95,855	97,627	97,015	$17,461,937	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	102	Elect.	Elect.	91,735	95,855	97,634	97,018	$17,461,943	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	11	Elect.	Elect.	91,735	95,855	97,638	97,019	$17,461,946	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	42	Elect.	Elect.	91,735	95,855	97,650	97,024	$17,461,955	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	121	Elect.	Elect.	91,735	95,855	97,661	97,028	$17,461,964	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	122	Elect.	Elect.	91,735	95,855	97,672	97,033	$17,461,971	2.05	1.00

Table 3.9

EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Cumulative Annual Energy and Demand Reductions

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Cumulative First-Year Energy Savings (MBtu)	Cumulative First-Year Demand Savings (kW-mo)	Cumulative Full Implement. Energy Savings (MBtu)	Cumulative Full Implement. Demand Savings (kW-mo)	Cumulative Net Present Value (1993 $)	Cumulative Savings to Investment Ratio	Individual ERO Savings to Investment Ratio
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	53	Elect.	Elect.	91,735	95,855	97,683	97,037	$17,461,979	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	26	Elect.	Elect.	91,735	95,855	97,685	97,038	$17,461,980	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	4	Elect.	Elect.	91,735	95,855	97,686	97,039	$17,461,981	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	123	Elect.	Elect.	91,735	95,855	97,698	97,043	$17,461,983	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	135	Elect.	Elect.	91,735	95,855	97,709	97,048	$17,461,986	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	67	Elect.	Elect.	91,735	95,855	97,720	97,052	$17,461,987	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	133	Elect.	Elect.	91,735	95,855	97,763	97,069	$17,461,995	2.05	1.00

Table 3.10
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Cumulative Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Cumulative Present Value of Installed Cost (1993 $)	Cumulative Present Value of Energy Savings (1993 $)	Cumulative Present Value of Demand Savings (1993 $)	Cumulative Present Value of O&M Savings (1993 $)	Cumulative Present Value of Replacement Cost Savings (1993 $)	Cumulative Present Value of Total Savings (1993 $)	Cumulative Net Present Value (1993 $)	Cumulative Savings to Investment Ratio	Individual ERO Savings to Investment Ratio
Controls	R&D	E-6	EMCS(exist. chill.)	RI	6	Elect.	Elect.	$8,800	$119,184	$0	$0	-$1,316	$117,869	$109,069	13.39	13.39
Lighting	2	INC 2x60 Cell	CFL 2-11 CEIL FIXT	RI	13	Elect.	Elect.	$10,493	$133,993	$2,810	$4,970	-$1,316	$140,457	$129,964	13.39	13.34
Lighting	3	INC 2x60 cell	CFL 2-11 CEIL FIXT	RI	10	Elect.	Elect.	$203,178	$1,678,456	$322,547	$526,480	-$1,316	$2,526,167	$2,322,988	12.43	12.38
Envelope	CLUB	Heating/Cooling	Weath. Package	RI	4c	Elect.	Elect.	$205,751	$1,698,925	$322,547	$526,480	-$1,316	$2,546,635	$2,340,884	12.38	7.96
Lighting	2	INC 60 Cell	CFL 11 CEIL FIXT	RI	15	Elect.	Elect.	$232,101	$1,815,945	$349,069	$575,186	-$1,316	$2,738,084	$2,506,783	11.80	7.30
Controls	DGR	E-3	EMCS(exist. chill.)	RI	3	Elect.	Elect.	$236,501	$1,848,656	$349,069	$575,186	-$1,973	$2,770,937	$2,534,436	11.72	7.28
Lighting	1	2F40ES STD	SENS	RI	2b	Elect.	Elect.	$248,459	$1,888,669	$363,209	$607,546	-$1,973	$2,857,450	$2,608,981	11.50	7.23
Lighting	3	INC 75 Cell	CFL 2-9 + BLST	RI	12	Elect.	Elect.	$381,662	$2,561,418	$502,483	$601,104	-$1,973	$3,663,030	$3,281,369	9.60	6.05
Lighting	2	INC 75 Cell	CFL 2-9 + BLST	RI	16	Elect.	Elect.	$384,730	$2,575,576	$505,692	$601,035	-$1,973	$3,680,329	$3,295,598	9.57	5.64
Controls	ADMIN	E-1	EMCS(exist. chill.)	RI	1	Elect.	Elect.	$397,930	$2,651,022	$505,692	$601,035	-$3,947	$3,753,802	$3,355,872	9.43	5.57
Lighting	2	EXIT INC (2x15)	LED	RI	11	Elect.	Elect.	$402,803	$2,655,336	$506,783	$622,483	-$3,947	$3,780,655	$3,377,853	9.39	5.51
Lighting	1	EXIT INC(2x15)	LED	RI	8	Elect.	Elect.	$475,601	$2,719,794	$523,091	$942,943	-$3,947	$4,181,882	$3,706,281	8.79	5.51
Lighting	5	INC 2-60	CFL 2-15 CEIL	RI	2	Elect.	Elect.	$649,500	$3,157,895	$746,175	$1,185,051	-$3,947	$5,085,174	$4,435,674	7.83	5.19
Lighting	2	3F40ES STD	2F40ES ELC REF SENS	RI	7b	Elect.	Elect.	$662,979	$3,201,187	$754,393	$1,200,245	-$3,947	$5,151,879	$4,488,899	7.77	4.95
Lighting	1	INC 75 Can	CFL 20 + BLST	RI	9	Elect.	Elect.	$716,310	$3,357,484	$813,103	$1,245,026	-$3,947	$5,411,667	$4,695,357	7.55	4.87
Envelope	Wherry	Heating/Cooling	Ceiling Insulation	RI	1b	Elect.	Elect.	$1,132,990	$5,303,421	$813,103	$1,245,026	-$3,947	$7,357,604	$6,224,614	6.49	4.67
Envelope	FAM HSG	Heating/Cooling	Refl. Window Trtmnt	RI	2b	Elect.	Elect.	$1,581,882	$7,371,535	$813,103	$1,245,026	-$3,947	$9,425,717	$7,843,835	5.96	4.61
Lighting	2	3F40ES STD	2F40ES ELC REF	RI	7a	Elect.	Elect.	$1,601,332	$7,428,902	$823,993	$1,264,011	-$3,947	$9,512,960	$7,911,628	5.94	4.49
Lighting	5	INC 1-60	CFL 15 CEIL	RI	3	Elect.	Elect.	$1,674,651	$7,636,861	$879,764	$1,325,510	-$3,947	$9,838,189	$8,163,538	5.87	4.44
Controls	COMCATN	E-2	EMCS(exist. chill.)	RI	2	Elect.	Elect.	$1,698,851	$7,746,469	$879,764	$1,325,510	-$7,565	$9,944,179	$8,245,328	5.85	4.38
Lighting	2	4F40 STD	3F32T8 ELC REF	RI	9	Elect.	Elect.	$1,773,788	$7,986,563	$925,699	$1,352,043	-$7,565	$10,256,740	$8,482,952	5.78	4.17
Controls	SHOP ELC	E-8	EMCS(exist. chill.)	RI	8	Elect.	Elect.	$1,775,988	$7,995,912	$925,699	$1,352,043	-$7,894	$10,265,760	$8,489,772	5.78	4.10
Lighting	2	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	$1,785,978	$8,022,929	$931,822	$1,355,472	-$7,894	$10,302,330	$8,516,353	5.77	3.66
Lighting	2	EXIT 2xPL9	LED	RI	10	Elect.	Elect.	$1,841,065	$8,056,097	$940,214	$1,493,019	-$7,894	$10,481,437	$8,640,371	5.69	3.25
Controls	MISC	E-4	EMCS(exist. chill.)	RI	4	Elect.	Elect.	$1,843,265	$8,063,525	$940,214	$1,493,019	-$8,222	$10,488,536	$8,645,271	5.69	3.23
Lighting	1	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	$1,969,832	$8,351,624	$1,017,797	$1,535,509	-$8,222	$10,896,707	$8,926,875	5.53	3.22
Lighting	3	INC 100 Cell	CFL 2-11 CEIL FIXT	RI	8	Elect.	Elect.	$1,973,369	$8,358,024	$1,022,362	$1,535,862	-$8,222	$10,908,025	$8,934,656	5.53	3.20
Lighting	2	2F40ES STD	2F32T8 ELC SENS	RI	3b	Elect.	Elect.	$2,005,748	$8,420,520	$1,035,400	$1,563,458	-$8,222	$11,011,155	$9,005,407	5.49	3.19
Controls	REC	E-7	EMCS(exist. chill.)	RI	7	Elect.	Elect.	$2,012,348	$8,442,174	$1,035,400	$1,563,458	-$9,209	$11,031,822	$9,019,475	5.48	3.13
Envelope	BRK/ADM	Heating/Cooling	Weath. Package	RI	4b	Elect.	Elect.	$2,048,205	$8,544,316	$1,035,400	$1,563,458	-$9,209	$11,133,964	$9,085,760	5.44	2.85
Lighting	1	3F40ES STD	2F40ES ELC REF SENS	RI	5b	Elect.	Elect.	$2,508,517	$9,288,873	$1,315,598	$1,840,327	-$9,209	$12,435,589	$9,927,072	4.96	2.83
Lighting	2	EXIT INC (2x20)	LED	RI	12	Elect.	Elect.	$2,515,486	$9,297,512	$1,317,784	$1,849,039	-$9,209	$12,455,125	$9,939,640	4.95	2.80
Lighting	3	EXIT INC(2x20)	LED	RI	7	Elect.	Elect.	$2,519,090	$9,301,980	$1,318,914	$1,853,545	-$9,209	$12,465,229	$9,946,140	4.95	2.80
Lighting	1	3F40ES STD	2F40ES ELC REF	RI	5a	Elect.	Elect.	$3,128,044	$10,207,938	$1,659,853	$2,199,038	-$9,209	$14,057,619	$10,929,575	4.49	2.61
Lighting	3	2F40 STD	2F40ES ELC REF SENS	RI	2b	Elect.	Elect.	$3,135,450	$10,221,059	$1,662,718	$2,202,389	-$9,209	$14,076,956	$10,941,507	4.49	2.61
Envelope	ADMIN	Heating/Cooling	Weath. Package	RI	4a	Elect.	Elect.	$3,234,889	$10,464,248	$1,662,718	$2,202,389	-$9,209	$14,320,146	$11,085,256	4.43	2.45
Envelope	TLF	Heating/Cooling	Refl. Window Trtmnt	RI	2a	Elect.	Elect.	$3,400,891	$10,859,832	$1,662,718	$2,202,389	-$9,209	$14,715,729	$11,314,838	4.33	2.38
Lighting	1	4F40ES STD	3F40ES ELC REF	RI	4	Elect.	Elect.	$3,435,546	$10,906,526	$1,678,018	$2,217,519	-$9,209	$14,792,854	$11,357,308	4.31	2.23
Boilers	Multiple	All Boilers	Tune-up 50	RI	3	NG,F Oil	NG,F Oil	$3,453,046	$10,956,201	$1,678,018	$2,209,708	-$13,840	$14,830,088	$11,377,042	4.29	2.13
Lighting	2	4F40ES STD	3F40ES ELC REF SENS	RI	8b	Elect.	Elect.	$3,465,639	$10,970,410	$1,684,839	$2,215,009	-$13,840	$14,856,419	$11,390,780	4.29	2.09
Lighting	3	3F40 STD	2F40 STD REF	RI	4b	Elect.	Elect.	$3,467,198	$10,972,010	$1,685,981	$2,215,370	-$13,840	$14,859,522	$11,392,324	4.29	1.99
Lighting	3	3F40 STD	2F40 STD REF	RI	4a	Elect.	Elect.	$3,468,757	$10,973,609	$1,687,122	$2,215,731	-$13,840	$14,862,623	$11,393,866	4.28	1.99
Lighting	3	2F40 STD	2F40ES ELC REF	RI	2a	Elect.	Elect.	$3,637,537	$11,210,280	$1,738,799	$2,260,779	-$13,840	$15,196,019	$11,558,482	4.18	1.98
Transport.	Vehicles	Various	CNG Vehicle	RI		Gas/Diese	NG,Diesel	$4,924,537	$12,323,976	$1,738,799	$4,102,388	-$427,410	$17,737,753	$12,813,216	3.60	1.97
Motors	CLUB	Fan Motor	Eff. Motor	RI	5a	Elect.	Elect.	$4,926,574	$12,326,638	$1,739,575	$4,102,388	-$426,872	$17,741,728	$12,815,154	3.60	1.95
Motors	PLT-BLD	Fan Motor	Eff. Motor	RI	16a	Elect.	Elect.	$4,927,212	$12,327,465	$1,739,816	$4,102,388	-$426,703	$17,742,965	$12,815,752	3.60	1.94
Motors	RESTRNT	Fan Motor	Eff. Motor	RI	19a	Elect.	Elect.	$4,927,662	$12,328,047	$1,739,985	$4,102,388	-$426,584	$17,743,837	$12,816,174	3.60	1.94
Motors	CHAPEL	Fan Motor	Eff. Motor	RI	3a	Elect.	Elect.	$4,929,294	$12,330,160	$1,740,601	$4,102,388	-$426,150	$17,746,998	$12,817,704	3.60	1.94
Motors	CLINIC	Fan Motor	Eff. Motor	RI	4a	Elect.	Elect.	$4,930,238	$12,331,382	$1,740,957	$4,102,388	-$425,899	$17,748,827	$12,818,589	3.60	1.94
Motors	TRAING	Fan Motor	Eff. Motor	RI	25a	Elect.	Elect.	$4,935,645	$12,338,380	$1,742,995	$4,102,388	-$424,463	$17,759,301	$12,823,655	3.60	1.94
Motors	STOR-UH	Fan Motor	Eff. Motor	RI	23a	Elect.	Elect.	$4,941,481	$12,345,935	$1,745,196	$4,102,388	-$422,914	$17,770,605	$12,829,123	3.60	1.94
Motors	TERMINL	Fan Motor	Eff. Motor	RI	24a	Elect.	Elect.	$4,953,443	$12,361,418	$1,749,705	$4,102,388	-$419,737	$17,793,775	$12,840,331	3.59	1.94
Motors	COMCATN	Fan Motor	Eff. Motor	RI	6a	Elect.	Elect.	$4,964,911	$12,376,262	$1,754,029	$4,102,388	-$416,691	$17,815,988	$12,851,076	3.59	1.94
Motors	GROCERY	Fan Motor	Eff. Motor	RI	9a	Elect.	Elect.	$4,976,548	$12,391,325	$1,758,416	$4,102,388	-$413,600	$17,838,528	$12,861,980	3.58	1.94
Motors	HOSPITL	Fan Motor	Eff. Motor	RI	11a	Elect.	Elect.	$4,986,713	$12,404,482	$1,762,248	$4,102,388	-$410,901	$17,858,217	$12,871,504	3.58	1.94
Motors	REC	Fan Motor	Eff. Motor	RI	18a	Elect.	Elect.	$4,992,653	$12,412,170	$1,764,487	$4,102,388	-$409,323	$17,869,722	$12,877,069	3.58	1.94
Motors	DGR	Fan Motor	Eff. Motor	RI	7a	Elect.	Elect.	$5,013,313	$12,438,911	$1,772,276	$4,102,388	-$403,836	$17,909,739	$12,896,425	3.57	1.94
Motors	MTRPOOL	Fan Motor	Eff. Motor	RI	14a	Elect.	Elect.	$5,020,398	$12,448,081	$1,774,946	$4,102,388	-$401,954	$17,923,462	$12,903,063	3.57	1.94
Motors	ADMIN	Fan Motor	Eff. Motor	RI	1a	Elect.	Elect.	$5,142,422	$12,606,017	$1,820,946	$4,102,388	-$369,544	$18,159,807	$13,017,384	3.53	1.94
Motors	WHS	Fan Motor	Eff. Motor	RI	26a	Elect.	Elect.	$5,185,827	$12,662,196	$1,837,309	$4,102,388	-$358,016	$18,243,877	$13,058,049	3.52	1.94
Motors	BRK/ADM	Fan Motor	Eff. Motor	RI	2a	Elect.	Elect.	$5,217,598	$12,703,318	$1,849,286	$4,102,388	-$349,578	$18,305,413	$13,087,815	3.51	1.94
Motors	MWR	Fan Motor	Eff. Motor	RI	15a	Elect.	Elect.	$5,233,467	$12,723,857	$1,855,268	$4,102,388	-$345,364	$18,336,149	$13,102,682	3.50	1.94
Motors	SHOP-ELEC	Fan Motor	Eff. Motor	RI	22a	Elect.	Elect.	$5,256,557	$12,753,742	$1,863,972	$4,102,388	-$339,231	$18,380,871	$13,124,313	3.50	1.94
Motors	HSG-FAM	Fan Motor	Eff. Motor	RI	12a	Elect.	Elect.	$5,258,260	$12,755,946	$1,864,614	$4,102,388	-$338,779	$18,384,169	$13,125,909	3.50	1.94
Motors	HANGER	Fan Motor	Eff. Motor	RI	10a	Elect.	Elect.	$5,274,232	$12,776,618	$1,870,635	$4,102,388	-$334,537	$18,415,104	$13,140,872	3.49	1.94
Motors	R&D	Fan Motor	Eff. Motor	RI	17a	Elect.	Elect.	$5,281,824	$12,786,444	$1,873,497	$4,102,388	-$332,520	$18,429,809	$13,147,984	3.49	1.94
Motors	DINING	Fan Motor	Eff. Motor	RI	8a	Elect.	Elect.	$5,293,152	$12,801,105	$1,877,767	$4,102,388	-$329,511	$18,451,749	$13,158,597	3.49	1.94
Motors	SHOP	Fan Motor	Eff. Motor	RI	21a	Elect.	Elect.	$5,297,817	$12,807,143	$1,879,526	$4,102,388	-$328,272	$18,460,784	$13,162,967	3.48	1.94
Motors	SECURITY	Fan Motor	Eff. Motor	RI	20a	Elect.	Elect.	$5,303,134	$12,814,023	$1,881,530	$4,102,388	-$326,859	$18,471,081	$13,167,947	3.48	1.94
Motors	MISC	Fan Motor	Eff. Motor	RI	13a	Elect.	Elect.	$5,303,715	$12,814,775	$1,881,749	$4,102,388	-$326,705	$18,472,206	$13,168,491	3.48	1.94
Lighting	2	2F40ES STD	2F32T8 ELC	RI	3a	Elect.	Elect.	$5,374,346	$12,895,937	$1,898,681	$4,140,341	-$326,705	$18,608,253	$13,233,907	3.46	1.93
HVAC	Family Housing	Air Source Ht. Pump	Gmd-Cpld Ht. Pump	ROF	1	Elect.	Elect.	$7,003,671	$13,039,875	$1,898,681	$4,140,341	$2,455,381	$21,534,278	$14,530,606	3.07	1.80
Motors	North Plant	Sewage Pump	Eff. Motor	RI	82a	Elect.	Elect.	$7,005,922	$13,043,297	$1,898,681	$4,140,341	$2,455,979	$21,538,297	$14,532,375	3.07	1.79

Table 3.10
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Cumulative Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Cumulative Present Value of Installed Cost (1993 $)	Cumulative Present Value of Energy Savings (1993 $)	Cumulative Present Value of Demand Savings (1993 $)	Cumulative Present Value of O&M Savings (1993 $)	Cumulative Present Value of Replacement Cost Savings (1993 $)	Cumulative Present Value of Total Savings (1993 $)	Cumulative Net Present Value (1993 $)	Cumulative Savings to Investment Ratio	Individual ERO Savings to Investment Ratio
Motors	South Plant	Sewage Pump	Eff Motor	RI	77a	Elect.	Elect.	$7,007,047	$13,045,007	$1,898,681	$4,140,341	$2,456,278	$21,540,307	$14,533,259	3.07	1.79
Motors	North Plant	Sewage Pump	Eff Motor	RI	83a	Elect.	Elect.	$7,007,610	$13,045,863	$1,898,681	$4,140,341	$2,456,427	$21,541,312	$14,533,702	3.07	1.79
Motors	South Plant	Sewage Pump	Eff Motor	RI	79a	Elect.	Elect.	$7,011,549	$13,051,851	$1,898,681	$4,140,341	$2,457,473	$21,548,346	$14,536,797	3.07	1.79
Motors	South Plant	Sewage Pump	Eff Motor	RI	72a	Elect.	Elect.	$7,011,774	$13,052,193	$1,898,681	$4,140,341	$2,457,533	$21,548,748	$14,536,974	3.07	1.79
Motors	South Plant	Sewage Pump	Eff Motor	RI	71a	Elect.	Elect.	$7,011,887	$13,052,364	$1,898,681	$4,140,341	$2,457,563	$21,548,949	$14,537,062	3.07	1.79
Motors	South Plant	Sewage Pump	Eff Motor	RI	76a	Elect.	Elect.	$7,012,731	$13,053,647	$1,898,681	$4,140,341	$2,457,787	$21,550,456	$14,537,725	3.07	1.79
Motors	REC	Chilled Water Pump	Eff Motor	ROF	42b	Elect.	Elect.	$7,013,149	$13,054,079	$1,898,681	$4,140,341	$2,458,098	$21,551,199	$14,538,050	3.07	1.77
Motors	CLINIC	Chilled Water Pump	Eff Motor	ROF	30b	Elect.	Elect.	$7,013,491	$13,054,431	$1,898,681	$4,140,341	$2,458,353	$21,551,806	$14,538,315	3.07	1.77
Motors	MISC	Chilled Water Pump	Eff Motor	ROF	38b	Elect.	Elect.	$7,013,833	$13,054,783	$1,898,681	$4,140,341	$2,458,608	$21,552,413	$14,538,579	3.07	1.77
Motors	SHOP-ELEC	Chilled Water Pump	Eff Motor	ROF	44b	Elect.	Elect.	$7,015,577	$13,056,580	$1,898,681	$4,140,341	$2,459,905	$21,555,507	$14,539,930	3.07	1.77
Motors	CHAPEL	Chilled Water Pump	Eff Motor	ROF	29b	Elect.	Elect.	$7,016,432	$13,057,461	$1,898,681	$4,140,341	$2,460,541	$21,557,024	$14,540,592	3.07	1.77
Motors	DGR	Chilled Water Pump	Eff Motor	ROF	33b	Elect.	Elect.	$7,020,075	$13,061,214	$1,898,681	$4,140,341	$2,463,252	$21,563,488	$14,543,412	3.07	1.77
Motors	SECURITY	Chilled Water Pump	Eff Motor	ROF	43b	Elect.	Elect.	$7,020,717	$13,061,875	$1,898,681	$4,140,341	$2,463,728	$21,564,625	$14,543,909	3.07	1.77
Motors	R&D	Chilled Water Pump	Eff Motor	ROF	41b	Elect.	Elect.	$7,022,701	$13,063,919	$1,898,681	$4,140,341	$2,465,205	$21,568,146	$14,545,445	3.07	1.77
Motors	ADMIN	Chilled Water Pump	Eff Motor	ROF	27b	Elect.	Elect.	$7,050,802	$13,092,866	$1,898,681	$4,140,341	$2,486,110	$21,617,999	$14,567,197	3.07	1.77
Motors	WHS	Condenser Pump	Eff Motor	ROF	63b	Elect.	Elect.	$7,051,315	$13,093,395	$1,898,681	$4,140,341	$2,486,492	$21,618,909	$14,567,594	3.07	1.77
Motors	BRK/ADM	Condenser Pump	Eff Motor	ROF	55b	Elect.	Elect.	$7,051,828	$13,093,924	$1,898,681	$4,140,341	$2,486,874	$21,619,819	$14,567,992	3.07	1.77
Motors	BRK/ADM	Condenser Pump	Eff Motor	ROF	56b	Elect.	Elect.	$7,052,341	$13,094,452	$1,898,681	$4,140,341	$2,487,256	$21,620,730	$14,568,389	3.07	1.77
Motors	ADMIN	Condenser Pump	Eff Motor	ROF	50b	Elect.	Elect.	$7,056,446	$13,098,681	$1,898,681	$4,140,341	$2,490,309	$21,628,012	$14,571,566	3.07	1.77
Motors	BRK/ADM	Condenser Pump	Eff Motor	ROF	57b	Elect.	Elect.	$7,056,959	$13,099,209	$1,898,681	$4,140,341	$2,490,691	$21,628,922	$14,571,963	3.06	1.77
Motors	ADMIN	Condenser Pump	Eff Motor	ROF	52b	Elect.	Elect.	$7,057,472	$13,099,738	$1,898,681	$4,140,341	$2,491,073	$21,629,833	$14,572,361	3.06	1.77
Motors	DGR	Condenser Pump	Eff Motor	ROF	58b	Elect.	Elect.	$7,058,413	$13,100,707	$1,898,681	$4,140,341	$2,491,773	$21,631,501	$14,573,089	3.06	1.77
Motors	MWR	Condenser Pump	Eff Motor	ROF	61b	Elect.	Elect.	$7,059,268	$13,101,588	$1,898,681	$4,140,341	$2,492,409	$21,633,019	$14,573,751	3.06	1.77
Motors	TRAING	Condenser Pump	Eff Motor	ROF	62b	Elect.	Elect.	$7,059,696	$13,102,028	$1,898,681	$4,140,341	$2,492,727	$21,633,777	$14,574,082	3.06	1.77
Motors	ADMIN	Condenser Pump	Eff Motor	ROF	51b	Elect.	Elect.	$7,060,294	$13,102,645	$1,898,681	$4,140,341	$2,493,172	$21,634,839	$14,574,545	3.06	1.77
Motors	BRK/ADM	Condenser Pump	Eff Motor	ROF	54b	Elect.	Elect.	$7,064,185	$13,106,653	$1,898,681	$4,140,341	$2,496,067	$21,641,742	$14,577,557	3.06	1.77
Motors	ADMIN	Condenser Pump	Eff Motor	ROF	49b	Elect.	Elect.	$7,069,402	$13,112,027	$1,898,681	$4,140,341	$2,499,948	$21,650,997	$14,581,595	3.06	1.77
Motors	ADMIN	Condenser Pump	Eff Motor	ROF	53b	Elect.	Elect.	$7,078,595	$13,121,497	$1,898,681	$4,140,341	$2,506,788	$21,667,306	$14,588,711	3.06	1.77
Motors	HOSPITL	Condenser Pump	Eff Motor	ROF	60b	Elect.	Elect.	$7,081,332	$13,124,316	$1,898,681	$4,140,341	$2,508,823	$21,672,161	$14,590,829	3.06	1.77
Motors	DINING	Condenser Pump	Eff Motor	ROF	59b	Elect.	Elect.	$7,082,016	$13,125,020	$1,898,681	$4,140,341	$2,509,332	$21,673,375	$14,591,359	3.06	1.77
Motors	PLT-BLD	Chilled Water Pump	Eff Motor	ROF	40b	Elect.	Elect.	$7,088,772	$13,131,980	$1,898,681	$4,140,341	$2,514,359	$21,685,361	$14,596,589	3.06	1.77
Motors	WHS	Chilled Water Pump	Eff Motor	ROF	48b	Elect.	Elect.	$7,093,647	$13,137,001	$1,898,681	$4,140,341	$2,517,986	$21,694,009	$14,600,362	3.06	1.77
Motors	BRK/ADM	Chilled Water Pump	Eff Motor	ROF	28b	Elect.	Elect.	$7,100,155	$13,143,705	$1,898,681	$4,140,341	$2,522,828	$21,705,555	$14,605,400	3.06	1.77
Motors	MWR	Chilled Water Pump	Eff Motor	ROF	39b	Elect.	Elect.	$7,103,746	$13,147,404	$1,898,681	$4,140,341	$2,525,500	$21,711,926	$14,608,179	3.06	1.77
Motors	DINING	Chilled Water Pump	Eff Motor	ROF	34b	Elect.	Elect.	$7,106,424	$13,150,162	$1,898,681	$4,140,341	$2,527,491	$21,716,675	$14,610,252	3.06	1.77
Motors	COMCATN	Chilled Water Pump	Eff Motor	ROF	32b	Elect.	Elect.	$7,107,022	$13,150,778	$1,898,681	$4,140,341	$2,527,937	$21,717,738	$14,610,715	3.06	1.77
Motors	GROCERY	Chilled Water Pump	Eff Motor	ROF	35b	Elect.	Elect.	$7,108,391	$13,152,188	$1,898,681	$4,140,341	$2,528,955	$21,720,165	$14,611,774	3.06	1.77
Motors	HOSPITL	Chilled Water Pump	Eff Motor	ROF	37b	Elect.	Elect.	$7,111,127	$13,155,007	$1,898,681	$4,140,341	$2,530,991	$21,725,020	$14,613,892	3.06	1.77
Motors	HANGER	Chilled Water Pump	Eff Motor	ROF	36b	Elect.	Elect.	$7,112,753	$13,156,681	$1,898,681	$4,140,341	$2,532,200	$21,727,903	$14,615,150	3.05	1.77
Motors	TERMINL	Chilled Water Pump	Eff Motor	ROF	46b	Elect.	Elect.	$7,114,293	$13,158,266	$1,898,681	$4,140,341	$2,533,345	$21,730,634	$14,616,341	3.05	1.77
Motors	TRAING	Chilled Water Pump	Eff Motor	ROF	47b	Elect.	Elect.	$7,115,832	$13,159,852	$1,898,681	$4,140,341	$2,534,490	$21,733,364	$14,617,532	3.05	1.77
Motors	STOR-UH	Chilled Water Pump	Eff Motor	ROF	45b	Elect.	Elect.	$7,116,132	$13,160,160	$1,898,681	$4,140,341	$2,534,713	$21,733,895	$14,617,763	3.05	1.77
Motors	CLUB	Chilled Water Pump	Eff Motor	ROF	31b	Elect.	Elect.	$7,116,388	$13,160,424	$1,898,681	$4,140,341	$2,534,904	$21,734,350	$14,617,961	3.05	1.77
Lighting	3	4F40 STD	3F32T8 ELC REF	RI	6	Elect.	Elect.	$7,117,592	$13,161,459	$1,899,418	$4,140,669	$2,534,904	$21,736,450	$14,618,858	3.05	1.74
Lighting	2	4F40ES STD	3F40ES ELC REF	RI	8a	Elect.	Elect.	$7,534,602	$13,544,977	$2,083,533	$4,295,145	$2,534,904	$22,458,559	$14,923,956	2.98	1.73
Wtr. Heating	Capehart Hsg	Water Heater	Desuperheater	RI	1	Elect.	Elect.	$7,884,252	$14,609,238	$2,083,533	$4,295,145	$2,073,256	$23,061,172	$15,176,920	2.92	1.72
Lighting	4	4F40ES STD	3F40ES ELC REF	RI	4	Elect.	Elect.	$7,898,292	$14,621,988	$2,089,732	$4,300,329	$2,073,256	$23,085,305	$15,187,013	2.92	1.72
Envelope	TRAING	Heating/Cooling	Weath. Package	RI	4d	Elect.	Elect.	$7,902,626	$14,629,390	$2,089,732	$4,300,329	$2,073,256	$23,092,707	$15,190,081	2.92	1.71
Lighting	1	1F40ES STD	1F32T8 ELC	RI	1	Elect.	Elect.	$7,903,813	$14,630,559	$2,090,158	$4,300,755	$2,073,256	$23,094,729	$15,190,916	2.92	1.70
AC	536	Chiller	Eff Chiller&TES	RI	52	Elect.	Elect.	$7,949,313	$14,622,236	$2,144,586	$4,307,644	$2,095,803	$23,170,269	$15,220,956	2.91	1.66
AC	534	Chiller	Eff Chiller&TES	RI	49	Elect.	Elect.	$7,981,813	$14,616,290	$2,183,463	$4,312,565	$2,111,908	$23,224,227	$15,242,414	2.91	1.66
AC	431	Chiller	Eff Chiller&TES	RI	38	Elect.	Elect.	$8,046,813	$14,604,400	$2,261,217	$4,322,407	$2,144,118	$23,332,142	$15,285,329	2.90	1.66
Lighting	3	4F40ES STD	3F40ES ELC REF	RI	5	Elect.	Elect.	$8,118,183	$14,664,748	$2,292,728	$4,347,987	$2,144,118	$23,449,580	$15,331,397	2.89	1.65
Lighting	4	3F40ES STD	2F40ES ELC REF	RI	3	Elect.	Elect.	$8,149,274	$14,687,681	$2,310,135	$4,357,897	$2,144,118	$23,499,831	$15,350,557	2.88	1.62
AC	533	Chiller	Eff Chiller&TES	RI	47	Elect.	Elect.	$8,176,574	$14,680,371	$2,343,248	$4,362,031	$2,157,646	$23,543,296	$15,366,722	2.88	1.59
Envelope	FAM HSG	Heating/Cooling	Weath. Package	RI	4e	Elect.	Elect.	$8,389,730	$15,019,709	$2,343,248	$4,362,031	$2,157,646	$23,882,634	$15,492,904	2.85	1.59
AC	800	Chiller	Eff Chiller&TES	RI	87	Elect.	Elect.	$8,448,230	$15,006,708	$2,410,878	$4,370,889	$2,186,635	$23,975,109	$15,526,880	2.84	1.58
AC	967	Chiller	Eff Chiller&TES	RI	101	Elect.	Elect.	$8,461,230	$15,003,819	$2,425,907	$4,372,857	$2,193,077	$23,995,660	$15,534,430	2.84	1.58
AC	329	Chiller	Eff Chiller&TES	RI	19	Elect.	Elect.	$8,474,230	$15,000,930	$2,440,935	$4,374,825	$2,199,519	$24,016,210	$15,541,980	2.83	1.58
AC	312	Chiller	Eff Chiller&TES	RI	14	Elect.	Elect.	$8,494,380	$14,996,452	$2,464,230	$4,377,876	$2,209,504	$24,048,062	$15,553,682	2.83	1.58
AC	330	Chiller	Eff Chiller&TES	RI	21	Elect.	Elect.	$8,533,380	$14,987,785	$2,509,316	$4,383,782	$2,228,830	$24,109,712	$15,576,332	2.83	1.58
AC	425	Chiller	Eff Chiller&TES	RI	34	Elect.	Elect.	$8,549,630	$14,984,174	$2,528,102	$4,386,242	$2,236,882	$24,135,400	$15,585,770	2.82	1.58
AC	561	Chiller	Eff Chiller&TES	RI	62	Elect.	Elect.	$8,585,380	$14,976,229	$2,569,431	$4,391,655	$2,254,598	$24,191,913	$15,606,533	2.82	1.58
AC	562	Chiller	Eff Chiller&TES	RI	63	Elect.	Elect.	$8,621,130	$14,968,284	$2,610,760	$4,397,068	$2,272,313	$24,248,425	$15,627,295	2.81	1.58
AC	535	Chiller	Eff Chiller&TES	RI	50	Elect.	Elect.	$8,639,330	$14,962,935	$2,632,532	$4,399,824	$2,281,332	$24,276,622	$15,637,292	2.81	1.55
AC	535	Chiller	Eff Chiller&TES	RI	51	Elect.	Elect.	$8,671,830	$14,953,382	$2,671,409	$4,404,745	$2,297,437	$24,326,972	$15,655,142	2.81	1.55
AC	1364	Chiller	Gas Chiller/Cogen	RI	122	Elect.	NG	$8,855,430	$15,145,490	$2,789,270	$4,317,011	$2,356,791	$24,608,563	$15,753,133	2.78	1.53
AC	501	Chiller	Eff Chiller&TES	RI	40	Elect.	Elect.	$8,894,430	$15,133,416	$2,835,531	$4,322,916	$2,376,117	$24,667,981	$15,773,551	2.77	1.52
AC	502	Chiller	Eff Chiller&TES	RI	41	Elect.	Elect.	$8,933,430	$15,121,341	$2,881,792	$4,328,822	$2,395,443	$24,727,398	$15,793,968	2.77	1.52
AC	503	Chiller	Eff Chiller&TES	RI	42	Elect.	Elect.	$8,972,430	$15,109,267	$2,928,053	$4,334,727	$2,414,769	$24,786,815	$15,814,385	2.76	1.52
AC	313	Chiller	Eff Chiller&TES	RI	15	Elect.	Elect.	$9,105,030	$15,071,112	$3,072,472	$4,354,804	$2,480,477	$24,978,866	$15,873,836	2.74	1.45
AC	800	Chiller	Eff Chiller&TES	RI	88	Elect.	Elect.	$9,222,030	$15,037,447	$3,199,901	$4,372,520	$2,538,455	$25,148,322	$15,926,292	2.73	1.45
AC	722	Chiller	Eff Chiller&TES	RI	78	Elect.	Elect.	$9,267,530	$15,024,355	$3,249,456	$4,379,409	$2,561,002	$25,214,222	$15,946,692	2.72	1.45

Table 3.10
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Cumulative Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Cumulative Present Value of Installed Cost (1993 $)	Cumulative Present Value of Energy Savings (1993 $)	Cumulative Present Value of Demand Savings (1993 $)	Cumulative Present Value of O&M Savings (1993 $)	Cumulative Present Value of Replacement Cost Savings (1993 $)	Cumulative Present Value of Total Savings (1993 $)	Cumulative Net Present Value (1993 $)	Cumulative Savings to Investment Ratio	Individual ERO Savings to Investment Ratio
AC	732	Chiller	Eff. Chiller&TES	RI	80	Elect.	Elect.	$9,299,380	$15,015,190	$3,284,145	$4,384,231	$2,576,785	$25,260,352	$15,960,972	2.72	1.45
AC	629	Chiller	Eff. Chiller&TES	RI	69	Elect.	Elect.	$9,322,130	$15,008,644	$3,308,923	$4,387,676	$2,588,058	$25,293,302	$15,971,172	2.71	1.45
AC	710	Chiller	Eff. Chiller&TES	RI	77	Elect.	Elect.	$9,344,880	$15,002,098	$3,333,701	$4,391,121	$2,599,332	$25,326,252	$15,981,372	2.71	1.45
AC	408	Chiller	Eff. Chiller&TES	RI	30	Elect.	Elect.	$9,370,880	$14,994,617	$3,362,018	$4,395,058	$2,612,215	$25,363,908	$15,993,029	2.71	1.45
AC	430	Chiller	Eff. Chiller&TES	RI	37	Elect.	Elect.	$9,396,880	$14,987,136	$3,390,336	$4,398,994	$2,625,099	$25,401,565	$16,004,685	2.70	1.45
AC	575	Chiller	Eff. Chiller&TES	RI	64	Elect.	Elect.	$9,445,630	$14,973,109	$3,443,431	$4,406,376	$2,649,257	$25,472,172	$16,026,542	2.70	1.45
AC	967	Chiller	Eff. Chiller&TES	RI	102	Elect.	Elect.	$9,502,830	$14,956,650	$3,505,729	$4,415,037	$2,677,601	$25,555,018	$16,052,188	2.69	1.45
AC	750	Chiller	Eff. Chiller&TES	RI	85	Elect.	Elect.	$9,584,080	$14,933,271	$3,594,222	$4,427,339	$2,717,864	$25,672,696	$16,088,616	2.68	1.45
AC	946	Chiller	Eff. Chiller&TES	RI	97	Elect.	Elect.	$9,649,080	$14,914,568	$3,665,015	$4,437,181	$2,750,074	$25,766,838	$16,117,758	2.67	1.45
AC	330	Chiller	Eff. Chiller&TES	RI	20	Elect.	Elect.	$9,681,580	$14,905,217	$3,700,412	$4,442,102	$2,766,178	$25,813,909	$16,132,329	2.67	1.45
AC	560	Chiller	Eff. Chiller&TES	RI	61	Elect.	Elect.	$9,714,080	$14,895,865	$3,735,809	$4,447,023	$2,782,283	$25,860,981	$16,146,901	2.66	1.45
AC	751	Chiller	Eff. Chiller&TES	RI	86	Elect.	Elect.	$9,756,330	$14,883,708	$3,781,825	$4,453,420	$2,803,220	$25,922,173	$16,165,843	2.66	1.45
AC	425	Chiller	Eff. Chiller&TES	RI	35	Elect.	Elect.	$9,792,080	$14,873,422	$3,820,761	$4,458,833	$2,820,935	$25,973,951	$16,181,871	2.65	1.45
AC	250	Chiller	Eff. Chiller&TES	RI	9	Elect.	Elect.	$9,886,330	$14,846,302	$3,923,412	$4,473,104	$2,867,639	$26,110,458	$16,224,128	2.64	1.45
AC	318	Chiller	Eff. Chiller&TES	RI	17	Elect.	Elect.	$9,918,830	$14,836,951	$3,958,809	$4,478,025	$2,883,744	$26,157,529	$16,238,699	2.64	1.45
AC	984	Chiller	Eff. Chiller&TES	RI	104	Elect.	Elect.	$9,957,830	$14,825,729	$4,001,285	$4,483,930	$2,903,070	$26,214,015	$16,256,185	2.63	1.45
AC	559	Chiller	Eff. Chiller&TES	RI	60	Elect.	Elect.	$9,996,830	$14,814,507	$4,043,761	$4,489,835	$2,922,396	$26,270,500	$16,273,670	2.63	1.45
AC	673	Chiller	Eff. Chiller&TES	RI	73	Elect.	Elect.	$10,016,330	$14,808,896	$4,065,000	$4,492,788	$2,932,059	$26,298,743	$16,282,413	2.63	1.45
AC	530	Chiller	Eff. Chiller&TES	RI	46	Elect.	Elect.	$10,055,330	$14,797,675	$4,107,476	$4,498,693	$2,951,385	$26,355,228	$16,299,898	2.62	1.45
AC	945	Chiller	Eff. Chiller&TES	RI	96	Elect.	Elect.	$10,094,330	$14,786,453	$4,149,952	$4,504,598	$2,970,711	$26,411,714	$16,317,384	2.62	1.45
AC	991	Chiller	Eff. Chiller&TES	RI	111	Elect.	Elect.	$10,109,930	$14,780,889	$4,167,986	$4,506,960	$2,978,441	$26,434,277	$16,324,347	2.61	1.45
AC	1493	Chiller	Eff. Chiller&TES	RI	130	Elect.	Elect.	$10,128,130	$14,774,397	$4,189,027	$4,509,716	$2,987,460	$26,460,600	$16,332,470	2.61	1.45
AC	810	Chiller	Eff. Chiller&TES	RI	89	Elect.	Elect.	$10,141,130	$14,769,761	$4,204,056	$4,511,684	$2,993,902	$26,479,403	$16,338,273	2.61	1.45
AC	402	Chiller	Eff. Chiller&TES	RI	28	Elect.	Elect.	$10,154,130	$14,765,124	$4,219,084	$4,513,653	$3,000,344	$26,498,205	$16,344,075	2.61	1.45
AC	989	Chiller	Eff. Chiller&TES	RI	106	Elect.	Elect.	$10,225,630	$14,739,623	$4,301,743	$4,524,479	$3,035,775	$26,601,619	$16,375,989	2.60	1.45
AC	424	Chiller	Eff. Chiller&TES	RI	33	Elect.	Elect.	$10,238,630	$14,734,986	$4,316,771	$4,526,447	$3,042,217	$26,620,421	$16,381,791	2.60	1.45
AC	957	Chiller	Eff. Chiller&TES	RI	98	Elect.	Elect.	$10,251,630	$14,730,349	$4,331,800	$4,528,415	$3,048,659	$26,639,223	$16,387,593	2.60	1.45
AC	990	Chiller	Eff. Chiller&TES	RI	109	Elect.	Elect.	$10,271,130	$14,723,394	$4,354,343	$4,531,368	$3,058,322	$26,667,427	$16,396,297	2.60	1.45
AC	1369	Chiller	Eff. Chiller&TES	RI	124	Elect.	Elect.	$10,290,630	$14,716,439	$4,376,886	$4,534,321	$3,067,985	$26,695,631	$16,405,001	2.59	1.45
AC	965	Chiller	Eff. Chiller&TES	RI	100	Elect.	Elect.	$10,323,130	$14,704,848	$4,414,458	$4,539,242	$3,084,090	$26,742,637	$16,419,507	2.59	1.45
AC	3656	Chiller	Eff. Chiller&TES	RI	133	Elect.	Elect.	$10,339,380	$14,699,052	$4,433,244	$4,541,702	$3,092,142	$26,766,140	$16,426,760	2.59	1.45
Lighting	1	2F40ES STD	2F32T8 ELC	RI	2a	Elect.	Elect.	$10,411,720	$14,748,125	$4,450,586	$4,578,847	$3,092,142	$26,869,700	$16,457,980	2.58	1.43
Lighting	2	2F96 STD	2F96ES ELC REF	RI	5	Elect.	Elect.	$10,421,690	$14,756,300	$4,454,845	$4,580,597	$3,092,142	$26,883,884	$16,462,194	2.58	1.42
Lighting	3	2F96 STD	2F96ES ELC REF	RI	3	Elect.	Elect.	$10,735,436	$15,012,988	$4,588,875	$4,635,342	$3,092,142	$27,329,347	$16,593,911	2.55	1.42
Lighting	2	1F40ES STD	1F32T8 ELC	RI	1	Elect.	Elect.	$10,786,344	$15,045,117	$4,607,164	$4,655,312	$3,092,142	$27,399,735	$16,613,390	2.54	1.38
AC	440	Chiller	Eff. Chiller&TES	RI	39	Elect.	Elect.	$10,818,844	$15,034,701	$4,641,473	$4,660,233	$3,108,247	$27,444,654	$16,625,810	2.54	1.38
AC	537	Chiller	Eff. Chiller&TES	RI	53	Elect.	Elect.	$10,864,344	$15,015,855	$4,692,399	$4,667,123	$3,130,794	$27,506,171	$16,641,826	2.53	1.35
AC	523	Chiller	Eff. Chiller&TES	RI	45	Elect.	Elect.	$10,883,844	$15,009,638	$4,712,086	$4,670,075	$3,140,457	$27,532,254	$16,648,409	2.53	1.34
Lighting	4	2F40ES STD	2F32T8 ELC	RI	1	Elect.	Elect.	$10,899,096	$15,018,408	$4,715,742	$4,677,724	$3,140,457	$27,552,331	$16,653,235	2.53	1.32
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	81b	Elect.	Elect.	$10,900,378	$15,019,110	$4,715,742	$4,677,724	$3,141,411	$27,553,987	$16,653,608	2.53	1.29
AC	969	Chiller	Eff. Chiller&TES	RI	103	Elect.	Elect.	$10,921,178	$15,009,516	$4,738,396	$4,680,874	$3,151,718	$27,580,503	$16,659,325	2.53	1.27
AC	990	Chiller	Eff. Chiller&TES	RI	110	Elect.	Elect.	$10,953,678	$14,994,525	$4,773,793	$4,685,795	$3,167,823	$27,621,935	$16,668,257	2.52	1.27
AC	576	Chiller	Eff. Chiller&TES	RI	65	Elect.	Elect.	$10,986,178	$14,979,535	$4,809,189	$4,690,716	$3,183,928	$27,663,368	$16,677,189	2.52	1.27
AC	533	Chiller	Eff. Chiller&TES	RI	48	Elect.	Elect.	$11,099,928	$14,927,067	$4,933,078	$4,707,939	$3,240,295	$27,808,380	$16,708,452	2.51	1.27
AC	3655	Chiller	Eff. Chiller&TES	RI	132	Elect.	Elect.	$11,132,428	$14,912,077	$4,968,475	$4,712,860	$3,256,400	$27,849,812	$16,717,384	2.50	1.27
AC	989	Chiller	Eff. Chiller&TES	RI	107	Elect.	Elect.	$11,476,928	$14,753,176	$5,343,682	$4,765,022	$3,427,112	$28,288,992	$16,812,064	2.46	1.27
AC	265	Chiller	Eff. Chiller&TES	RI	12	Elect.	Elect.	$11,525,678	$14,730,690	$5,396,777	$4,772,403	$3,451,270	$28,351,140	$16,825,462	2.46	1.27
AC	734	Chiller	Eff. Chiller&TES	RI	81	Elect.	Elect.	$11,545,828	$14,721,396	$5,418,723	$4,775,454	$3,461,255	$28,376,828	$16,831,000	2.46	1.27
AC	1316	Chiller	Eff. Chiller&TES	RI	118	Elect.	Elect.	$11,571,828	$14,709,404	$5,447,040	$4,779,391	$3,474,139	$28,409,974	$16,838,146	2.46	1.27
AC	558	Chiller	Eff. Chiller&TES	RI	59	Elect.	Elect.	$11,623,828	$14,685,419	$5,503,675	$4,787,265	$3,499,907	$28,476,265	$16,852,437	2.45	1.27
AC	400	Chiller	Eff. Chiller&TES	RI	26	Elect.	Elect.	$11,675,828	$14,661,434	$5,560,310	$4,795,138	$3,525,674	$28,542,557	$16,866,728	2.44	1.27
AC	1353	Chiller	Eff. Chiller&TES	RI	119	Elect.	Elect.	$11,701,828	$14,649,441	$5,588,628	$4,799,075	$3,538,558	$28,575,702	$16,873,874	2.44	1.27
AC	1365	Chiller	Eff. Chiller&TES	RI	123	Elect.	Elect.	$11,805,828	$14,601,471	$5,701,898	$4,814,822	$3,590,094	$28,708,285	$16,902,457	2.43	1.27
AC	996	Chiller	Eff. Chiller&TES	RI	115	Elect.	Elect.	$11,831,828	$14,589,479	$5,730,215	$4,818,759	$3,602,978	$28,741,431	$16,909,602	2.43	1.27
AC	727	Chiller	Eff. Chiller&TES	RI	79	Elect.	Elect.	$11,870,828	$14,571,490	$5,772,691	$4,824,664	$3,622,304	$28,791,149	$16,920,321	2.43	1.27
AC	1492	Chiller	Eff. Chiller&TES	RI	129	Elect.	Elect.	$11,890,328	$14,562,495	$5,793,929	$4,827,617	$3,631,967	$28,816,008	$16,925,680	2.42	1.27
AC	992	Chiller	Eff. Chiller&TES	RI	113	Elect.	Elect.	$11,909,828	$14,553,501	$5,815,168	$4,830,569	$3,641,630	$28,840,868	$16,931,039	2.42	1.27
AC	423	Chiller	Eff. Chiller&TES	RI	32	Elect.	Elect.	$12,306,328	$14,501,308	$6,165,267	$4,890,605	$3,776,825	$29,334,005	$17,027,676	2.38	1.24
Wtr. Heating	Temp.Lod.Fac.	WH-1	Solar Water Heater	RI	4	Elect.	Elect.	$12,341,228	$14,558,677	$6,165,267	$4,890,605	$3,762,688	$29,377,237	$17,036,009	2.38	1.24
Wtr. Heating	Wherry Hsg	WH-1	Solar Water Heater	RI	3	Elect.	Elect.	$12,727,920	$15,194,331	$6,165,267	$4,890,605	$3,606,052	$29,856,254	$17,128,334	2.35	1.24
Wtr. Heating	APPR PFY50	WH-1	Solar Water Heater	RI	1	Elect.	Elect.	$12,730,014	$15,197,773	$6,165,267	$4,890,605	$3,605,204	$29,858,848	$17,128,834	2.35	1.24
AC	3659	Chiller	Eff. Chiller&TES	RI	135	Elect.	Elect.	$12,795,014	$15,176,941	$6,233,885	$4,900,447	$3,627,367	$29,938,640	$17,143,626	2.34	1.23
Wtr. Heating	504	Water Heater	Solar Water Heater	RI	1d	Elect.	Elect.	$12,815,139	$15,209,467	$6,233,885	$4,900,447	$3,619,215	$29,963,015	$17,147,875	2.34	1.21
Wtr. Heating	502	Water Heater	Solar Water Heater	RI	1b	Elect.	Elect.	$12,835,264	$15,241,960	$6,233,885	$4,900,447	$3,611,063	$29,987,356	$17,152,091	2.34	1.21
Wtr. Heating	503	Water Heater	Solar Water Heater	RI	1c	Elect.	Elect.	$12,855,389	$15,274,453	$6,233,885	$4,900,447	$3,602,911	$30,011,696	$17,156,307	2.33	1.21
Wtr. Heating	501	Water Heater	Solar Water Heater	RI	1a	Elect.	Elect.	$12,875,514	$15,306,946	$6,233,885	$4,900,447	$3,594,759	$30,036,037	$17,160,523	2.33	1.21
Lighting	2	1F40 STD	1F32T8 ELC REF	RI	2	Elect.	Elect.	$12,960,786	$15,383,226	$6,251,174	$4,909,640	$3,594,759	$30,138,799	$17,178,014	2.33	1.21
Wtr. Heating	505	Water Heater	Solar Water Heater	RI	1e	Elect.	Elect.	$12,979,263	$15,412,574	$6,251,174	$4,909,640	$3,587,275	$30,160,663	$17,181,401	2.32	1.18
Wtr. Heating	506	Water Heater	Solar Water Heater	RI	1f	Elect.	Elect.	$12,997,740	$15,441,923	$6,251,174	$4,909,640	$3,579,790	$30,182,527	$17,184,788	2.32	1.18
AC	404	Chiller	Eff. Chiller&TES	RI	29	Elect.	Elect.	$13,036,740	$15,421,690	$6,292,215	$4,915,545	$3,599,116	$30,228,567	$17,191,827	2.32	1.18
Controls	WHS	E-9	EMCS(exist. chill.)	RI	9	Elect.	Elect.	$13,043,340	$15,430,449	$6,292,215	$4,915,545	$3,598,130	$30,236,338	$17,192,999	2.32	1.18
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	86b	Elect.	Elect.	$13,046,760	$15,431,875	$6,292,215	$4,915,545	$3,600,674	$30,240,309	$17,193,549	2.32	1.16
AC	546	Chiller	Eff. Chiller&TES	RI	55	Elect.	Elect.	$13,111,760	$15,411,885	$6,355,494	$4,925,387	$3,622,838	$30,315,603	$17,203,843	2.31	1.16

Table 3.10

EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Cumulative Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Cumulative Present Value of Installed Cost (1993 $)	Cumulative Present Value of Energy Savings (1993 $)	Cumulative Present Value of Demand Savings (1993 $)	Cumulative Present Value of O&M Savings (1993 $)	Cumulative Present Value of Replacement Cost Savings (1993 $)	Cumulative Present Value of Total Savings (1993 $)	Cumulative Net Present Value (1993 $)	Cumulative Savings to Investment Ratio	Individual ERO Savings to Investment Ratio
AC	330	Chiller	Eff. Chiller&TES	RI	22	Elect.	Elect.	$13,306,760	$15,377,914	$6,519,191	$4,954,913	$3,689,327	$30,541,344	$17,234,584	2.30	1.16
AC	425	Chiller	Eff. Chiller&TES	RI	36	Elect.	Elect.	$13,618,760	$15,323,559	$6,781,106	$5,002,154	$3,795,710	$30,902,530	$17,283,770	2.27	1.16
AC	415	Chiller	Eff. Chiller&TES	RI	31	Elect.	Elect.	$13,690,260	$15,311,103	$6,841,128	$5,012,980	$3,820,090	$30,985,302	$17,295,041	2.26	1.16
AC	556	Chiller	Eff. Chiller&TES	RI	57	Elect.	Elect.	$13,709,760	$15,301,139	$6,860,815	$5,015,933	$3,829,753	$31,007,640	$17,297,880	2.26	1.15
AC	557	Chiller	Eff. Chiller&TES	RI	58	Elect.	Elect.	$13,716,260	$15,297,976	$6,867,065	$5,016,917	$3,832,974	$31,014,932	$17,298,671	2.26	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	91b	Elect.	Elect.	$13,725,240	$15,301,345	$6,867,065	$5,016,917	$3,839,654	$31,024,981	$17,299,742	2.26	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	89b	Elect.	Elect.	$13,731,226	$15,303,592	$6,867,065	$5,016,917	$3,844,108	$31,031,681	$17,300,455	2.26	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	88b	Elect.	Elect.	$13,735,844	$15,305,324	$6,867,065	$5,016,917	$3,847,543	$31,036,849	$17,301,006	2.26	1.12
Motors	Lift Station	Lift Station Pump	Eff. Motor	ROF	90b	Elect.	Elect.	$13,738,409	$15,306,287	$6,867,065	$5,016,917	$3,849,452	$31,039,721	$17,301,311	2.26	1.12
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	85b	Elect.	Elect.	$13,739,265	$15,306,599	$6,867,065	$5,016,917	$3,850,088	$31,040,669	$17,301,404	2.26	1.11
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	51	Elect.	Elect.	$13,744,492	$15,307,587	$6,867,312	$5,016,917	$3,854,594	$31,046,410	$17,301,918	2.26	1.10
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	65	Elect.	Elect.	$13,747,106	$15,308,081	$6,867,436	$5,016,917	$3,856,846	$31,049,280	$17,302,175	2.26	1.10
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	116	Elect.	Elect.	$13,749,719	$15,308,576	$6,867,560	$5,016,917	$3,859,099	$31,052,151	$17,302,432	2.26	1.10
AC	1380	Chiller	Eff. Chiller&TES	RI	125	Elect.	Elect.	$13,957,719	$15,255,877	$7,045,650	$5,048,411	$3,930,021	$31,279,959	$17,322,240	2.24	1.10
AC	989	Chiller	Eff. Chiller&TES	RI	108	Elect.	Elect.	$14,656,469	$15,078,842	$7,643,922	$5,154,211	$4,168,275	$32,045,251	$17,388,782	2.19	1.10
Lighting	2	2F40 STD	2F40ES ELC REF	RI	4	Elect.	Elect.	$14,664,933	$15,083,395	$7,646,514	$5,156,238	$4,168,275	$32,054,422	$17,389,489	2.19	1.08
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	16	Elect.	Elect.	$14,678,089	$15,086,333	$7,647,249	$5,156,238	$4,178,774	$32,068,595	$17,390,506	2.18	1.08
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	95	Elect.	Elect.	$14,690,738	$15,089,083	$7,647,938	$5,156,238	$4,188,943	$32,082,202	$17,391,463	2.18	1.08
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	117	Elect.	Elect.	$14,692,972	$15,089,401	$7,648,017	$5,156,238	$4,190,948	$32,084,604	$17,391,632	2.18	1.08
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	48	Elect.	Elect.	$14,695,126	$15,089,869	$7,648,134	$5,156,238	$4,192,667	$32,086,908	$17,391,781	2.18	1.07
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	118	Elect.	Elect.	$14,697,275	$15,090,147	$7,648,204	$5,156,238	$4,194,615	$32,089,203	$17,391,929	2.18	1.07
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	92	Elect.	Elect.	$14,700,995	$15,[illegible]0,933	$7,648,401	$5,156,238	$4,197,591	$32,093,163	$17,392,169	2.18	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	12	Elect.	Elect.	$14,708,435	$15,092,506	$7,648,794	$5,156,238	$4,203,545	$32,101,083	$17,392,648	2.18	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	93	Elect.	Elect.	$14,719,166	$15,094,713	$7,649,347	$5,156,238	$4,212,193	$32,112,491	$17,393,326	2.18	1.06
AC	998	Chiller	Eff. Chiller&TES	RI	117	Elect.	Elect.	$14,803,666	$15,074,918	$7,717,351	$5,169,033	$4,241,006	$32,202,307	$17,398,642	2.18	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	49	Elect.	Elect.	$14,805,619	$15,075,224	$7,717,428	$5,169,033	$4,242,694	$32,204,379	$17,398,760	2.18	1.06
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	96	Elect.	Elect.	$14,821,024	$15,077,660	$7,718,037	$5,169,033	$4,255,949	$32,220,680	$17,399,656	2.17	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	17	Elect.	Elect.	$14,861,076	$15,083,995	$7,719,623	$5,169,033	$4,290,412	$32,263,062	$17,401,986	2.17	1.06
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	80b	Elect.	Elect.	$14,862,786	$15,084,530	$7,719,623	$5,169,033	$4,291,684	$32,264,869	$17,402,083	2.17	1.06
Motors	North Plant	Sewage Pump	Eff. Motor	ROF	87b	Elect.	Elect.	$14,869,628	$15,086,669	$7,719,623	$5,169,033	$4,296,774	$32,272,098	$17,402,471	2.17	1.06
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	43	Elect.	Elect.	$14,878,515	$15,087,994	$7,719,954	$5,169,033	$4,304,496	$32,281,477	$17,402,962	2.17	1.06
AC	929	Chiller	Eff. Chiller&TES	RI	94	Elect.	Elect.	$15,034,515	$15,044,391	$7,850,912	$5,192,653	$4,357,687	$32,445,644	$17,411,129	2.16	1.05
AC	925	Chiller	Eff. Chiller&TES	RI	92	Elect.	Elect.	$15,392,015	$14,944,468	$8,151,024	$5,246,784	$4,479,585	$32,821,860	$17,429,845	2.13	1.05
AC	505	Chiller	Eff. Chiller&TES	RI	43	Elect.	Elect.	$15,570,765	$14,894,506	$8,301,079	$5,273,849	$4,540,534	$33,009,968	$17,439,203	2.12	1.05
AC	986	Chiller	Eff. Chiller&TES	RI	105	Elect.	Elect.	$15,700,765	$14,858,171	$8,410,211	$5,293,533	$4,584,860	$33,146,774	$17,446,009	2.11	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	71	Elect.	Elect.	$15,713,765	$14,861,068	$8,410,936	$5,293,533	$4,594,876	$33,160,412	$17,446,647	2.11	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	61	Elect.	Elect.	$15,726,765	$14,863,965	$8,411,661	$5,293,533	$4,604,892	$33,174,050	$17,447,285	2.11	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	13	Elect.	Elect.	$15,760,743	$14,869,050	$8,412,934	$5,293,533	$4,634,177	$33,209,693	$17,448,950	2.11	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	64	Elect.	Elect.	$15,770,570	$14,870,681	$8,413,342	$5,293,533	$4,642,444	$33,219,999	$17,449,429	2.11	1.05
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	97	Elect.	Elect.	$15,778,787	$14,871,745	$8,413,608	$5,293,533	$4,649,729	$33,228,615	$17,449,829	2.11	1.05
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	14	Elect.	Elect.	$15,793,285	$14,873,659	$8,414,087	$5,293,533	$4,662,472	$33,243,751	$17,450,465	2.10	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	72	Elect.	Elect.	$15,802,419	$14,875,100	$8,414,448	$5,293,533	$4,670,157	$33,253,237	$17,450,818	2.10	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	62	Elect.	Elect.	$15,829,821	$14,879,423	$8,415,530	$5,293,533	$4,693,211	$33,281,698	$17,451,877	2.10	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	32	Elect.	Elect.	$15,832,532	$14,879,945	$8,415,661	$5,293,533	$4,695,366	$33,284,504	$17,451,972	2.10	1.04
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	73	Elect.	Elect.	$15,840,977	$14,881,120	$8,415,955	$5,293,533	$4,702,635	$33,293,243	$17,452,266	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	33	Elect.	Elect.	$15,843,483	$14,881,578	$8,416,069	$5,293,533	$4,704,654	$33,295,834	$17,452,351	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	47	Elect.	Elect.	$15,851,003	$14,882,952	$8,416,413	$5,293,533	$4,710,710	$33,303,608	$17,452,605	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	7	Elect.	Elect.	$15,866,042	$14,885,700	$8,417,101	$5,293,533	$4,722,822	$33,319,156	$17,453,115	2.10	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	87	Elect.	Elect.	$15,873,272	$14,886,986	$8,417,423	$5,293,533	$4,728,687	$33,326,628	$17,453,356	2.10	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	113	Elect.	Elect.	$15,880,502	$14,888,271	$8,417,745	$5,293,533	$4,734,551	$33,334,100	$17,453,597	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	69	Elect.	Elect.	$15,888,471	$14,889,479	$8,418,047	$5,293,533	$4,741,257	$33,342,316	$17,453,844	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	58	Elect.	Elect.	$15,896,440	$14,890,687	$8,418,349	$5,293,533	$4,747,962	$33,350,532	$17,454,091	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	76	Elect.	Elect.	$15,912,794	$14,891,841	$8,418,638	$5,293,533	$4,763,372	$33,367,384	$17,454,590	2.10	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	82	Elect.	Elect.	$15,914,078	$14,892,070	$8,418,696	$5,293,533	$4,764,407	$33,368,706	$17,454,628	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	2	Elect.	Elect.	$15,915,266	$14,892,272	$8,418,746	$5,293,533	$4,765,376	$33,369,927	$17,454,661	2.10	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	127	Elect.	Elect.	$15,922,634	$14,893,257	$8,418,993	$5,293,533	$4,771,719	$33,377,502	$17,454,868	2.10	1.03
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	59	Elect.	Elect.	$15,930,001	$14,894,242	$8,419,239	$5,293,533	$4,778,063	$33,385,076	$17,455,075	2.10	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	138	Elect.	Elect.	$15,937,085	$14,895,121	$8,419,459	$5,293,533	$4,784,235	$33,392,348	$17,455,263	2.10	1.03
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	115	Elect.	Elect.	$15,938,458	$14,895,202	$8,419,479	$5,293,533	$4,785,540	$33,393,753	$17,455,296	2.10	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	18	Elect.	Elect.	$15,951,446	$14,895,970	$8,419,672	$5,293,533	$4,797,868	$33,407,043	$17,455,597	2.09	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	77	Elect.	Elect.	$15,964,738	$14,897,360	$8,420,020	$5,293,533	$4,809,708	$33,420,620	$17,455,883	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	119	Elect.	Elect.	$15,966,435	$14,897,422	$8,420,035	$5,293,533	$4,811,362	$33,422,352	$17,455,917	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	130	Elect.	Elect.	$15,983,324	$14,899,893	$8,420,654	$5,293,533	$4,825,499	$33,439,578	$17,456,254	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	107	Elect.	Elect.	$15,985,160	$14,899,996	$8,420,679	$5,293,533	$4,827,243	$33,441,451	$17,456,291	2.09	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	35	Elect.	Elect.	$15,994,739	$14,901,738	$8,421,116	$5,293,533	$4,834,833	$33,451,219	$17,456,480	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	89	Elect.	Elect.	$16,003,596	$14,903,269	$8,421,499	$5,293,533	$4,841,946	$33,460,247	$17,456,651	2.09	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	9	Elect.	Elect.	$16,021,308	$14,906,332	$8,422,265	$5,293,533	$4,856,173	$33,478,303	$17,456,994	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	90	Elect.	Elect.	$16,029,496	$14,907,670	$8,422,600	$5,293,533	$4,862,845	$33,486,648	$17,457,152	2.09	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	79	Elect.	Elect.	$16,041,728	$14,908,428	$8,422,790	$5,293,533	$4,874,361	$33,499,112	$17,457,384	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	131	Elect.	Elect.	$16,056,742	$14,910,226	$8,423,240	$5,293,533	$4,887,389	$33,514,388	$17,457,646	2.09	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	10	Elect.	Elect.	$16,062,964	$14,910,988	$8,423,431	$5,293,533	$4,892,765	$33,520,716	$17,457,752	2.09	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	38	Elect.	Elect.	$16,077,483	$14,912,765	$8,423,876	$5,293,533	$4,905,309	$33,535,483	$17,458,000	2.09	1.02
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	74	Elect.	Elect.	$16,083,900	$14,913,144	$8,423,971	$5,293,533	$4,911,356	$33,542,004	$17,458,104	2.09	1.02

Table 3.10
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Cumulative Present Values of Costs and Savings

ERO Category	Facility Type	Equipment	Description of ERO	RI or ROF	ID	Existing Fuel	Resulting Fuel	Cumulative Present Value of Installed Cost (1993 $)	Cumulative Present Value of Energy Savings (1993 $)	Cumulative Present Value of Demand Savings (1993 $)	Cumulative Present Value of O&M Savings (1993 $)	Cumulative Present Value of Replacement Cost Savings (1993 $)	Cumulative Present Value of Total Savings (1993 $)	Cumulative Net Present Value (1993 $)	Cumulative Savings to Investment Ratio	Individual ERO Savings to Investment Ratio
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	139	Elect.	Elect.	$16,089,723	$14,913,548	$8,424,071	$5,293,533	$4,916,768	$33,547,919	$17,458,196	2.09	1.02
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	91	Elect.	Elect.	$16,095,255	$14,914,102	$8,424,210	$5,293,533	$4,921,688	$33,553,533	$17,458,279	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	128	Elect.	Elect.	$16,106,452	$14,914,737	$8,424,369	$5,293,533	$4,932,240	$33,564,880	$17,458,427	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	29	Elect.	Elect.	$16,112,914	$14,915,848	$8,424,647	$5,293,533	$4,937,398	$33,571,426	$17,458,512	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	30	Elect.	Elect.	$16,115,068	$14,916,219	$8,424,740	$5,293,533	$4,939,117	$33,573,608	$17,458,540	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	103	Elect.	Elect.	$16,119,376	$14,916,960	$8,424,926	$5,293,533	$4,942,555	$33,577,973	$17,458,596	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	112	Elect.	Elect.	$16,121,530	$14,917,330	$8,425,018	$5,293,533	$4,944,274	$33,580,155	$17,458,625	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	5	Elect.	Elect.	$16,127,505	$14,918,307	$8,425,263	$5,293,533	$4,949,105	$33,586,207	$17,458,702	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	23	Elect.	Elect.	$16,128,340	$14,918,400	$8,425,286	$5,293,533	$4,949,833	$33,587,052	$17,458,713	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	100	Elect.	Elect.	$16,130,843	$14,918,680	$8,425,356	$5,293,533	$4,952,018	$33,589,588	$17,458,745	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	50	Elect.	Elect.	$16,132,112	$14,918,719	$8,425,366	$5,293,533	$4,953,255	$33,590,873	$17,458,761	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	134	Elect.	Elect.	$16,134,650	$14,918,797	$8,425,385	$5,293,533	$4,955,728	$33,593,443	$17,458,793	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	6	Elect.	Elect.	$16,138,847	$14,919,283	$8,425,507	$5,293,533	$4,959,370	$33,597,692	$17,458,845	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	110	Elect.	Elect.	$16,152,856	$14,919,715	$8,425,615	$5,293,533	$4,973,010	$33,611,873	$17,459,017	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	44	Elect.	Elect.	$16,158,860	$14,919,901	$8,425,662	$5,293,533	$4,978,856	$33,617,951	$17,459,091	2.08	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	20	Elect.	Elect.	$16,162,863	$14,920,025	$8,425,693	$5,293,533	$4,982,753	$33,622,003	$17,459,140	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	94	Elect.	Elect.	$16,169,654	$14,920,223	$8,425,742	$5,293,533	$4,989,367	$33,628,865	$17,459,211	2.08	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	108	Elect.	Elect.	$16,251,148	$14,922,605	$8,426,339	$5,293,533	$5,068,735	$33,711,211	$17,460,063	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	39	Elect.	Elect.	$16,261,334	$14,922,903	$8,426,413	$5,293,533	$5,078,656	$33,721,505	$17,460,170	2.07	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	120	Elect.	Elect.	$16,264,599	$14,922,965	$8,426,429	$5,293,533	$5,081,877	$33,724,803	$17,460,204	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	52	Elect.	Elect.	$16,267,864	$14,923,026	$8,426,444	$5,293,533	$5,085,099	$33,728,102	$17,460,238	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	31	Elect.	Elect.	$16,268,970	$14,923,105	$8,426,464	$5,293,533	$5,086,117	$33,729,218	$17,460,248	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	75	Elect.	Elect.	$16,274,903	$14,923,288	$8,426,509	$5,293,533	$5,091,872	$33,735,202	$17,460,299	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	66	Elect.	Elect.	$16,280,837	$14,923,471	$8,426,555	$5,293,533	$5,097,627	$33,741,186	$17,460,349	2.07	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	85	Elect.	Elect.	$16,281,885	$14,923,586	$8,426,584	$5,293,533	$5,098,540	$33,742,243	$17,460,358	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	36	Elect.	Elect.	$16,286,257	$14,923,786	$8,426,634	$5,293,533	$5,102,696	$33,746,649	$17,460,392	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	40	Elect.	Elect.	$16,290,733	$14,924,481	$8,426,808	$5,293,533	$5,106,334	$33,751,156	$17,460,423	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	3	Elect.	Elect.	$16,293,718	$14,924,945	$8,426,924	$5,293,533	$5,108,759	$33,754,161	$17,460,444	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	25	Elect.	Elect.	$16,294,579	$14,925,010	$8,426,940	$5,293,533	$5,109,546	$33,755,029	$17,460,450	2.07	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	84	Elect.	Elect.	$16,296,193	$14,925,273	$8,427,006	$5,293,533	$5,110,841	$33,756,654	$17,460,461	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	27	Elect.	Elect.	$16,297,807	$14,925,537	$8,427,072	$5,293,533	$5,112,136	$33,758,279	$17,460,471	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	19	Elect.	Elect.	$16,315,126	$14,925,811	$8,427,141	$5,293,533	$5,129,222	$33,775,707	$17,460,581	2.07	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	88	Elect.	Elect.	$16,321,990	$14,925,985	$8,427,184	$5,293,533	$5,135,912	$33,782,614	$17,460,624	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	8	Elect.	Elect.	$16,325,422	$14,926,071	$8,427,206	$5,293,533	$5,139,256	$33,786,067	$17,460,645	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	34	Elect.	Elect.	$16,339,149	$14,926,418	$8,427,293	$5,293,533	$5,152,635	$33,799,879	$17,460,730	2.07	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	105	Elect.	Elect.	$16,365,460	$14,927,083	$8,427,459	$5,293,533	$5,178,277	$33,826,353	$17,460,893	2.07	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	109	Elect.	Elect.	$16,367,092	$14,927,107	$8,427,465	$5,293,533	$5,179,888	$33,827,994	$17,460,902	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	15	Elect.	Elect.	$16,376,887	$14,927,254	$8,427,502	$5,293,533	$5,189,553	$33,837,842	$17,460,955	2.07	1.01
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	83	Elect.	Elect.	$16,377,971	$14,927,280	$8,427,509	$5,293,533	$5,190,611	$33,838,932	$17,460,961	2.07	1.01
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	63	Elect.	Elect.	$16,383,676	$14,927,370	$8,427,531	$5,293,533	$5,196,229	$33,844,662	$17,460,986	2.07	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	24	Elect.	Elect.	$16,384,413	$14,927,400	$8,427,539	$5,293,533	$5,196,931	$33,845,402	$17,460,989	2.07	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	106	Elect.	Elect.	$16,465,251	$14,929,333	$8,428,022	$5,293,533	$5,275,692	$33,926,580	$17,461,330	2.06	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	37	Elect.	Elect.	$16,486,807	$14,929,848	$8,428,152	$5,293,533	$5,296,695	$33,948,228	$17,461,420	2.06	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	41	Elect.	Elect.	$16,490,849	$14,929,945	$8,428,176	$5,293,533	$5,300,633	$33,952,287	$17,461,437	2.06	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	132	Elect.	Elect.	$16,502,489	$14,930,125	$8,428,221	$5,293,533	$5,312,091	$33,963,969	$17,461,481	2.06	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	60	Elect.	Elect.	$16,507,466	$14,930,200	$8,428,240	$5,293,533	$5,316,992	$33,968,965	$17,461,499	2.06	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	129	Elect.	Elect.	$16,517,421	$14,930,351	$8,428,277	$5,293,533	$5,326,795	$33,978,957	$17,461,536	2.06	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	70	Elect.	Elect.	$16,522,398	$14,930,427	$8,428,296	$5,293,533	$5,331,696	$33,983,952	$17,461,554	2.06	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	81	Elect.	Elect.	$16,535,251	$14,930,556	$8,428,329	$5,293,533	$5,344,435	$33,996,852	$17,461,602	2.06	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	78	Elect.	Elect.	$16,595,856	$14,931,482	$8,428,560	$5,293,533	$5,404,095	$34,057,670	$17,461,814	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	22	Elect.	Elect.	$16,600,192	$14,931,577	$8,428,584	$5,293,533	$5,408,327	$34,062,020	$17,461,828	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	101	Elect.	Elect.	$16,603,444	$14,931,648	$8,428,602	$5,293,533	$5,411,501	$34,065,283	$17,461,839	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	104	Elect.	Elect.	$16,614,351	$14,931,894	$8,428,664	$5,293,533	$5,422,135	$34,076,226	$17,461,875	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	28	Elect.	Elect.	$16,619,805	$14,932,018	$8,428,694	$5,293,533	$5,427,453	$34,081,697	$17,461,893	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	86	Elect.	Elect.	$16,622,531	$14,932,079	$8,428,710	$5,293,533	$5,430,111	$34,084,433	$17,461,902	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Impvd Silicon Steel	ROF	80	Elect.	Elect.	$16,633,733	$14,932,185	$8,428,736	$5,293,533	$5,441,214	$34,095,668	$17,461,935	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	1	Elect.	Elect.	$16,634,254	$14,932,191	$8,428,738	$5,293,533	$5,441,729	$34,096,191	$17,461,937	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	102	Elect.	Elect.	$16,636,978	$14,932,250	$8,428,753	$5,293,533	$5,444,386	$34,098,922	$17,461,943	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	11	Elect.	Elect.	$16,638,274	$14,932 266	$8,428,757	$5,293,533	$5,445,665	$34,100,220	$17,461,946	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	42	Elect.	Elect.	$16,642,160	$14,932,313	$8,428,768	$5,293,533	$5,449,500	$34,104,115	$17,461,955	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	121	Elect.	Elect.	$16,646,694	$14,932,665	$8,428,857	$5,293,533	$5,453,603	$34,108,658	$17,461,964	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	122	Elect.	Elect.	$16,650,724	$14,932,857	$8,428,904	$5,293,533	$5,457,401	$34,112,695	$17,461,971	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	53	Elect.	Elect.	$16,655,627	$14,933,325	$8,429,022	$5,293,533	$5,461,727	$34,117,606	$17,461,979	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	26	Elect.	Elect.	$16,656,282	$14,933,332	$8,429,024	$5,293,533	$5,462,373	$34,118,262	$17,461,980	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	4	Elect.	Elect.	$16,656,937	$14,933,339	$8,429,025	$5,293,533	$5,463,020	$34,118,918	$17,461,981	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	123	Elect.	Elect.	$16,660,519	$14,933,385	$8,429,037	$5,293,533	$5,466,548	$34,122,503	$17,461,983	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Amorphous Core	ROF	135	Elect.	Elect.	$16,664,102	$14,933,430	$8,429,048	$5,293,533	$5,470,077	$34,126,088	$17,461,986	2.05	1.00
Trans.&Dist.	N. Substation	Transformers	Amorphous Core	ROF	67	Elect.	Elect.	$16,669,838	$14,934,158	$8,429,230	$5,293,533	$5,474,905	$34,131,826	$17,461,987	2.05	1.00
Trans.&Dist.	S. Substation	Transformers	Impvd Silicon Steel	ROF	133	Elect.	Elect.	$16,693,883	$14,934,335	$8,429,275	$5,293,533	$5,498,736	$34,155,878	$17,461,995	2.05	1.00

Table 3.11
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Present Values Aggregated by Category

ERO Category	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Present Value of Installed Cost (1993 $)	Present Value of Energy Savings (1993 $)	Present Value of Demand Savings (1993 $)	Present Value of O&M Savings (1993 $)	Present Value of Replacement Cost Savings (1993 $)	Present Value of Total Savings (1993 $)	Net Present Value (1993 $)	Savings to Investment Ratio
AC	-2,625	72,387	-2,625	72,387	$6,210,400	-$1,561,723	$6,067,747	$824,808	$2,594,756	$7,925,589	$1,715,189	1.28
Boilers	623	0	623	0	$17,500	$49,675	$0	-$7,811	-$4,631	$37,233	$19,734	2.13
Controls	2,505	0	2,505	0	$68,200	$384,139	$0	$0	-$10,196	$373,944	$305,744	5.48
Envelope	30,267	0	30,267	0	$1,386,934	$5,122,174	$0	$0	$0	$5,122,174	$3,735,240	3.69
HVAC	0	0	1,83[illegible]	0	$1,629,326	$143,938	$0	$0	$2,782,086	$2,926,025	$1,296,69[illegible]	1.80
Lighting	44,266	22,032	44,266	22,032	$3,551,476	$7,008,373	$2,193,583	$2,634,927	$0	$11,836,883	$8,285,407	3.33
Motors	3,148	1,436	4,318	1,436	$528,155	$624,774	$142,949	$0	$207,203	$974,926	$446,771	1.85
Transport.	1,268	0	1,268	0	$1,287,000	$1,113,696	$0	$1,841,609	-$413,570	$2,541,734	$1,254,734	1.97
Trans&Dist.	0	0	3,025	1,214	$1,124,103	$99,861	$24,995	$0	$1,023,932	$1,148,788	$24,685	1.02
Wtr. Heating	12,283	0	12,283	0	$890,790	$1,949,428	$0	$0	-$680,846	$1,268,582	$377,792	1.42
Totals	91,735	95,855	97,763	97,069	$16,693,883	$14,934,335	$8,429,275	$5,293,533	$5,498,735	$34,155,878	$17,461,995	2.05

Table 3.12
EROs Constituting the Minimum Life-Cycle Cost Efficiency Resource: Annualized Values Aggregated by ERO Category

ERO Category	First-Year Energy Savings (MBtu)	First-Year Demand Savings (kW-mo)	Full Implement. Energy Savings (MBtu)	Full Implement. Demand Savings (kW-mo)	Annualized Installed Cost (1993 $)	Annualized Energy Savings (1993 $)	Annualized Demand Savings (1993 $)	Annualized O&M Savings (1993 $)	Annualized Replacement Cost Savings (1993 $)	Annualized Total Savings (1993 $)	Annualized Net Savings (1993 $)	Savings to Investment Ratio
AC	-2,625	72,387	-2,625	72,387	$397,540	-$99,969	$388,408	$52,798	$166,095	$507,332	$109,793	1.28
Boilers	623	0	623	0	$1,120	$3,179	$0	-$500	-$297	$2,383	$1,263	2.13
Controls	2,505	0	2,505	0	$4,366	$24,590	$0	$0	-$653	$23,937	$19,571	5.48
Envelope	30,267	0	30,267	0	$88,780	$327,880	$0	$0	$0	$327,880	$239,100	3.69
HVAC	0	0	1,833	0	$104,296	$9,214	$0	$0	$178,087	$187,301	$83,004	1.80
Lighting	44,266	22,032	44,266	22,032	$227,337	$448,620	$140,416	$168,667	$0	$757,702	$530,365	3.33
Motors	3,148	1,436	4,318	1,436	$33,808	$39,993	$9,150	$0	$13,263	$62,407	$28,599	1.85
Transport.	1,268	0	1,268	0	$82,383	$71,290	$0	$117,885	-$26,473	$162,701	$80,318	1.97
Trans&Dist.	0	0	3,025	1,214	$71,956	$6,392	$1,600	$0	$65,544	$73,536	$1,580	1.02
Wtr. Heating	12,283	0	12,283	0	$57,021	$124,787	$0	$0	-$43,582	$81,204	$24,183	1.42
Totals	91,735	95,855	97,763	97,069	$1,068,608	$955,976	$539,574	$338,849	$351,984	$2,186,384	$1,117,777	2.05

TABLE 3.13. Summary of Total Minimum Life-Cycle Cost Efficiency Resource

Summary of Energy and Demand Savings:

First-Year Energy Savings (MBtu/yr)	91,735
First-Year Demand Savings (kW-mo)	95,855
Full-Implementation Energy Savings (MBtu/yr)	97,763
Full-Implementation Demand Savings (kW-mo)	97,069

Summary of Costs and Benefits:

	Present Value (1993 $)	Annualized Value (1993 $)
Installed Cost	$16,693,883	$1,068,608
Value of Energy Savings	$14,934,335	$955,976
Value of Demand Savings	$8,429,275	$539,574
Value of O&M Savings	$5,293,533	$338,849
Value of Replacement Cost Savings	$5,498,735	$351,984
Value of Total Savings	$34,155,879	$2,186,385
Net Present Value of Savings	$17,461,995	$1,117,777
Savings-to-Investment Ratio	2.05	2.05

Table 3.14
Fuel Balance Table

	Existing		Conservation		New Load		Resulting		Net Conservation	
Fuel Type	Existing Energy Use (MBtu)	Existing Demand (kW-mo)	Energy Use Reduction (MBtu)	Demand Reduction (kW-mo)	Increased Energy Use (MBtu)	Increased Demand (kW-mo)	Resulting Energy Use (MBtu)	Resulting Demand (kW-mo)	Net Energy Use Reduction (MBtu)	Net Demand Reduction (kW-mo)
Diesel	19,161	NA	2,923	NA	0	NA	16,238	NA	2,923	0
Electricity	370,803	247,196	95,782	97,069	0	0	275,021	150,127	95,782	97,069
Fuel Oil	9,671	NA	146	NA	0	NA	9,525	NA	146	0
Gasoline	78,150	NA	15,195	NA	0	NA	62,955	NA	15,195	0
Natural Gas	23,819	NA	5,174	NA	21,457	NA	40,102	NA	(16,283)	0
Totals	501,604	247,196	119,220	97,069	21,457	0	403,841	150,127	97,763	97,069

3.5 ADDITIONAL NOTES

- The LCC calculations for the family housing fuel-switching ERO do not include any cost of installing natural gas lines. However, the NPVs of the two options are negative without the inclusion of gas line costs. Any additional cost would only make the ERO even less cost effective.

- Tables 3.4 and 3.5 report the LCC values for individual vehicle EROs. These tables do not include the construction costs of the filling stations. However, beginning with Tables 3.6 and 3.7, the cost-effective vehicle EROs are aggregated into one line, with a filling station cost of $150,000 included in the LCC figures.

- The savings associated with the EMCS EROs are estimated under the assumption that existing chillers, or chillers of a similar efficiency, remain in operation. If the proposed chiller EROs, such as the high-efficiency chillers with thermal energy storage systems, are implemented, the savings associated with the EMCS system will be lower, as will the NPV for the EMCS EROs.

- As mentioned in Section 3.4, total 1991 expenditures for energy (Wahlstrom et al. 1993) were adjusted with current prices to estimate the percentage of dollar savings available. Table 3.15 lists 1991 expenditures, the adjustment factor used for the conversion, and the adjusted expenditures for each fuel type.

TABLE 3.15. Summary of Expenditure Adjustment Process

Fuel	1991 Expenditures	Adjustment Factor	Adjusted Expenditures
Electricity	$6,065,000	0.04923/0.0532	$5,612,405
No. 2 fuel oil	$71,768	0.69000/1.0300	$48,078
Diesel	$146,194	0.69000/1.0300	$97,936
Gasoline	$873,863	0.84000/1.2300	$596,784
Natural gas	$90,749	1.0000	$90,749
Totals	$7,247,574		$6,445,952

The adjustment factor is the ratio of the prices used in the LCC analysis to the prices used in the Volume II Baseline Detail Report (Wahlstrom et al. 1993). The average price per kWh was $0.0532 in 1991. (In the LCC analysis, actual rates, broken out by rate period, were used.) Of that price, $0.03808 originated from the per kWh rate schedule. The remainder was due to demand and customer charges. The per kWh, or marginal energy charge, portion was calculated using the following formula:

$$kWh = ONPK \times .33 + OFFPK \times .67 \qquad (3.13)$$

where kWh = per kWh, or marginal energy charge portion of average rate
ONPK = on peak electricity rate
OFFPK = off peak electricity rate

The rates used in the baseline report were $0.04043 and $0.03692 for on-peak and off-peak, respectively (Wahlstrom et al. 1993). Inserting the rates used in the LCC analysis, as reported in Table 3.2, into this formula yields a marginal rate of $0.03411. To find the new average price per kWh (including demand and customer charges), the change (-$0.00397) in the marginal rate was added to the previous overall per kWh cost of $0.0532, which resulted in an overall average rate of $0.04923 per kWh.

- Information regarding the rate structure for natural gas was not available for some buildings. To alleviate this problem, assumptions were made for several buildings as to whether the correct rate was firm or interruptible. In general, the rate that made the analysis more conservative was chosen. In other words, the rate that made an ERO less attractive, relative to the baseline case, was used. For the family housing fuel-switching ERO, vehicle EROs, and the gas chiller EROs for all buildings other than Building 989, firm rates were selected. Interruptible rates were used for all boiler EROs (both tune-ups and pulse replacements), with the exceptions of those affecting Buildings 998 and 1364, which are on the firm schedule.

- The unleaded gasoline and diesel prices for vehicles were not reported in Table 3.2 because of the use of vehicle specific data. Table 3.16 reports the diesel and gasoline prices used for each vehicle ERO in both dollars per gallon and dollars per MBtu. The prices are averages paid on- and off-base by vehicles affected by each ERO.

TABLE 3.16. Gasoline and Diesel Prices Used for Vehicle EROs

Facility Type	Equipment	ID	Existing Fuel	Average Fuel Cost On-Base ($/gal)	Off-Base ($/gal)	Total ($/gal)	On-Base ($/MBtu)	Off-Base ($/MBtu)	Total ($/MBtu)
Sedan	Compact, 4 psgr, Class II	B102	Gas	0.839	0.873	0.845	$7.63	$7.94	$7.68
Sedan	Midsize, 5 psgr, Class II (See Note 1)	B103	Gas	0.844		0.844	$7.67		$7.67
Sedan	Compact, Law Enforcement, Class II	B106	Gas	0.839	0.872	0.852	$7.63	$7.93	$7.75
Wagon	Station Wagon, Compact, Class II	B150	Gas	0.839	0.877	0.845	$7.63	$7.97	$7.68
Ambulance	Modular, 4x2	B162	Gas		0.843	0.843		$7.66	$7.66
Ambulance	Modular, 4x4	B163	Gas	0.736		0.736	$6.69		$6.69
Truck	Panel Truck, 4x2, 6,999 GVW & under	B168	Gas	0.848	0.871	0.850	$7.71	$7.92	$7.73
Truck	Multistop, 4x2, 12,500-16,999 GVW	B177	Gas	0.842	0.853	0.845	$7.66	$7.75	$7.68
Truck	Multistop, 4x2, 8,500-12,499 GVW	B178	Gas	0.839	0.850	0.841	$7.62	$7.73	$7.64
Truck	Carryall, 4x2, 6,999 GVW & under	B185	Gas	0.844	0.874	0.845	$7.67	$7.95	$7.68
Truck	Carryall, 4x2, 7 DAX	B188	Gas	0.843	0.903	0.850	$7.67	$8.21	$7.73
Truck	Carryall, 4x4, 7,500 GVW	B190	Gas	0.837	0.838	0.837	$7.61	$7.62	$7.61
Truck	Carryall, 4x2, Conv, 15 psgr, 7,700 GVW	B192	Gas	0.839	0.957	0.841	$7.63	$8.70	$7.65
Truck	Carryall, Low Silhouette, 4x2, 7,100 GVW	B193	Gas	0.828		0.828	$7.52		$7.52
Truck	Utility, 4x4, 6,000 GVW	B198	Gas	0.837	0.833	0.836	$7.61	$7.58	$7.60
Pickup	Compact, 4x2, 4,599 GVW & under	B200	Gas	0.836	1.469	0.840	$7.60	$13.35	$7.64
Pickup	Compact, 4x2, 4,600-5,799 GVW	B204	Gas	0.848	1.224	0.850	$7.71	$11.13	$7.72
Pickup	4 dr cab, 4x2, 5,500 GVW	B217	Gas	0.816	1.000	0.818	$7.42	$9.09	$7.43
Pickup	4 dr cab, 4x4, 7,000-8510 GVW	B222	Gas	0.825	1.588	0.827	$7.50	$14.44	$7.51
Truck	Cargo, 4x4, 12,499 GVW & under	B237	Gas	0.842	0.825	0.837	$7.65	$7.50	$7.61
Truck	Cargo, 4x4, 17,000-20,999 GVW	B239	Gas	0.691		0.691	$6.29		$6.29
Truck	Stake, 4x2, 7,000 GVW	B261	Gas	0.839	0.899	0.840	$7.63	$8.17	$7.64
Bus	School, 28-29 psgr, 4x2	B121	Diesel	0.690	1.100	0.700	$5.11	$8.15	$5.18
Bus	School, 42-45 psgr, 4x2	B130	Diesel	0.690	0.892	0.702	$5.11	$6.61	$5.20
Bus	Intercity, 41-51 psgr, 4x2	B139	Diesel	0.690		0.690	$5.11		$5.11
Truck	Multistop, 4x2, 8,499 GVW & under	B176	Diesel	0.690	0.959	0.695	$5.11	$7.11	$5.15
Truck	Multistop, 4x2, 1-ton	B180	Diesel	0.694		0.694	$5.14		$5.14
Bus	16 psgr, 4x2	B184	Diesel	0.691		0.691	$5.12		$5.12
Truck	Carryall, 4x2, Conv, 9 psgr	B191	Diesel	0.691		0.691	$5.12		$5.12
Pickup	Compact, 4x4, 4,600-5,799 GVW	B211	Diesel	0.721		0.721	$5.34		$5.34
Truck	Stake, 4x2, 12,500-16,999 GVW, 1-1/2 ton	B264	Diesel	0.688		0.688	$5.10		$5.10
Truck	Stake, 4x2, 10,000 GVW	B265	Diesel	0.691	0.833	0.692	$5.12	$6.17	$5.13
Truck	Tractor, 4x2, 24,000-44,500 GVW	B353	Diesel	0.690		0.690	$5.11		$5.11
Truck	Tractor, 6x4, 24,000-44,500 GVW	B361	Diesel	0.690	1.500	0.692	$5.11	$11.11	$5.13
	B-Category Averages:		Gas	0.837	0.875	0.842	$7.61	$7.95	$7.65
			Diesel	0.691	0.986	0.693	$5.12	$7.31	$5.14
Tractor	Whse, 4,000-6,999#	E801	Gas	0.838		0.838	$7.62		$7.62
Forklift	2,000-5,999#, ST	E830	Gas	0.848		0.848	$7.71		$7.71
Forklift	2,000-5,999#, PT	E831	Gas	0.833		0.833	$7.57		$7.57
Forklift	6,000-9,999#, PT	E832	Gas	0.839		0.839	$7.63		$7.63
Forklift	4,000#, PT	E816	Diesel	0.689		0.689	$5.10		$5.10
Forklift	6,000-6,200#, PT	E822	Diesel	0.690		0.690	$5.11		$5.11
Forklift	15,000#	E824	Diesel	0.689		0.689	$5.10		$5.10
Lift	Platform, 40K, 463L	E940	Diesel	0.680		0.680	$5.04		$5.04
Forklift	Huster, 463L, 10K	E956	Diesel	0.692		0.692	$5.12		$5.12
Forklift	Allis Chalmers, 463L, 10K	E957	Diesel	0.688		0.688	$5.10		$5.10
Forklift	AT(463L), 10K	E958	Diesel	0.691		0.691	$5.12		$5.12
	E-Category Averages:		Gas	0.836		0.836	$7.60		$7.60
			Diesel	0.689		0.689	$5.11		$5.11

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