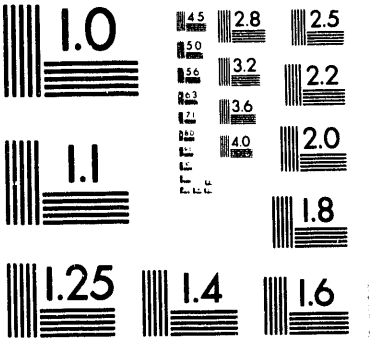
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PNL-8756 Vol. 2
UC-350

PATRICK AIR FORCE BASE INTEGRATED RESOURCE ASSESSMENT

VOLUME 2: BASELINE DETAIL

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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 assess energy use at Patrick Air Force Base (AFB). The information obtained from this assessment will be used in identifying energy resource opportunities to reduce overall energy consumption on the base.

The primary focus of this report is to assess the current baseline energy consumption at Patrick AFB. It is a comparison report to Volume 1, the Executive Summary, and Volume 3, the Resource Assessment. This assessment requires that information be obtained and characterized for buildings, utilities, energy sources, energy uses, and load profile information to be used to improve the characterization of energy use on the base. The characteristics of electricity, natural gas, and No. 2 fuel oil are analyzed for on-base facilities and housing. The assessment examines basic regional information used to determine energy-use intensity (EUI) values for Patrick AFB facilities by building, fuel type, and energy end use. It also provides a summary of electricity consumption from Florida Power & Light Company (FPL) metered data for 1985-1991. Load profile information obtained from FPL data is presented for the north and south substations for the four seasons of the year, including weekdays and weekends.

(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 has tasked the Pacific Northwest Laboratory (PNL), in support of the U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP), to assess energy use at Patrick Air Force Base (AFB). The information obtained from this assessment will be used in identifying energy resource opportunties to reduce overall energy consumption on the base.

The primary focus of this report is to assess the current baseline energy consumption at Patrick AFB. This assessment requires that information be obtained and characterized for buildings, utilities, energy sources, energy uses, and load profile information to be used to improve the characterization of energy use on the base.

The characteristics of electricity, natural gas, and No. 2 fuel oil are analyzed for on-base facilities and housing. Electrical service is provided by Florida Power & Light Company (FPL), natural gas is purchased from City Gas of Florida (City Gas), and fuel oil is supplied through a contract with Raytheon Services.

The assessment examines basic regional information used to determine energy-use intensity (EUI) values for Patrick AFB facilities by building, fuel type, and energy end use. It also provides a summary of electricity consumption from FPL metered data for 1985-1991. Load profile information obtained from FPL data is presented for the north and south substations for the four seasons of the year, including weekdays and weekends.

Patrick AFB is a 2,108-acre space command (SPACECOM) facility containing military family housing units, base industrial facilities, an airfield, and related community facilities. In FY92, the number of people affecting energy consumption through their use of Patrick AFB facilities included 4,000 active duty military personnel and 2,000 civilian personnel. In addition, approximately 45,000 to 50,000 retired military personnel and their families, living on the east coast of Florida were entitled to use these facilities.

A total of 1,188 buildings with 5,288,364 ft^2 of floorspace were identified at the base. Utilities include electricity, a central heating steam system, natural gas, water, and sewage.

Table S.1 shows a summation of the typical yearly energy consumption and related costs for all on-base facilities and housing at Patrick AFB. For each energy type, the annual total is shown in units appropriate to the energy type and in common units as a basis of comparison.

TABLE S.1. Typical Annual Energy Consumption and Cost at Patrick AFB

Energy Type	Annual Total	Annual Total MBtu[a]	Percent of Total	Energy Cost 1991$ x 10^3	Percent of Total Cost
Electricity	108,676 MWh	370,803	91.7	6,065	97.4
Natural Gas	238 ktherm	23,819	5.9	91	1.5
No. 2 Fuel Oil	69.7 kgal	9,671	2.4	72	1.1
TOTALS:		404,293	100.0	6,228	100.0

(a) 1 MBtu = 1,000,000 Btu
(b) 3,413 Btu/kWh
(c) 100,000 Btu/therm; 1,050 Btu/ft^3
(d) 0.1388 MBtu/gal

Table S.2 breaks down electric energy use and Table S.3 breaks down natural-gas energy use for the buildings at Patrick AFB.

TABLE S.2. Patrick AFB Electrical Energy-Use Breakdown

Site Bldg-Type	Total Buildings	Site Total (sq ft)	Total EUI (kWh/sq ft/yr)	Total (MWh/yr)	Electric Heat	Electric Cool	Electric Ventilation	Electric DHW	Electric Cook	Electric Light	Electric Refrigeration	Electric Other
ADMIN	36	903,999	21.97	19859.05	86,784	5,469,194	1,581,998	65,088	0	6,418,393	677,999	5,559,894
BRK/ADM	29	325,972	25.32	8253.61	162,986	2,086,221	814,930	919,241	521,555	1,923,235	488,958	1,336,485
CHAPEL	2	19,588	23.40	458.36	5,876	129,281	29,382	5,876	17,629	129,281	27,423	113,610
CLINIC	2	9,280	41.01	380.55	4,826	91,872	72,384	9,169	9,280	89,088	11,136	92,800
CLUB	8	23,391	24.90	582.44	7,017	0	51,460	88,886	0	304,083	0	130,990
CONCATN	15	87,123	21.10	1838.30	26,137	575,012	130,685	26,137	0	575,012	0	505,313
DET-RR	6	1,390	3.40	4.73	0	0	139	0	0	4,587	0	0
DGR	7	150,862	20.41	3079.24	10,409	1,040,948	188,578	13,879	60,345	1,221,982	165,948	377,155
DINING	3	82,537	59.82	4937.28	14,609	1,625,979	181,581	185,048	0	1,072,981	1,394,875	462,207
FUELDSP	2	211	14.20	3.00	63	0	317	0	0	1,393	0	1,224
GROCERY	1	84,797	60.10	5096.30	16,959	975,166	152,635	0	0	1,399,151	2,043,608	508,782
HANGAR	4	172,563	6.73	1161.35	34,513	186,368	17,256	0	0	569,458	43,141	310,613
HOSPITL	1	74,071	39.50	2925.80	0	733,303	577,754	0	74,071	711,082	88,885	740,710
HOTEL	18	64,060	25.50	1633.53	32,030	409,984	160,150	192,180	102,496	377,954	96,090	262,646
HSG-FAM	793	1,873,722	18.03	33783.21	993,073	5,714,852	4,684,305	2,417,101	580,854	11,054,960	2,810,583	5,527,480
HUT	2	1,760	8.10	14.26	0	0	2,640	0	0	11,616	0	0
MTRPOOL	10	79,586	6.00	477.52	15,917	0	7,959	0	7,959	262,634	39,793	143,255
MWR	14	126,375	21.92	2770.14	37,913	834,075	189,563	0	0	834,075	141,540	732,975
OTHER	27	13,792	22.95	316.53	4,138	91,027	20,688	4,138	6,206	91,027	19,309	79,994
PLT-BLD	12	17,979	11.40	204.96	3,596	97,087	3,596	0	0	59,331	8,990	32,362
P&D	7	128,224	22.50	2885.04	38,467	846,278	192,336	38,467	0	846,278	179,514	743,699
REC	6	47,566	21.80	1036.94	14,270	313,936	71,349	14,270	0	313,936	33,296	275,883
RESTRNT	3	3,641	57.81	210.49	109	71,728	8,010	1,384	0	47,333	61,533	20,390
SECURTY	10	45,490	19.78	899.79	13,647	240,187	68,235	13,647	0	300,234	0	263,842
SHOP	15	60,288	10.07	607.10	12,058	260,444	12,058	0	0	198,950	15,072	108,518
SHOP-AIR	2	2,738	10.07	27.57	548	11,828	548	0	0	9,035	685	4,928
SHOP-ELC	8	192,629	10.07	1939.77	38,526	832,157	38,526	0	0	635,676	48,157	346,732
SHOP-WPN	5	2,397	10.07	24.14	479	10,355	479	0	0	7,910	599	4,315
STOR-UH	106	182,375	3.40	620.08	0	0	18,238	0	0	601,838	0	0
TERMINL	1	87,168	22.50	1961.28	26,150	575,309	130,752	26,150	0	575,309	122,035	505,574
TRAING	2	39,402	13.80	543.71	867	169,429	55,163	3,034	59,103	177,309	31,522	47,282
WHS	29	374,821	8.50	3185.98	0	1,012,017	74,964	0	0	1,236,909	187,411	674,678
WHS-CLD	2	8,567	5.80	49.69	0	0	1,713	0	0	28,271	4,284	15,421
Pumps				1,501								
Ext. Light.				1,242								
Line Loss				10,338								
Totals:	1,188	5,288,364		114,853								

All units are kWh/yr unless otherwise noted.

TABLE S.3. Patrick AFB Natural-Gas Energy-Use Breakdown

Site Bldg-Type	Total Buildings	Site Total sq ft	Total MBtu/yr	Heating MBtu/yr	Cooling MBtu/yr	DHW MBtu/yr	Cooking MBtu/yr	Other MBtu/yr
ADMIN	36	903,999	10323.67	7662.46	0.00	2661.20	0.00	0.00
BRK/ADM	29	325,972	0.00	0.00	0.00	0.00	0.00	0.00
CHAPEL	2	19,588	0.00	0.00	0.00	0.00	0.00	0.00
CLINIC	2	9,280	151.44	88.32	0.00	63.12	0.00	0.00
CLUB	8	23,391	0.00	0.00	0.00	0.00	0.00	0.00
COMCATN	15	67,123	0.00	0.00	0.00	0.00	0.00	0.00
DET-RR	6	1,390	0.00	0.00	0.00	0.00	0.00	0.00
DGR	7	150,862	285.88	206.49	0.00	79.39	0.00	0.00
DINING	3	82,537	6584.22	2808.57	0.00	3775.66	0.00	0.00
FUELDSP	2	211	0.00	0.00	0.00	0.00	0.00	0.00
GROCERY	1	84,797	0.00	0.00	0.00	0.00	0.00	0.00
HANGAR	4	172,563	0.00	0.00	0.00	0.00	0.00	0.00
HOSPITL	1	74,071	5303.04	3092.75	0.00	2210.29	0.00	0.00
HOTEL	18	64,060	0.00	0.00	0.00	0.00	0.00	0.00
HSG-FAM	793	1,873,722	0.00	0.00	0.00	0.00	0.00	0.00
HUT	2	1,760	0.00	0.00	0.00	0.00	0.00	0.00
MTRPOOL	10	79,586	0.00	0.00	0.00	0.00	0.00	0.00
MWR	14	126,375	0.00	0.00	0.00	0.00	0.00	0.00
OTHER	27	13,792	0.00	0.00	0.00	0.00	0.00	0.00
PLT-BLD	12	17,979	0.00	0.00	0.00	0.00	0.00	0.00
R&D	7	128,224	0.00	0.00	0.00	0.00	0.00	0.00
REC	6	47,566	0.00	0.00	0.00	0.00	0.00	0.00
RESTRNT	3	3,641	1078.34	258.40	0.00	347.38	472.55	0.00
SECURTY	10	45,490	0.00	0.00	0.00	0.00	0.00	0.00
SHOP	15	60,288	0.00	0.00	0.00	0.00	0.00	0.00
SHOP-AIR	2	2,738	0.00	0.00	0.00	0.00	0.00	0.00
SHOP-ELC	8	192,629	0.00	0.00	0.00	0.00	0.00	0.00
SHOP-WPN	5	2,397	0.00	0.00	0.00	0.00	0.00	0.00
STOR-UH	106	182,375	0.00	0.00	0.00	0.00	0.00	0.00
TERMINL	1	87,168	0.00	0.00	0.00	0.00	0.00	0.00
TRAING	2	39,402	91.73	64.96	0.00	26.76	0.00	0.00
WHS	29	374,821	0.00	0.00	0.00	0.00	0.00	0.00
WHS-CLD	2	8,567	0.00	0.00	0.00	0.00	0.00	0.00
Totals:		5,288,364	23,818	MBtu per year total natural gas consumption				
			238.18	ktherms				

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ABBREVIATIONS AND ACRONYMS

AFB	Air Force Base
AFR	Air Force Regulation
AFS	Air Force Station
AFTAC	USAF Technical Applications Center
Btu	British thermal unit
City Gas	City Gas of Florida
Corps	U.S. Army Corps of Engineers
CY	calendar year
dc	direct current
DEIS	Defense Energy Information System
DHW	domestic hot water
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
EPA	Environmental Protection Agency
EUI	energy-use intensity
FEMP	Federal Energy Management Program
FPL	Florida Power & Light
FY	fiscal year
hp	horsepower
HPS	high-pressure sodium
kW	kilowatt
kWh	kilowatt-hour
LPS	low-pressure sodium
MBtu	million British thermal units
MEP	Mobile Electric Power
MWh	megawatt-hour
O&M	operation and maintenance
PLT-BLD	plant building
PNL	Pacific Northwest Laboratory
RECS	Residential Energy Consumption Survey
RESTRNT	restaurant
SERC	Southeastern Electric Reliability Council
SPACECOM	space command
T&D	transmission and distribution
USAF	U.S. Air Force
USFWS	U.S. Fish and Wildlife Service

1.0 PHYSICAL CHARACTERISTICS

1.1 SITE PROFILE

Patrick Air Force Base (AFB) is a 2,108-acre space command (SPACECOM) facility consisting of two noncontiguous land parcels joined by a road easement approximately 1 mile south of the city of Cocoa Beach on the east coast of the state of Florida. The base is approximately 130 miles south of Jacksonville, 205 miles north of Miami, and 115 miles east-northeast of Tampa. The main base is located on a barrier island, bounded on the east by the Atlantic Ocean and on the west by the Banana River. U.S. Route A1A, a major north-south highway on the Florida east coast, traverses the base. The main base consists of 1,791 acres and contains family housing units, base commerical and industrial facilities, and an airfield. The south housing area, located approximately 1 mile south of the base, consists of 317 acres for military family housing and related community facilities. The base's mission includes the responsibility of safety, planning, engineering, support services, scheduling test operations, launch and range operations, directing or supporting operations, test results evaluation, and providing similar support to other Department of Defense (DOD) and non-DOD programs (EDAW undated).

The base is the headquarters of the 45th Space Wing of the U.S. Air Force (USAF) SPACECOM and includes Cape Canaveral Air Force Station (AFS), Antigua Air Station, Ascension Auxiliary Airfield, and Florida mainland stations that provide tracking services.

In FY92, the number of personnel and their families affecting energy consumption at Patrick AFB included 4,000 active-duty military personnel assigned to the base. Almost all of these people live in military housing. There are an additional 2,000 civilians employed at the base. These personnel do not live in military housing. Approximately 45,000 to 50,000 retired military personnel and their families living on the east coast of Florida are entitled to use these facilities, affecting energy consumption through their use of site facilities such as the Base Exchange, recreation centers, and medical facilities.

The base, along with Cape Canaveral AFS, hosts over 40 tenant organizations. These tenants depend upon the base for support services. Some of the major organizations located at Patrick AFB include

- 41st Air Rescue Squadron
- USAF Technical Applications Center
- Department of State Air Wing
- Florida Air National Guard
- U.S. Army Corps of Engineers (Corps)
- USAF Judiciary/Area Defense Counsel
- Federal Aviation Administrator, Manager USAF Special Forecast Office
- 21st Medical Service Squadron.

Land use at Patrick AFB is listed in Table 1.1. The largest land uses are for accompanied housing that comprises 414 acres and the airfield that comprises 387 acres. The administrative facilities at the base account for 58 acres that are concentrated in the portion identified as the "main base." Community commercial, community service, unaccompanied housing, and industrial facilities are also located in the main base north of the airfield. Another large administrative parcel, containing the USAF Technical Applications Center (AFTAC) building, is located in the southeastern quadrant of the base.

The main community center, including the commissary, main base exchange, and hospital, is located at the southern edge of the base. This allows retirees easy access to these facilities without having to travel into the main base area. Outdoor recreation areas include the golf course and marina in the southwest portion of the base, family camping and picnic areas along the Banana River, and four designated recreation areas along the Atlantic Ocean. Family housing is divided into three distinct neighborhoods. The north housing (North Wherry), central housing (South Wherry), and south housing (Capehart) areas. Of these three areas, the newest is Capehart, which was constructed in the late 1950s. A total of 1,556 units in 793 buildings are located in these three housing areas and each unit is all-electric.

TABLE 1.1. Existing Land Use at Patrick AFB

Land Use	Acres
Airfield	387
Runway/Taxiway/Apron	197
Aircraft Operation and Maintenance	29
Industrial	178
Administrative	58
Community Commercial	95
Community Service	15
Medical	15
Accompanied Housing	414
Unaccompanied Housing	20
Outdoor Recreation	274
Open Space	373
Water	44
Launch and Range Control	5
Total	2,108

1.2 BUILDING AND FACILITY PROFILE

This section is a characterization of the base's buildings, family housing, central heating (steam) system, and utilities. Major energy sources, average age, building count, and floorspace are described for the buildings. Inventories for the sewage lift station motors, sewage treatment plants, irrigation pumps, and street lighting are also documented. These items, together with the buildings and the losses from the electrical transmission and distribution (T&D) system, represent the total energy use at Patrick AFB.

1.2.1 Building Characterization

1.2.1.1 Site Facilities

A total of 33 primary building categories were identified at the base. These categories were based on identifiable function or uniqueness in terms of operation, construction, age, and energy use. A mnemonic letter code identifies each building type. Categorization is provided in Table 1.2, along

with information on floorspace, average floorspace, average age, the number of buildings in each category, and their percentage of the total.

The "other" facility category was identified from the real property list and includes items such as utility vaults, kennels, water treatment buildings, and other unique facilities having very low energy use. Real property items such as fire protection and sprinkler systems, fire and security alarm systems, and outdoor facilities with no energy consumption were not included in our listing.

TABLE 1.2. Building Characterization at Patrick AFB

Bldg-type	Description	Floorspace (sq ft)	Avgflrsp (sq ft)	Avg Age (Years)	Number of Bldgs	Percent of Total
ADMIN	Administration Building	903,999	25,111	35	36	3.03
BRK/ADM	Barracks (Dormitory; enlisted & BOQ)	325,972	11,240	40	29	2.44
CHAPEL	Chapel	19,588	9,794	38	2	0.17
CLINIC	Medical/Dental Clinic	9,280	4,640	24	2	0.17
CLUB	Club (NCO, Officers, etc.)	23,391	2,924	21	8	0.67
COMCATN	Communications	87,123	5,808	26	15	1.26
DET-RR	Detached Restrooms, Latrines, Shower Houses, etc.	1,390	232	21	6	0.51
DGR	Dry Goods/Retail	150,862	21,552	21	7	0.59
DINING	Enlisted Dining Facility	82,537	27,512	42	3	0.25
FUELDSP	Fuel Dispensing Bldgs.	211	106	28	2	0.17
GROCERY	Commissary	84,797	84,797	11	1	0.08
HANGAR	Hangar	172,563	43,141	42	4	0.34
HOSPITL	Hospital	74,071	74,071	26	1	0.08
HOTEL	Hotel/Motel/Guesthouse	64,060	3,559	43	18	1.52
HSG-FAM	Family Housing	1,873,722	2,363	36	793	66.75
HUT	Misc. Small Bldgs. and Shelters (not security)	1,760	880	26	2	0.17
MTRPOOL	Maint. Shops for Cars, Trucks, Tanks	79,586	7,959	24	10	0.84
MWR	Morale, Welfare, & Recreation (Non-physical rec)	126,375	9,027	27	14	1.18
OTHER	Other (non ECO bldgs.)	13,792	511	34	27	2.27
PLT-BLD	Heat/Cool/Power Plant, Elec. Dist Bldgs	17,979	1,498	26	12	1.01
R&D	Research and Development Buildings	128,224	18,318	34	7	0.59
REC	Physical Recreation (gym, bowling alley, etc)	47,566	7,928	19	6	0.51
RESTRNT	Restaurant	3,641	1,214	10	3	0.25
SECURTY	Security Operations (police, fire)	45,490	4,549	23	10	0.84
SHOP	General Maint. Shops, inc. DEH/Base Eng.	60,288	4,019	33	15	1.26
SHOP-AIR	Maint. Shops for Aircraft	2,738	1,369	42	2	0.17
SHOP-ELC	Maint. Shops for Electronics, Avionics, ECM, etc.	192,629	24,079	34	8	0.67
SHOP-WPN	Maint. Shops for Weapons, (all weapons)	2,397	479	15	5	0.42
STOR-UH	Unheated Storage	182,375	1,721	32	106	8.92
TERMINL	Airport, Bus, Train Terminal	87,168	87,168	47	1	0.08
TRAING	Training/Classrooms (not simulator)	39,402	19,701	23	2	0.17
WHS	Warehouse	374,821	12,925	33	29	2.44
WHS-CLD	Cold Storage Warehouse	8,567	4,284	38	2	0.17
Totals		5,288,364			1,188	100.00

1.2.1.2 Family Housing Characterization

Table 1.3 provides data on the number of buildings and living units in each housing area, as well as the average age of the buildings, total floorspace, and average floorspace per building and unit. The largest percentage of available housing is located in Capehart, which constitutes roughly 63% (1,185,847 ft^2) of the total area. Three residences, referred to as APPR PFY50, are also shown in Table 1.3. All housing units are only served by electrical energy.

TABLE 1.3. Patrick AFB Family Housing Characterization

Description	Building Count	Unit Count	No. of Units Per Bldg	Avg. Age (Years)	Total Floorspace (Sq. Ft.)	Avg. Floorspace (Per Bldg)	Avg. Floorspace (Per Unit)	Percent Floorspace
APPR PFY50	3	3	1	51	4,656	1,552	1,552	0.2%
APPR PFY50 Subtotals	3	3			4,656		1,552	0.2%
FAM HSG, CAPEHART	113	113	1	34	168,999	1,496	1,496	9.0%
FAM HSG, CAPEHART	443	886	2	34	1,016,848	2,295	1,148	54.4%
Capehart Subtotals	556	999			1,185,847		1,322	63.4%
FAM HSG, WHERRY	85	85	1	37	118,531	1,394	1,394	6.4%
FAM HSG, WHERRY	87	174	2	37	206,116	2,369	1,185	11.0%
FAM HSG, WHERRY	6	18	3	40	23,125	3,854	1,285	1.2%
FAM HSG, WHERRY	28	112	4	39	144,370	5,156	1,289	7.7%
FAM HSG, WHERRY	3	15	5	40	18,816	6,272	1,254	1.0%
FAM HSG, WHERRY	25	150	6	39	172,261	6,890	1,148	9.2%
Wherry Subtotals	234	554			683,219		1,259	36.6%
FAM HSG TOTALS	793	1,556			1,873,722			100.0%

1.2.2 Utility and Other Energy Use Characterizations

Energy use at Patrick AFB includes electricity, a central heating steam system, natural gas, water, sewage, and exterior lighting. Fuel oil is also burned as a back-up fuel.

The Corps prepared a report entitled Electrical System Master Pattern and Analysis describing the present condition of the electrical system at the base (Corps 1992). Proposals for improvement to the current system were also

recommended in the report. For purposes of this baseline report, information describing the existing utility systems at Patrick AFB will be summarized below.

1.2.2.1 Electricity

Electrical service to the base is provided by Florida Power & Light (FPL) at Substation 1 (north substation) and Substation 2 (south substation); both are owned by FPL. After 138 kV enter the substations, the voltage is stepped down to 13.2 kV by transformers also owned by FPL. The USAF owns the switchgear immediately adjacent to each fenced substation yard, which is supplied with power from FPL. The power is then distributed by a system of radial feeders owned by the USAF. There are four feeders on the north side and six on the south side with a distribution voltage of 13.2 kV that is grounded WYE as shown in Table 1.4 (Corps 1992).

Most of the major loads, except for the housing areas, are being fed by seven underground radial feeders consisting of three single 350 kCMil copper-shielded MV-90 class cables with 133% insulation. No neutral conductor is provided because no neutral connected loads are intended to be served. Each circuit has a single #2 insulated ground wire pulled with it. Smaller conductors, which are generally #1 or #2 AWG copper, are pulled from the main feeder to the step-down service transformers. The circuits that remain overhead consist of wood pole with wood cross-arm structures that utilize primarily #4 or #2 copper conductors, which are sectionalized and protected by conventional fused cutouts (Corps 1992). The transformers associated with the distribution system are listed in Table 1.5.

TABLE 1.4. Patrick AFB Electrical Distribution Feeder Numbers

North Substation	South Substation
NH	C
A2	F
330	A1
D2	B
	D1
	E

TABLE 1.5. Patrick AFB Transformer Schedule for Distribution System

Total Cap kVA	Size, kVA	Quantity	Type
5	5	1	Single-Phase
230	10	23	Single-Phase
240	15	16	Single-Phase
900	25	36	35 Single-Phase, 1 Three-Phase
2,318	38	61	Single-Phase
225	45	5	Three-Phase
5,700	50	114	Single-Phase
7,650	75	102	91 Single-Phase, 11 Three-Phase
5,700	100	57	Single-Phase
678	113	6	Three-Phase
2,100	150	14	Three-Phase
668	167	4	Single-Phase
2,700	225	12	Three-Phase
3,300	300	11	Three-Phase
3,996	333	12	Single-Phase
350	350	1	Three-Phase
1,000	500	2	Three-Phase
6,750	750	9	Three-Phase
2,000	1,000	2	Three-Phase
4,500	1,500	3	Three-Phase
2,000	2,000	1	Three-Phase
53,010		492	

The underground system has limited manual sectionalization provided by vacuum switches on each feeder. Maintenance personnel can remotely operate most switches by a radio link that is backed up by a battery. Two basic types of operators are available for the switches; one type runs on a small direct current (dc) motor and the other is spring-loaded. The vacuum switches normally consist of four sections; two 600-A unprotected through-feed load break (2000 AIC) sections and two 200-A fault-interrupting (12000 AIC) sections that are protected by solid-state phase and ground overcurrent relays. The main feeders are protected by the phase and ground overcurrent

relays in the switchgear that are found at the main substations. Currently, there is no automatic fault-sensing sectionalization capability for any of the underground main feeder sections. Although a few fused-air or vacuum/oil switches remain (which are being phased out), most of the step-down service transformer taps are made through the vacuum switches via the relay-protected 200-A fault interrupting sections (Corps 1992).

1.2.2.2 Central Heating System Characterization

The central heating steam system at Patrick AFB is a combination of an above- and below-ground distribution network of insulated pipe providing steam to various facilities on the base, along with corresponding condensate return lines. There are approximately 7,500 ft of above-ground steam and condensate lines throughout the base. Additionally, there are roughly 6,000 ft of underground steam and condensate lines. The steam heating plant located toward the north end of the base has three boilers. Each of the boilers are 350 boiler hp (11.718 MBtu/h). The steam pressure provided is 100 psig, and the steam temperature leaving the central plant is approximately 338°F. The primary fuel used in the heating plant is natural gas however No. 2 fuel oil is available as a back-up fuel.

The heating plant is operational approximately three to four months per year, providing heat to 53 facilities. The plant is closed the remainder of the year. During this nonoperational period, designated maintenance is performed on the boilers. The heating plant was previously used to produce steam used in the generation of electricity for the main base; however, that capability no longer exists because the turbine has been removed.

1.2.2.3 Natural-Gas Usage Characterization

Natural Gas is used primarily at Patrick AFB for space heating and domestic hot water (DHW). A small amount of gas is also used for cooking in the restaurant (RESTRNT) building category. A more detailed description of the natural-gas use at Patrick AFB can be found in Section 5.0.

1.2.2.4 Irrigation Water Pumping System

Irrigation water is supplied from 29 wells located around the base. A total of 67 pumps, ranging from 1 hp to 10 hp, primarily pump the water from

the wells to the housing areas. The estimated annual electrical consumption from the irrigation pumps is 315,079 kWh. Table 1.6 lists the number of various irrigation pumps and their associated horsepower ratings for the motors that drive them, estimated hours of operation, and annual electricity consumption. The pumps were assumed to be operating for six months a year, with a duty cycle of 30%.

1.2.2.5 Sewage Lift Station Pumping Characterization

Patrick AFB has 27 sewage lift stations with pumps in the 2-hp range and 7 other lift stations with larger pumps (up to 35 hp) that are used to get the sewage to the existing treatment plants. There are two sewage treatment plants - the north and the south plant.

After consulting with sewage treatment plant operators regarding the types of pumps (with corresponding motors) and the estimated hours of operation within their facilities, an annual consumption of 1,186 MWh was estimated for the entire sewage process. Table 1.7 provides an inventory of the various sewage lift station motors and the motors found in the treatment facilities.

TABLE 1.6. Irrigation Pumps at Patrick AFB

Size (hp)	Number of Pumps	Est Hours (Annual Operation)	Annual kWh
1.0	1	1,314	964
1.5	2	1,314	2,850
2.0	4	1,314	7,492
3.0	5	1,314	13,682
5.0	36	1,314	159,054
7.5	15	1,314	96,961
10.0	4	1,314	34,076
Totals	67		315,079

TABLE 1.7. Patrick AFB Sewage System Motors

Description	Size (hp)	Number of Motors	Est Hours (Annual Operation)	Annual kWh
North Plant				
	2	10	2,190	31,218
	7.5	2	3,832	37,702
	10	2	8,760	113,586
	5	1	8,760	29,454
	10	1	913	5,919
	5	2	2,555	17,182
	40	1	2,920	72,530
	40	2	2,190	108,795
Subtotal		21		416,386
South Plant				
	0.5	2	8,760	6,518
	2	1	8,760	12,487
	2	1	730	1,041
	3	1	730	1,520
	5	1	730	2,455
	7.5	1	8,760	43,094
	10	1	8,760	56,793
	35	1	730	15,937
	35	1	8,760	191,240
Subtotal		10		331,084
Lift Stations				
	2	27	2,628	101,146
	35	2	2,628	114,744
	15	2	2,628	50,586
	35	3	2,628	172,116
Subtotal		34		438,593
Totals		65		1,186,063

1.2.2.6 Exterior Lighting Characterization

Patrick AFB streets are illuminated by both pole-mounted 135-W low-pressure sodium (LPS) lamps and 55-W high-pressure sodium (HPS) lamps. The total estimated annual energy use for street lighting is 294,774 kWh. Low-pressure sodium lamps are used in accordance with regulations affecting federally protected sea turtles. USAF Regulation 88-15 (USAF 1985), along with direction provided by the U. S. Fish and Wildlife Service (USFWS), has mandated that all exterior lighting that is not mission-, safety-, or security-essential be eliminated from May 1 to October 31 each year. When essential exterior lighting is required, it must be provided by well-shielded LPS light. "Well shielded" means that each light must be surrounded by a guard to ensure that the light is directed on the work area only. If color rendition is critical, an exception can be made by substituting a well-shielded HPS lamp (USAF 1985).

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 a LPS lamp (unless color rendition is needed and an HPS lamp is substituted) (USAF 1985). These lights are now manually controlled by a switch.

Other sources of exterior lighting at Patrick AFB are for airfield operations, security, and recreational sports (see Table 1.8). Of these, the largest estimated energy use is for airfield lighting (361,090 annual kWh), lighting for security (336,384 annual kWh), and ballfield lighting (208,915 annual kWh). The only other source of exterior lighting is for ramps supporting aircraft operations (41,154 annual kWh). An inventory of exterior lighting sources is documented in Table 1.8.

TABLE 1.8. Exterior Lighting at Patrick AFB

Description	Number of Lamps	Size (Watts)	Wattage Draw	Est Hours (Annual Operation)	Annual kWh
Airfield Lighting					
Runway Edge	550	200	200	1,460	160,600
Taxiway	2,000	45	45	1,460	131,400
Distance Markers	24	200	200	1,460	7,008
VASI	38	500	500	1,460	27,740
Approach	125	200	200	486	12,150
Wingout Threshold	36	200	200	1,460	10,512
Pre-Threshold	20	200	200	1,460	5,840
Inboard Threshold	20	200	200	1,460	5,840
Subtotal	2,813				361,090
Security Lighting					
Metal Halide	105	1,000	1,080	1,460	165,564
LPS	150	135	173	4,380	113,661
HPS	150	55	87	4,380	57,159
Subtotal	405				336,384
Ball Park Lighting					
Metal Halide	248	1,000	1,080	780	208,915
Subtotal	248				208,915
Ramp Lighting					
3 - 100 ft concrete poles (HPS)	90	55	87	4,380	34,295
9 - 45 ft wooden poles (HPS)	18	55	87	4,380	6,859
Subtotal	108				41,154
Street Lighting					
North Housing (HPS)	94	55	87	4,380	35,820
South Housing (HPS)	306	55	87	4,380	116,604
Main Base (HPS)	67	55	87	4,380	25,531
Main Base (LPS)	67	135	173	4,380	50,769
Central Housing/Beachside (HPS)	58	55	87	4,380	22,101
Central Housing/Beachside (LPS)	58	135	173	4,380	43,949
Subtotal	650				294,774
Totals	4,224				1,242,318

2.0 ENERGY SOURCE CHARACTERISTICS

This section describes characteristics of overall energy use at Patrick AFB. Table 2.1 shows the typical yearly energy consumption and cost for all on-base facilities and housing. For each energy type, the yearly total is shown in appropriate units and in common units as a basis of comparison. This typical year is based on the best available data gathered from 1991 consumption levels. Figure 2.1 shows the total energy consumption, by month and fuel type, for Patrick AFB from FY85 through March 1992 as reported in the Defense Energy Information System (DEIS). Electricity consumption is separated into housing and commercial/industrial end uses. Figure 2.2 shows the percentage by month of base use for each fuel type for 1991. For this period, energy use at the base was primarily electric ($\geq$ 90%), except for the months of January, February, March, and April (which were very close to 90%). Figure 2.2 indicates that during the winter, between 70% and 80% of the total fuel use at Patrick AFB was electric.

TABLE 2.1. Typical Annual Energy Consumption and Cost at Patrick AFB

Energy Type	Annual Total	Annual Total MBtu[a]	Percent of Total	Energy Cost 1991$ x 10^3
Electricity	108,676 MWh	370,803[b]	91.7	6,065
Natural Gas	238 ktherm	23,819[c]	5.9	91
No.2 Fuel Oil	69.7 kgallon	9,671[d]	2.4	72
TOTALS:		404,293	100.0	6,228

(a) 1 MBtu = 1,000,000 Btu
(b) 3,413 Btu/kWh
(c) 100,000 Btu/therm; 1,050 Btu/ft^3
(d) 0.1388 MBtu/gal.

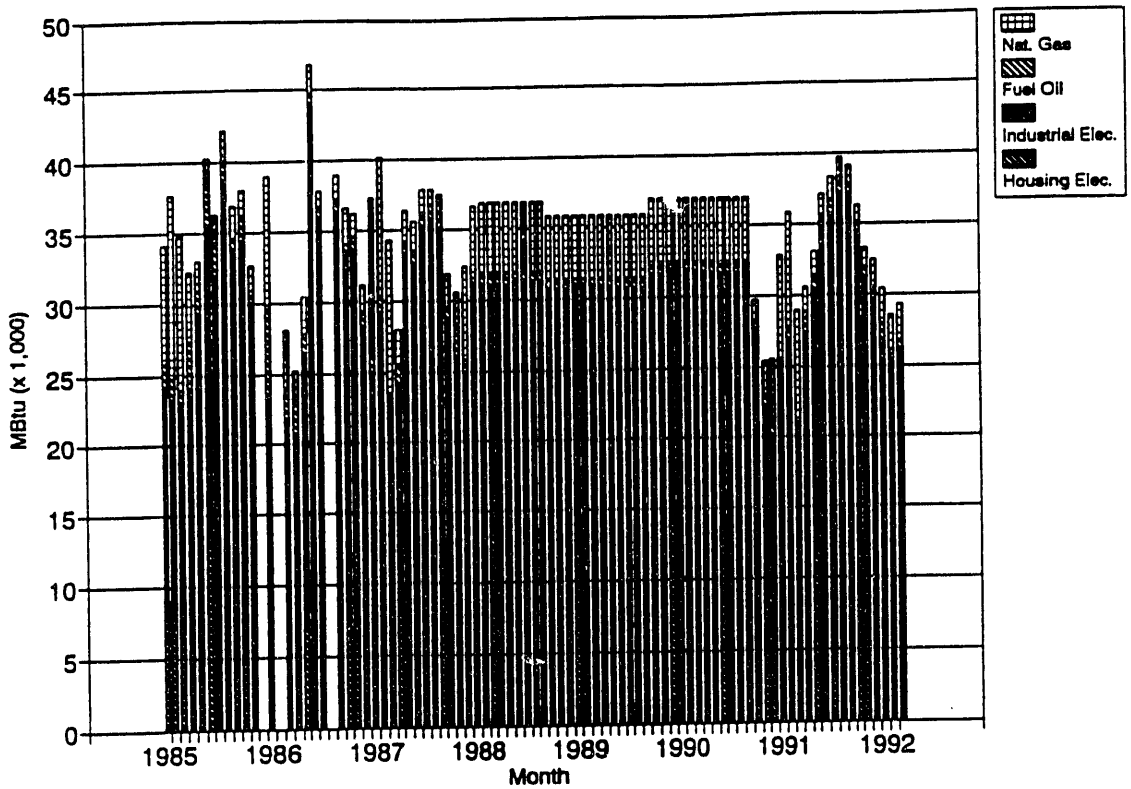

FIGURE 2.1. Patrick AFB Energy Consumption, 1985 to March 1992

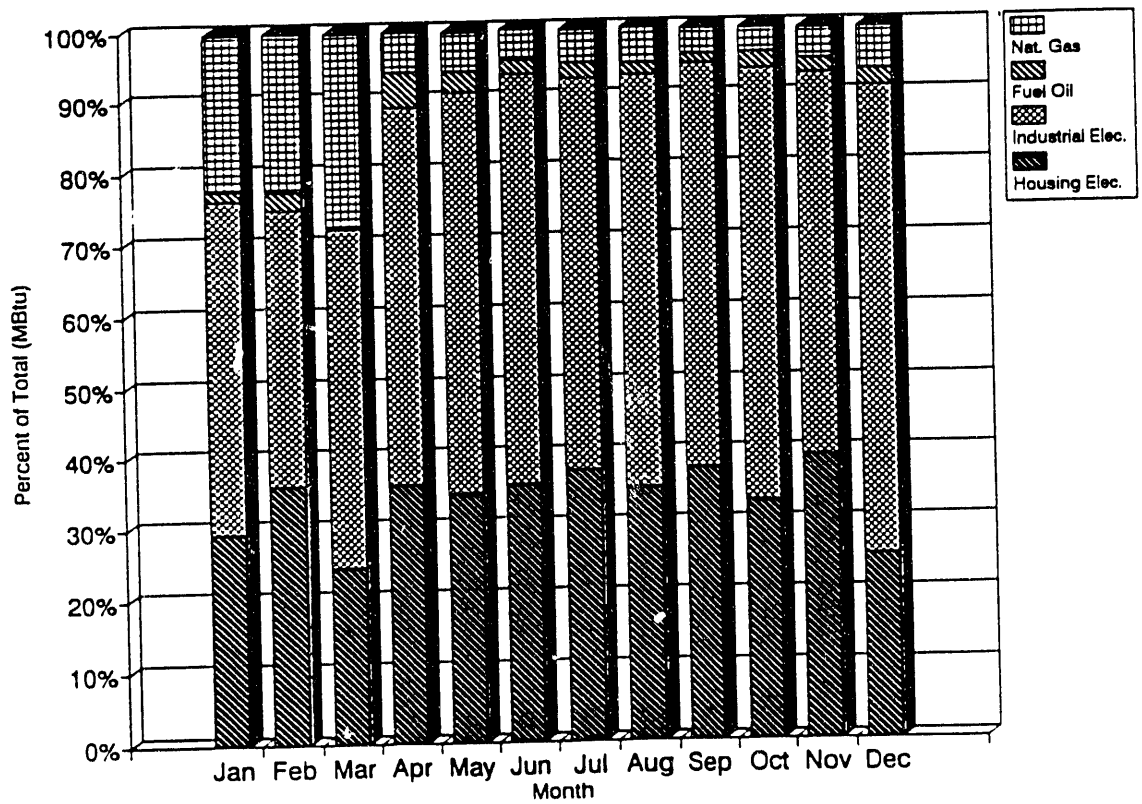

FIGURE 2.2. Patrick AFB Fuel Use, 1991

2.1 ELECTRIC SUPPLY SOURCE DESCRIPTION

DEIS records for a typical year (CY91) indicate on-base industrial use of 66,808 MWh and family housing use of 41,868 MWh. Electricity is supplied by FPL and billed under a time-of-use rate structure designated by GSLDT-3. The on-peak period is from 6:00 a.m. to 10:00 a.m. and 6:00 p.m. to 10:00 p.m. for November 1 through March 31, and 12:00 noon to 9:00 p.m. from April 1 through October 31. The rate in effect in 1991 consisted of a monthly customer charge of $400 and an on-peak demand charge of $6.25/kW. An on-peak energy and fuel charge of $0.01082/kWh and $0.02175/kWh, respectively, and an off-peak energy and fuel charge of $0.00949/kWh and $0.01975/kWh, respectively, were charged. An oil backout charge of $0.0651/kWh and a conservation charge of $0.0135/kWh were also included in the electric bill. Housing areas were on the same rate as the main base. The average cost of electricity for on-base industrial and military family housing areas was $0.0532/kWh in 1991. Table 2.2 summarizes the electric rate information.

2.2 GAS SUPPLY SOURCE DESCRIPTION

This section describes the distribution and use of gas at Patrick AFB. Patrick AFB purchases all of its natural gas from City Gas of Florida (City Gas). City Gas does not institute a demand charge. The total consumption for a representative year (June 1991 to May 1992) was 238,000 therms (23,819 MBtu) at an average cost of $0.03813/therm for a total cost of $90,749 (City

TABLE 2.2. Patrick AFB Electric Energy Rate Breakdown

Season	Rate type	Hours of Day	Demand Charge ($/kW)	Energy Charge (¢/kWh)	Fuel Charge (¢/kWh)	Oil Backout Charge (¢/kWh)	Conservation Charge (¢/kWh)	Total Energy (¢/kWh)
Winter (Nov. 1-March 31)	On-Peak	6:00am-10:00am	6.25	1.082	2.175	0.651	0.135	4.043
		6:00pm-10:00pm	6.25	1.082	2.175	0.651	0.135	4.043
	Off-Peak	10:00am-6:00pm	0.00	0.949	1.975	0.651	0.135	3.71
		10:00pm-6:00am	0.00	0.949	1.975	0.651	0.135	3.71
Summer (April 1-Oct. 31)	On-Peak	Noon-9:00pm	6.25	1.082	2.175	0.651	0.135	4.043
	Off-Peak	9:00pm-Noon	0.00	0.949	1.975	0.651	0.135	3.71

Gas of Florida billing records). This is approximately 6% of the overall energy use at Patrick AFB. Table 2.3 shows a breakdown of gas use.

Patrick AFB uses natural gas as a fuel for boilers at various locations across the base. In commercial buildings, boilers produce steam used primarily for dehumidification reheat in the summer months and space heating in the winter months. Table 2.4 lists the boilers that are in operation, their location, age, boiler horsepower, boiler energy usage, boiler type, and type of fuel used.

TABLE 2.3. Patrick AFB Natural-Gas Use

Building Area	Annual Total, therm x 10^3	Annual Total, MBtu	Percent of Total
Tech Lab	93.85	9,385	39.4
Hospital	53.03	5,303	22.3
Officer's Club Boiler	51.65	5,165	21.7
Officer's Club Mess	14.20	1,420	6.0
Burger King	10.78	1,078	4.5
Steam Plant	9.39	939	3.9
Base Exchange	2.86	286	1.2
Dental Clinic	1.51	151	0.6
Elementary School	0.92	92	0.4
TOTALS:	238.19	23,819	100.0

TABLE 2.4. Patrick AFB Boilers

Facility Name	Facility Number	Age	hp	MBtu/h	Type [a]	Fuel [b]
Officer's Club	250-N	8	45	1.508	S	G
Officer's Club	250-S	6	50	2.100	S	G
Steam Plant	314#1	7	350	41.718	S	G
Steam Plant	314#2	7	350	11.718	S	G
Steam Plant	314#3	7	350	11.718	S	G
Htg Fclty Bldg	344	17	30	1.005	S	O
Admin, TV prod fclty	430	10	20	0.670	W	O
Base Theater	431	21	20	0.835	S	O
Training	440	12	15.5	0.520	W	O
Gymnasium	545	8	25	0.837	S	O
Housing Support	558	9	60	2.009	S	O
Admin, HQ	629	3	9.7	0.324	W	O
HQ	632	27	28	0.945	W	O
Wst Trtmt Bldg	650	12	8.7	0.291	W	O
Water Supply Bldg	672	-- [c]	23.7	0.792	W	O
HQ Group	673	19	8.9	0.297	W	O
Maintenance Shop	681	--	3	0.100	W	O
Gas Station	691	3	10.8	0.360	W	O
Maintenance Shop	703	--	4.4	0.146	W	O
Terminal, Admin	800(x2)	4	50	2.100	S	O
Terminal, Admin	810	4	10	0.415	W	O
Fire Station	925(x2)	28	46	1.540	W	G
Air Cond. Plant Bldg	945	--	30	1.005	W	G
Child Care Center	946	10	40	1.339	S	G
Transmitter/Receiver Bldg	957	23	7.8	0.264	W	O
Open Mess, NCO	967	20	40	1.339	S	O
Film Stor Vault	984	21	40	1.339	W	O
Admin	985	4	50	2.100	S	G
Admin, R&D, Whse	986	4	50	2.100	S	G
Msl/Space Rsch & Test	988	10	13.5	0.453	W	G

TABLE 2.4. Contd.

Facility Name	Facility Number	Age	hp	Mbtu/h	Type [a]	Fuel [b]
Tech Lab (AFTAC)	989-A(x2)	7	60	2.009	W	G
Tech Lab (AFTAC)	989-B(x2)	7	40	1.339	W	G
Tech Lab (AFTAC)	989-C(x2)	7	60	2.009	W	G
Thrift Shop	990	33	6.9	0.231	W	O
Radome Twr Bldg	992	16	8.4	0.280	W	O
Education Center, NCO	998(x2)	6	20	0.685	W	G
RAPCON Center	1316	18	25	0.840	W	O
BX (mini mall)	1364-E	8	26	0.880	W	O
BX (mini mall)	1364-W	8	25	0.837	W	O
Hospital	1380(x2)	29	150	5.022	S	G
Golf Clubhouse	1492	32	7	0.233	W	O
Waste Treatment Bldg	1497	12	8.7	0.291	W	O
Chapel	3659	4	10	0.350	W	O

Notes:
(a)Type: S = Steam, W = Hot Water
(b)Fuel: G = Gas, O = Gas or Fuel Oil (dual-fuel)
(c)"--": Indicates data unavailable

2.2.1 Steam Plant

The Patrick AFB steam plant used 9390 therms (939 MBtu), just under 4% of the overall yearly gas use, in the winter of 1991-1992. The plant typically operates approximately three to four months a year, but the 1991-1992 winter was warm, so the steam plant operated for less than two months. Operation and maintenance of the underground and aboveground steam distribution system is complicated because exposure to the salt environment and high-water table cause corrosion to the system.

2.2.2 Main Base

Several buildings on the base have smaller boilers that produce either steam or hot water for space heating in the warmer months when the steam plant is not operating. The boilers are also used during the warmer months when reheat is needed for the air-conditioning systems. For example, the technical laboratory (Facility 989) has six boilers that heat water for space heating during the winter months and reheat during the summer months. These boilers operate all year and account for nearly 40% of the yearly natural-gas consumption. Natural gas is also used in the hospital, officers' club, and Burger King for cooking and heating. These miscellaneous uses, which include the hospital, steam plant, officers' club, Burger King, base exchange, educational center, and dental clinic, account for the majority of gas use - 144,338 therms (14,439 MBtu) per year.

2.3 OIL SUPPLY SOURCE DESCRIPTION

No. 2 fuel oil is used primarily for space and water heating via small oil-fired hot-water or steam boilers. In FY91, Patrick AFB purchased 1659 barrels of No. 2 fuel oil (9,671 MBtu) at a price of $1.03/gal for a total cost of $71,768. All fuel oil for the base is supplied by a contract with Raytheon Services. Fuel oil use represents only 2.4% of the total energy use at the base. Fuel oil stores are generally available for emergency fuel. Several boilers are dual fuel (natural gas or fuel oil), but normally burn natural gas. Stores of fuel oil are burned off in the boilers once a year to keep the fuel oil supply in good condition, accounting for the majority of the total fuel oil use. It should be noted that the price of $1.03/gal for FY91 is significantly higher than the price in either FY90 ($0.56/gal) or FY92 ($0.69/gal). Most of the price increase for FY91 is probably because of higher fuel prices as a result of Operation Desert Storm.

2.4 GASOLINE (MOGAS) SUPPLY SOURCE DESCRIPTION

Fuels for motor vehicles at Patrick AFB are also supplied through Raytheon Services. In FY91, the base vehicles consumed 710,458 gal of unleaded regular gasoline at a cost of $1.23/gal, for a total cost of

$873,863. During the same period, 141,936 gal of diesel fuel were consumed at a cost of $1.03/gal, for a total of $146,194.

2.5 PORTABLE ELECTRIC GENERATORS

Patrick AFB maintains a number of Mobile Electric Power (MEP) units for use in emergency situations or when a building's power supply must be interrupted for maintenance reasons. The MEPs are not assigned to specific facilities, but are kept in a central location and moved to sites as they are needed. In general, the units are not used on a regular basis. Table 2.5 lists the number and sizes of the generators.

TABLE 2.5. Patrick AFB Mobile Electric Power Units

Designation	Units	Output	Fuel
MEP-005B	6	30 kW	Diesel
MEP-007B	6	100 kW	Diesel
MEP-009B	7	200 kW	Diesel

3.0 ENERGY-USE INTENSITIES

Energy-use intensity (EUI) values are used to help develop baseline consumption for various building types when metered data are not available. This section describes the regional EUI information that was gathered for use in the energy assessment at Patrick AFB. Tables A.1 through A.22 (see Appendix A) display the basic regional information that was collected. These data provided reasonable EUI values from which site-specific values could be determined. FPL, along with the Environmental Protection Agency/Southeastern Electric Reliability Council (EPA/SERC), Gulf Power, and Georgia Power Company, provided the EUI information. Calculation of site-specific EUIs is discussed in more detail in the following sections.

3.1 INITIAL ENERGY-USE DATA SOURCES

EUIs are defined as energy use per unit floor area per unit time. They are commonly expressed as thousands of British thermal units per square foot per year (kBtu/ft^2-yr) for fossil fuel EUIs or kilowatt-hours per square foot per year (kWh/ft^2-yr) for electric EUIs.

3.2 REGIONAL EUI INFORMATION

Tables A.1 through A.22 show regional EUI information, breaking down energy use by facility type, building type, fuel type, and fuel end use. The two major building types are residential and commercial. Energy-use data are reported for the following end use categories: space heating, cooling, ventilation, domestic hot water, cooking, lighting (interior and exterior), refrigeration, and other. The "Other" category includes miscellaneous end uses made up of a variety of electrical appliances, computer/plug loads, and motors, as well as water and steam heating for laundry or food preparation.

The residential and commercial building electrical EUI estimates shown in Tables A.1 through A.11 are FPL values. Because EPA/SERC, Georgia Power, and FPL EUI values are not available for ventilation, lighting, and refrigeration for residential housing, values corresponding to lodging are used for these categories. According to bills received from both FPL and

City Gas, the total base energy consumption cost is paid by the USAF SPACECOM. The base then, in turn, bills tenants based on their consumption by direct metering of electricity or gas consumption, or by a predetermined formula. By having metered data available for various facilities on the base, a reality check of the regional EUI data is possible. Table 3.1 shows typical monthly electricity consumption data for reimbursable accounts.

The billing for each facility is based on its agreement to operate on the base indicated by the rate designation column in Table 3.1. The rates range from 1 to 4, representing a variety of overhead and operation and maintenance (O&M) costs for services supplied. Rate 1, the lowest rate charged, is the base's average cost per kilowatt-hour per month multiplied by the total number of kilowatt-hours consumed. The average cost is the total electric bill for the month divided by the total number of kilowatt-hours. This rate applies to family housing and medical facilities.

Rate 2 includes a charge of $0.00263/kWh for transmission and distribution losses and $0.01469/kWh for O&M activities. Most of the reimbursable accounts are charged this rate. Rate 3 includes a charge of $0.00263/kWh for transmission and distribution losses and $0.01591/kWh for O&M activities, which include military labor charges not included in the lower O&M charge used in Rate 2. Only the U.S. Post Office falls in the Rate 3 classification. Rate 4 is $0.0214/kWh higher than Rate 3 to recover base overhead charges. The Credit Union and the Barnett Bank branch facility, located on base, are the only facilities charged Rate 4. To calculate the military cost and overhead charges, cost data for the previous year are supplied by the base engineering group and used along with the average monthly electrical consumption for the previous year to calculate a cost per kilowatt-hour.

Some accounts are billed according to a constant kilowatt-hour per square-foot formula. This rate, designated as "S" in the table, is based on total square footage and constant consumption.

Although metering data are available from the base, the EUI data that were provided by FPL will be used as the basis of our analysis. This is being done to ensure consistency with any analysis done by FPL.

TABLE 3.1. Patrick AFB Electricity Use for Reimbursable Accounts

Num.	Facility	Rate	Avg/Month, kWh	Area, ft^2	EUI, kWh/ft^2-yr	Category
1364	Barnett Bank	4	7,840	2,967	31.70	DGR
Mult.	Base Exchange	2	308,210	81,707	45.27	DGR
1365	Commissary	2	371,520	84,797	52.56	GROCERY
402	Credit Union	4	11,328	2,817	48.26	DGR
1391	DRMO	2	3,000	17,704	2.03	WHS
Mult.	Hospital	1	134,701	74,071	21.72	HOSPITL
Mult.	Space Shuttle	2	33,698	--	--	--
732	Bowling Center	2	53,800	17,508	36.87	REC
424	Post Office	3	5,530	8,500	7.81	ADMIN
Mult.	Golf Course	2	45,540	8,811	62.02	CLUB
1493	Yacht Club	2	27,530	5,307	62.25	MWR
624	Florida ANG	2	13,480	7,000	23.10	ADMIN
--	Campground	2	2,160	--	--	--
967	NCO Club	2	100,116	22,833	52.62	DINING
--	AFL-CIO	S	564	--	--	--
--	Army Readiness	S	15,744	--	--	--
--	FAA	S	16,530	--	--	--
--	Military Sealift	S	3,329	--	--	--
--	DDMS	S	5,207	--	--	--
--	Aero Club	S	372	--	--	--
1659	Skeet Range	S	74	840	1.06	CLUB
--	USCG Landbased	S	1,029	--	--	--
--	DCAS	S	1,103	--	--	--
250	O'Club	S	80,067	67,592	14.21	DINING
--	Dept. of State	S	22,130	--	--	--
--	Army	S	257	--	--	--
--	Comet Club	S	6,720	--	--	--
--	USA Crim Inv	S	1,200	--	--	--
--	USA Corps Eng	S	800	--	--	--
--	NASA Corps Eng	S	3,358	--	--	--
Mult.	Capehart Hsg	1	2,355,040	1,185,847	23.83	HSG-FAM
Mult.	North Hsg	1	430,000	237,041	21.77	HSG-FAM
Mult.	Central Hsg	1	596,400	446,178	16.04	HSG-FAM

The final step in EUI development was completed as part of the final allocation of energy process. This process incorporates various factors that influence energy consumption (and EUIs) among buildings, which include weather, occupancy, construction, age, operation, and function. When using the energy balance method, all the energy consumed at the base must be accounted for and apportioned as accurately as possible among the building types and end uses. For example, solar collectors are used on the visiting officers' quarters to provide some of the DHW. The amount of hot water provided by these collectors is estimated to be 6% of the total required for all facilities falling under the "Lodging" building category. This percentage was specifically accounted for in the allocation process. Tables 3.2 and 3.3 show EUI values for both electric and fossil fuels, respectively. Information is provided by building type and end use.

TABLE 3.2. Patrick AFB Electric End-Use Intensities (EUIs)[a]

Site Bldg-Type	Regional Bldg-Type	Total sq ft	Electric Total	Metered Data	Heat	Cool	Vent	DHW	Cook	Light	Refrig.	Other
ADMIN	OFFICE	903,999	21.97	No	0.10	6.05	1.75	0.07	0.00	7.10	0.75	6.15
BRK/ADM	LODGING	325,972	25.32	No	0.50	6.40	2.50	2.82	1.60	5.90	1.50	4.10
CHAPEL	ASSEMBLY	19,588	23.40	No	0.30	6.60	1.50	0.30	0.90	6.60	1.40	5.80
CLINIC	HEALTH	9,280	41.01	No	0.52	9.90	7.80	0.99	1.00	9.60	1.20	10.00
CLUB	RESTAURANT	23,391	24.90	No	0.30	0.00	2.20	3.80	0.00	13.00	0.00	5.60
COMCATN	MISC.	87,123	21.10	No	0.30	6.60	1.50	0.30	0.00	6.60	0.00	5.80
DET-RR	WAREHOUSE	1,390	3.40	No	0.00	0.00	0.10	0.00	0.00	3.30	0.00	0.00
DGR	RETAIL	150,862	20.41	No	0.07	6.90	1.25	0.09	0.40	8.10	1.10	2.50
DINING	RESTAURANT	82,537	59.82	No	0.18	19.70	2.20	2.24	0.00	13.00	16.90	5.60
FUELDSP	MISC.	211	14.20	No	0.30	0.00	1.50	0.00	0.00	6.60	0.00	5.80
GROCERY	GROCERY	84,797	60.10	No	0.20	11.50	1.80	0.00	0.00	16.50	24.10	6.00
HANGAR	WAREHOUSE	172,563	6.73	No	0.20	1.08	0.10	0.00	0.00	3.30	0.25	1.80
HOSPITL	HEALTH	74,071	39.50	No	0.00	9.90	7.80	0.00	1.00	9.60	1.20	10.00
HOTEL	LODGING	64,060	25.50	No	0.50	6.40	2.50	3.00	1.60	5.90	1.50	4.10
HSG-FAM	RESIDENTIAL	1,873,722	18.03	No	0.53	3.05	2.50	1.29	0.31	5.90	1.50	2.95
EUT	MISC.	1,760	8.10	No	0.00	0.00	1.50	0.00	0.00	6.60	0.00	0.00
MTRPOOL	WAREHOUSE	79,586	6.00	No	0.20	0.00	0.10	0.00	0.10	3.30	0.50	1.80
MWR	MISC.	126,375	21.92	No	0.30	6.60	1.50	0.00	0.00	6.60	1.12	5.80
OTHER	MISC.	13,792	22.95	No	0.30	6.60	1.50	0.30	0.45	6.60	1.40	5.80
PLT-BLD	WAREHOUSE	17,979	11.40	No	0.20	5.40	0.20	0.00	0.00	3.30	0.50	1.80
R&D	MISC.	128,224	22.50	No	0.30	6.60	1.50	0.30	0.00	6.60	1.40	5.80
REC	MISC.	47,566	21.80	No	0.30	6.60	1.50	0.30	0.00	6.60	0.70	5.80
RESTRNT	RESTAURANT	3,641	57.81	No	0.03	19.70	2.20	0.38	0.00	13.00	16.90	5.60
SECURTY	MISC.	45,490	19.78	No	0.30	5.28	1.50	0.30	0.00	6.60	0.00	5.80
SHOP	WAREHOUSE	60,288	10.07	No	0.20	4.32	0.20	0.00	0.00	3.30	0.25	1.80
SHOP-AIR	WAREHOUSE	2,738	10.07	No	0.20	4.32	0.20	0.00	0.00	3.30	0.25	1.80
SHOP-ELC	WAREHOUSE	192,629	10.07	No	0.20	4.32	0.20	0.00	0.00	3.30	0.25	1.80
SHOP-WPN	WAREHOUSE	2,397	10.07	No	0.20	4.32	0.20	0.00	0.00	3.30	0.25	1.80
STOR-UH	WAREHOUSE	182,375	3.40	No	0.00	0.00	0.10	0.00	0.00	3.30	0.00	0.00
TERMINL	MISC.	87,168	22.50	No	0.30	6.60	1.50	0.30	0.00	6.60	1.40	5.80
TRAING	SCHOOL	39,402	13.80	No	0.02	4.30	1.40	0.08	1.50	4.50	0.80	1.20
WHS	WAREHOUSE	374,821	8.50	No	0.00	2.70	0.20	0.00	0.00	3.30	0.50	1.80
WHS-CLD	WAREHOUSE	8,567	5.80	No	0.00	0.00	0.20	0.00	0.00	3.30	0.50	1.80
Total		5,288,364										

(a) All values are kWh/sq ft-year.

TABLE 3.3. Patrick AFB Natural-Gas End-Use Intensities[a]

Site Bldg-Type	Regional Bldg-Type	Total (sq ft)	Nat. Gas Total	Metered Data	Heat	DHW	Cook
ADMIN	OFFICE	903,999	11,420	Yes	8,476	2,944	0
BRK/ADM	LODGING	325,972	0	No	0	0	0
CHAPEL	ASSEMBLY	19,588	0	No	0	0	0
CLINIC	HEALTH	9,280	16,319	Yes	9,517	6,802	0
CLUB	RESTAURANT	23,391	0	No	0	0	0
COMCATN	MISC.	87,123	0	No	0	0	0
DET-RR	WAREHOUSE	1,390	0	No	0	0	0
DGR	RETAIL	150,862	1,895	Yes	1,369	526	0
DINING	RESTAURANT	82,537	79,773	Yes	34,028	45,745	0
FUELDSP	MISC.	211	0	No	0	0	0
GROCERY	GROCERY	84,797	0	No	0	0	0
HANGAR	WAREHOUSE	172,563	0	No	0	0	0
HOSPITL	HEALTH	74,071	71,594	Yes	41,754	29,840	0
HOTEL	LODGING	64,060	0	No	0	0	0
HSG-FAM	RESIDENTIAL	1,873,722	0	No	0	0	0
HUT	MISC.	1,760	0	No	0	0	0
KITCHEN	WAREHOUSE	79,586	0	No	0	0	0
LAB-MED	MISC.	126,375	0	No	0	0	0
MTRPOOL	MISC.	13,792	0	No	0	0	0
MWR	WAREHOUSE	17,979	0	No	0	0	0
OTHER	MISC.	128,224	0	No	0	0	0
PLT-BLD	MISC.	47,566	0	No	0	0	0
R&D	RESTAURANT	3,641	296,165	Yes	70,971	95,408	129,786
REC	MISC.	45,490	0	No	0	0	0
RESTRNT	WAREHOUSE	60,288	0	No	0	0	0
SECURTY	WAREHOUSE	2,738	0	No	0	0	0
SHOP	WAREHOUSE	192,629	0	No	0	0	0
SHOP-AIR	WAREHOUSE	2,397	0	No	0	0	0
SHOP-ELC	WAREHOUSE	182,375	0	No	0	0	0
SHOP-WPN	MISC.	87,168	0	No	0	0	0
TERMINL	SCHOOL	39,402	2,328	Yes	1,649	679	0
TRAING	WAREHOUSE	374,821	0	No	0	0	0
WHS	WAREHOUSE	8,567	0	No	0	0	0
Total		5,288,364					

(a) All values are Btu/sq ft-year.

4.0 ELECTRICAL CONSUMPTION

4.1 METERING AND DATA SUMMARY

There were two sources of electricity consumption data at Patrick AFB: utility company whole-base meter readings and the reimbursable accounts that are recorded on the DEIS reports.

The substations have a kilowatt-hour meter with a demand register on each feeder. Most of the buildings owned or occupied by agencies that are required to pay their utilities (e.g., U.S. Army and USAF Exchange Services facilities like the commissary and base exchange) have meters that are read monthly. Family housing is required to reimburse SPACECOM for its utility services. The reimbursement for electricity consumption is currently based on meter readings in the Capehart and Central Wherry housing areas, while that for the North Wherry housing area is based on engineering estimates.

Tables B.1 through B.14 (see Appendix B) provide a summary of FPL metered data for the north and south substations from 1985 (base year for energy reduction requirements) through 1991. Kilowatt-hours for on-peak, off-peak, total kilowatt-hour, maximum kilowatt demand for the month, and load factor are all shown in these tables. Monthly meter readings are shown at the substation level. The reimbursable accounts (see Table 3.1) are also metered.

Generally, the north substation provides service for the industrial portion of the base and the North Wherry housing area, while the south substation provides service to the rest of the base.

4.2 FAMILY HOUSING SUMMARY

The family housing readings were compiled on a monthly basis per housing area (Capehart, South Wherry, North Wherry), providing a basis to begin estimating EUIs for all housing areas. Annual energy consumptions for 1985 through 1991 are shown in Table 4.1. These consumption values were obtained from the reimbursable account sheets, which were then entered into the DEIS reports.

TABLE 4.1. Patrick AFB Family Housing[a] Annual Electricity Consumption

Year	Consumption, kWh/yr
1985	35,822,000
1986	34,944,000
1987	37,765,000
1988	48,057,000
1989	48,048,000
1990	46,522,000
1991	41,868,000
Totals	293,026,000

(a) Capehart and Wherry Housing Areas

4.3 ELECTRICAL END-USE BREAKDOWN

The electrical end-use breakdown for Patrick AFB is shown in Table 4.2. This table includes consumption data for all industrial and housing areas.

An overall EUI is calculated for each building type as discussed in Section 3.1 and corresponding Tables 3.2 and 3.3. The "Total MWh/yr" column in Table 4.2 is computed by multiplying the total square footage by the EUI developed by FPL. The total electricity usage by end use (heating, cooling, ventilation, DHW, cooking, lighting, refrigeration, and other) is then apportioned among the end uses with a certain penetration rate applied (a percentage multiplier that is used to derate end uses if it is felt that not all of the buildings within a given classification have the particular end use in question). Pumps (sewage, water, and irrigation), exterior lighting, and T&D losses are added at the bottom of the table. Thus, all of the building categories along with three additional categories make up the total electricity consumption on the base.

To check the accuracy of this method, the previously explained energy balance method was applied. FPL reported 114,853 MWh as the total electricity consumption at Patrick AFB for 1991 Discrepancies found between the method of calculating energy use by multiplying EUI by the square footage (and summing all building categories, while accounting for pumps, exterior

TABLE 4.2. Patrick AFB Electrical Energy-Use Breakdown[a]

Site Bldg-Type	Total Buildings	Site Total (sq ft)	Total EUI (kWh/sq ft/yr)	Total (MWh/yr)	Electric Heat	Electric Cool	Electric Ventilation	Electric DHW	Electric Cook	Electric Light	Electric Refrigeration	Electric Other
ADMIN	36	903,999	21.97	19859.05	86,786	5,469,194	1,581,998	65,088	0	6,418,393	677,999	5,559,894
BRK/ADM	29	325,972	25.32	8253.61	162,986	2,086,221	814,930	919,241	521,555	1,923,235	488,958	1,336,485
CHAPEL	2	19,588	23.40	458.36	5,876	129,281	29,382	5,876	17,629	129,281	27,423	113,610
CLINIC	2	9,280	41.01	380.55	4,826	91,872	72,384	9,169	9,280	89,088	11,136	92,800
CLUB	8	23,391	24.90	582.44	7,017	0	51,460	88,086	0	304,083	0	130,990
CONCATH	15	87,123	21.10	1838.30	26,137	575,012	130,685	26,137	0	575,012	0	505,313
DET-RR	6	1,390	3.40	4.73	0	0	139	0	0	4,587	0	0
DGR	7	150,862	20.41	3079.24	10,409	1,040,948	188,578	13,879	60,345	1,221,982	165,948	377,155
DINING	3	82,537	59.82	4937.28	14,609	1,625,979	181,581	185,048	0	1,072,981	1,394,875	462,207
FUELDEP	2	211	14.20	3.00	63	6	317	0	0	1,393	0	1,224
GROCERY	1	84,797	60.10	5096.30	16,959	975,166	152,635	0	0	1,399,151	2,043,608	508,782
HANGAR	4	172,563	6.73	1161.35	34,513	186,368	17,256	0	0	569,458	43,141	310,613
HOSPITL	1	74,071	39.50	2925.80	0	733,303	577,754	0	74,071	711,082	88,885	740,710
HOTEL	18	64,060	25.50	1633.53	32,030	409,984	160,150	192,180	102,496	377,954	96,090	262,646
MSG-FAM	793	1,873,722	18.03	33783.21	993,073	5,714,052	4,684,305	2,417,101	580,854	11,054,960	2,810,583	5,527,480
NUT	2	1,760	8.10	14.26	0	0	2,640	0	0	11,616	0	0
NTRPOOL	10	79,586	6.00	477.52	15,917	0	7,959	0	7,959	262,634	39,793	143,255
NWR	14	126,375	21.92	2770.14	37,913	834,075	189,563	0	0	834,075	141,540	732,975
OTHER	27	13,792	22.95	316.53	4,138	91,027	20,688	4,138	6,206	91,027	19,309	79,994
PLT-BLD	12	17,979	11.40	204.96	3,596	97,087	3,596	0	0	59,331	8,990	32,362
R&D	7	128,224	22.50	2885.04	38,467	846,278	192,336	38,467	0	846,278	179,514	743,699
REC	6	47,566	21.80	1036.94	14,270	313,936	71,349	14,270	0	313,936	33,296	275,883
RESTRNT	3	3,641	57.81	210.49	109	71,728	8,010	1,384	0	47,333	61,533	20,390
SECURTY	10	45,490	19.78	899.79	13,647	240,187	68,235	13,647	0	300,234	0	263,842
SHOP	15	60,268	10.07	607.10	12,058	260,444	12,058	0	0	198,950	15,072	108,518
SHOP-AIR	2	2,738	10.07	27.57	548	11,828	548	0	0	9,035	685	4,928
SHOP-ELC	8	192,629	10.07	1939.77	38,526	832,157	38,526	0	0	635,676	48,157	346,732
SHOP-WPN	5	2,397	10.07	24.14	479	10,355	479	0	0	7,910	599	4,315
STOR-UN	106	182,375	3.40	620.08	0	0	18,238	0	0	601,838	0	0
TERMINL	1	87,168	22.50	1961.28	26,150	575,309	130,752	26,150	0	575,309	122,035	505,574
TRAING	2	39,402	13.80	543.71	867	169,429	55,163	3,034	59,103	177,309	31,522	47,282
WHS	29	374,821	8.50	3185.98	0	1,012,017	74,964	0	0	1,236,909	187,411	674,678
WHS-CLD	2	8,567	5.80	49.69	0	0	1,713	0	0	28,271	4,284	15,421
Pumps				1,501								
Ext. Light.				1,242								
Line Loss				10,338								
Totals:	1,188	5,288,364		114,853								

(a) All units are kWh/yr unless otherwise noted.

lighting, and T&D losses) and the figures given by FPL were reconciled by adjusting the penetration rates when additional information was obtained. Finally, to balance out the numbers exactly, any remaining discrepancy was accounted for in the T&D loss category. The total T&D loss estimate of 10,338 MWh was 9% of the total consumption, falling in the range of an estimated actual T&D loss of 5% to 10% (Dixon 1993).

4.4 LOAD PROFILE

FPL provided load profile information for both the north and south substations for the four different seasons of the year. In addition, the weekday/weekend split is shown by providing midweek data (Wednesday, except for August, which was Tuesday), along with weekend data (Saturdays). The data are in 15-min intervals showing the kilowatt demand for the whole day. Analysis of these data provides an idea of the peak shaving or reduction potential at the base. As shown in Figures C.1 through C.16 (see Appendix C), the load profile data are provided on a midnight-to-midnight basis, thus covering a 24-h period. May, August, October, and January information was provided so that seasonal differences in temperature could be analyzed to determine the actual effects on the demand profile for each substation.

One key point is that the weekday profile for the north substation is representative of a commercial or industrial load. The load shape begins to pick up between 6:00 a.m. and 8:00 a.m. during the week and then begins to taper off around 4:00 p.m. On the weekend however, the load profile is relatively constant, indicating that little activity is occurring. This is consistent with typical load profiles of this nature.

The profile for the south substation is typical of residential load types. The general trend is for the load to increase throughout the day, normally peaking around 6:00 p.m, corresponding to residents arriving home, preparing the evening meal, doing laundry, etc. After the peak, the load declines steadily throughout the evening.

5.0 GAS CONSUMPTION

5.1 METERING AND DATA SUMMARY

Information was obtained from City Gas regarding various metered buildings or areas. Included were the AFTAC, hospital, officers' club, steam plant, educational center, dental clinic, Burger King, and the base exchange. City Gas indicated that the meter readings account for all of the gas use on the base, but differ slightly (for unknown reasons) from data entered into DEIS. The meter data available from City Gas were for a 12-month period (June 1991 to May 1992). Analysis of these data indicated 238,189 therms were used on the base during this period. Figure 5.1 shows the typical monthly use of natural gas at Patrick AFB by facility. Figure 5.2 shows the monthly percentage of total gas use by facility. Note that Figure 5.2 does not illustrate the normal January through December consumption profile. The available gas consumption data were for June 1991 through May 1992.

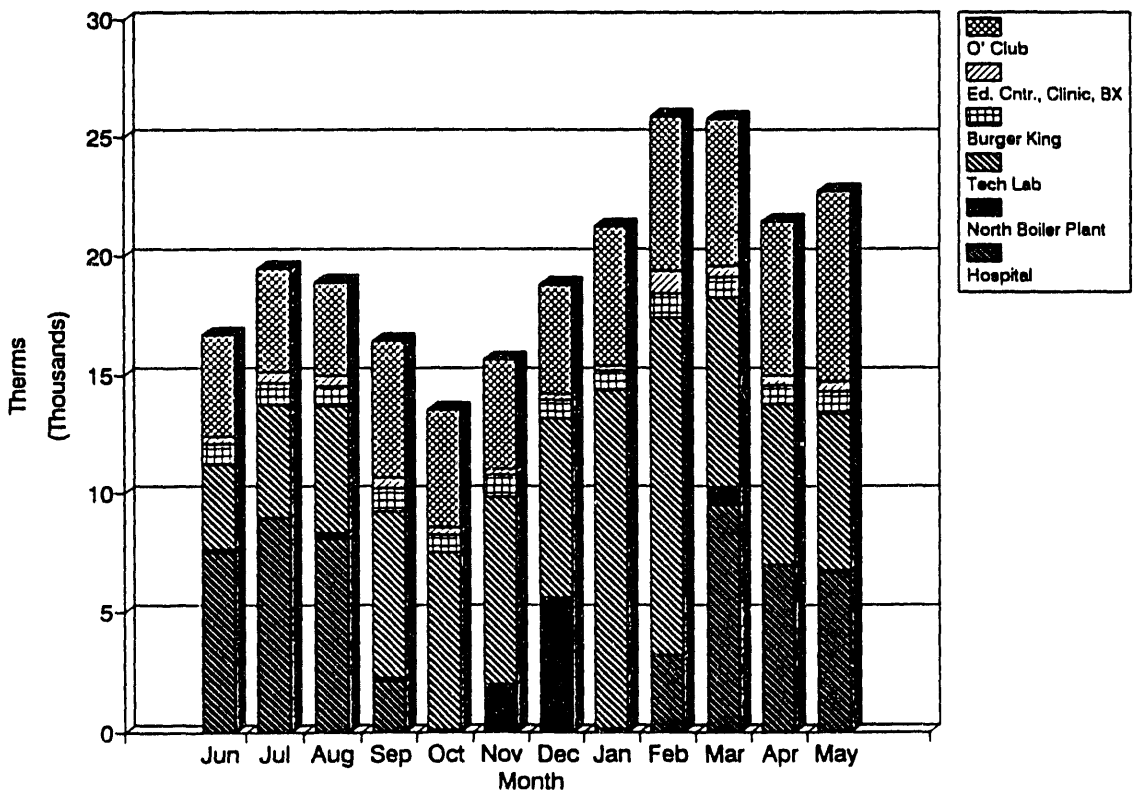

FIGURE 5.1. Patrick AFB Natural-Gas Use, 1991-1992

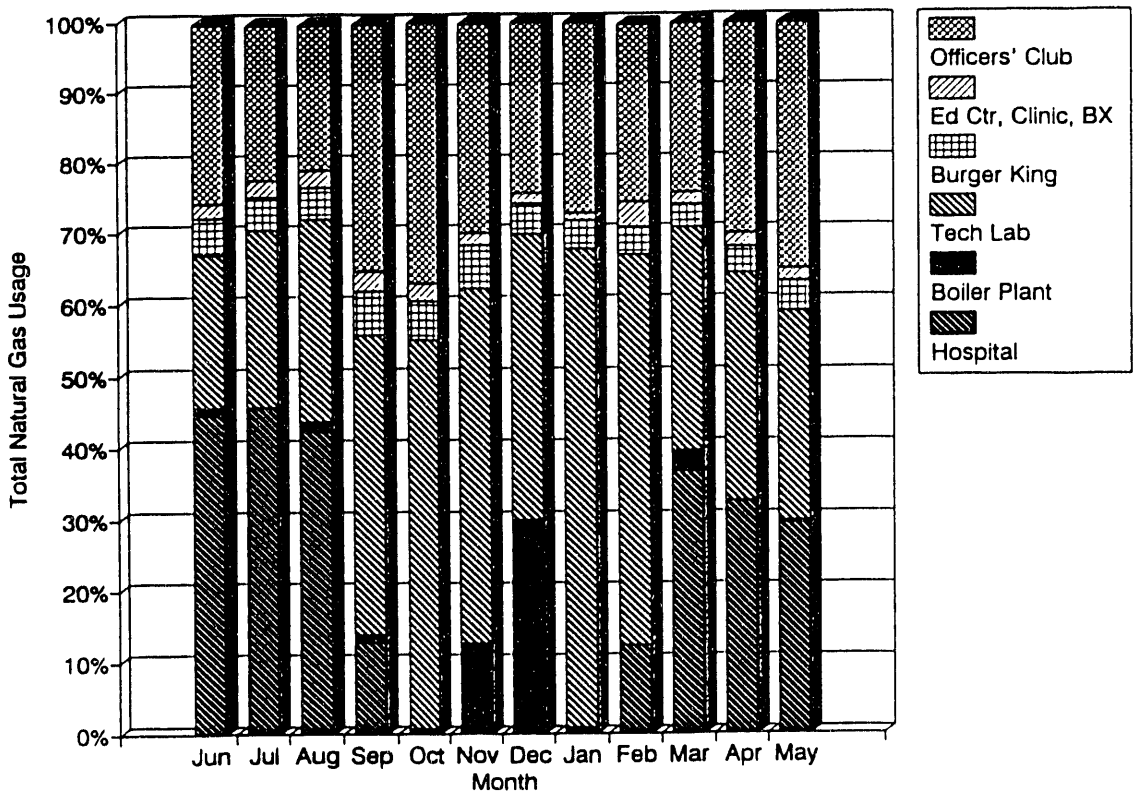

FIGURE 5.2. Patrick AFB Natural-Gas Load by Building, 1991-1992

5.2 NATURAL-GAS USE BREAKDOWN

Natural-gas use on the base is shown in Table 5.1. Although each building type is listed, only seven building types show an actual gas consumption because of the limited consumption of natural gas at Patrick AFB. Although the central plant (in the PLT-BLD building type) uses natural gas to produce steam for many facilities when it is operating, it is impossible to determine how the natural gas (British thermal units [Btus]) is allocated by end use at the buildings served; thus, it is not included in Table 5.1.

TABLE 5.1. Patrick AFB Natural-Gas Energy-Use Breakdown

Site Bldg-Type	Total Buildings	Site Total (sq ft)	Total (MBtu/yr)	Heating (MBtu/yr)	DHW (MBtu/yr)	Cooking (MBtu/yr)
ADMIN	36	903,999	10323.67	7662.46	2661.20	0.00
BRK/ADM	29	325,972	0.00	0.00	0.00	0.00
CHAPEL	2	19,588	0.00	0.00	0.00	0.00
CLINIC	2	9,280	151.44	88.32	63.12	0.00
CLUB	8	23,391	0.00	0.00	0.00	0.00
COMCATN	15	87,123	0.00	0.00	0.00	0.00
DET-RR	6	1,390	0.00	0.00	0.00	0.00
DGR	7	150,862	285.88	206.49	79.39	0.00
DINING	3	82,537	6584.22	2808.57	3775.66	0.00
FUELDSP	2	211	0.00	0.00	0.00	0.00
GROCERY	1	84,797	0.00	0.00	0.00	0.00
HANGAR	4	172,563	0.00	0.00	0.00	0.00
HOSPITL	1	74,071	5303.04	3092.75	2210.29	0.00
HOTEL	18	64,060	0.00	0.00	0.00	0.00
HSG-FAM	793	1,873,722	0.00	0.00	0.00	0.00
HUT	2	1,760	0.00	0.00	0.00	0.00
MTRPOOL	10	79,586	0.00	0.00	0.00	0.00
MWR	14	126,375	0.00	0.00	0.00	0.00
OTHER	27	13,792	0.00	0.00	0.00	0.00
PLT-BLD	12	17,979	0.00	0.00	0.00	0.00
R&D	7	128,224	0.00	0.00	0.00	0.00
REC	6	47,566	0.00	0.00	0.00	0.00
RESTRNT	3	3,641	1078.34	258.40	347.38	472.55
SECURTY	10	45,490	0.00	0.00	0.00	0.00
SHOP	15	60,288	0.00	0.00	0.00	0.00
SHOP-AIR	2	2,738	0.00	0.00	0.00	0.00
SHOP-ELC	8	192,629	0.00	0.00	0.00	0.00
SHOP-WPN	5	2,397	0.00	0.00	0.00	0.00
STOR-UH	106	182,375	0.00	0.00	0.00	0.00
TERMINL	1	87,168	0.00	0.00	0.00	0.00
TRAING	2	39,402	91.73	64.96	26.76	0.00
WHS	29	374,821	0.00	0.00	0.00	0.00
WHS-CLD	2	8,567	0.00	0.00	0.00	0.00
Totals:	1,188	5,288,364	23,818			

6.0 REGIONAL EUI INFORMATION

Tables A.1 through A.11 reflect electrical EUIs. Tables A.12 through A.22 reflect the natural-gas and fuel oil EUIs. Various sources of information were considered, which included EPA, Gulf Power, Georgia Power, and FPL for the electrical EUIs. All of the sources are shown to indicate that some variation exists between them. These numbers are not absolute values; they are broad estimates for the various building classifications. However, for purposes of this report, the FPL EUI numbers were used to maintain consistency with any work that FPL may do in connection with, or related to, these efforts. EPA, Gulf Power, and Georgia Power were the sources for the natural-gas and fuel oil EUIs. Average EUI values were determined for the various sources of natural-gas and fuel oil information, indicating a large variation between the EUIs. Average values were used to obtain the EUI numbers that were used throughout the analysis.

The broad classifications of building types shown in Tables A.1 through A.22 are a reflection of the way utilities, or other providers of this type of information, report their findings. Therefore, the building classifications shown in Table 1.2 were mapped to correspond to the broad classifications shown in Tables A.1 through A.22. The criterion used to map the facilities was mainly one of functionality. The more specific classifications in Table 1.2 were compared to the EUI source information classifications, and relationships were noted. For example, the hospital would fall under the health category, administration buildings would be mapped with office, etc. Suitable categories were more difficult to find for facilities such as pump houses, communications, and huts, so these facilities were grouped together under Miscellaneous.

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APPENDIX A

BASIC REGIONAL INFORMATION USED TO DETERMINE ENERGY-USE INTENSITY (EUI) VALUES

TABLE A.1. Office Electricity Baseline Development Notes

EUI Development (kWh/ft^2-yr)

	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	2.2	5.50	2.50	.80	.60	6.70	.30	3.60	22.20
GULF POWER	0.66	3.51	0.70	.38	.81	2.98	.11	1.51	10.66
GEORGIA POWER	1.64	4.30	3.00	.70	.23	8.12	.24	3.30	21.53
FPL[b]	0.20	6.05	1.75	.15	.40	7.10[c]	.75	6.15	22.55

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for office category.

(a) Defined as miscellaneous EUI.
(b) Average EUI value of large and small office.
(c) Light is combined value of indoor and outdoor.

TABLE A.2. Restaurant Electricity Baseline Development Notes

EUI Development (kWh/ft^2-yr)

	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	2.30	4.30	1.90	3.90	7.20	5.20	5.50	2.10	32.40
GULF POWER	0.83	13.97	3.98	3.55	0.75	5.83	9.63	3.91	42.45
GEORGIA POWER	0.99	22.52	3.33	2.27	10.82	10.60	17.96	4.60	73.09
FPL	.30	19.70	2.20	3.80	23.10	13.0[b]	16.90	5.60	84.60

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for restaurant category.

(a) Defined as miscellaneous EUI.
(b) Light is combined value of indoor and outdoor.

TABLE A.3. Retail Electricity Baseline Development Notes

	EUI Development (kWh/ft^2-yr)								
	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	2.30	3.10	1.40	0.60	0.90	6.10	0.70	1.40	16.50
GULF POWER	0.96	3.95	0.99	0.46	0.01	4.26	1.41	3.51	15.55
GEORGIA POWER	1.62	4.75	1.80	0.89	0.19	6.75	0.56	2.79	19.35
FPL[b]	0.15	6.90	1.25	0.25	0.40	8.1[c]	1.10	2.50	20.60

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for retail category.

(a) Defined as miscellaneous EUI.
(b) Average EUI value of large and small retail.
(c) Light is combined value of indoor and outdoor.

TABLE A.4. Grocery Electricity Baseline Development Notes

	EUI Development (kWh/ft^2-yr)								
	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	3.70	4.70	3.80	0.80	2.10	15.30	28.70	2.30	61.40
GULF POWER	0.75	10.80	2.49	0.49	0.14	10.73	16.35	2.99	44.74
GEORGIA POWER	0.32	8.23	2.23	0.69	0.77	13.23	24.00	2.71	52.18
FPL	.20	11.50	1.80	0.40	2.80	16.5[b]	24.10	6.00	63.30

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for grocery category.

(a) Defined as miscellaneous EUI.
(b) Light is combined value of indoor and outdoor.

TABLE A.5. Warehouse Electricity Baseline Development Notes

	EUI Development (kWh/ft^2-yr)								
	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	1.9	1.8	1.3	0.6	-	3.8	8.6	1.2	19.2
GULF POWER	-	-	-	-	-	-	-	-	-
GEORGIA POWER	0.03	1.23	0.73	0.23	0.05	1.95	0.46	0.9	5.58
FPL(b)	0.20	5.40	0.20	0.0	0.20	3.3[c]	0.50	1.8	11.60

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for warehouse category.

(a) Defined as miscellaneous EUI.
(b) Non-refrigerated EUI values used.
(c) Light is combined value of indoor and outdoor.

TABLE A.6. School Electricity Baseline Development Notes

	EUI Development (kWh/ft^2-yr)								
	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	4.2	1.30	0.60	1.10	2.10	4.20	0.40	0.60	14.5
GULF POWER	0.26	2.99	0.69	0.39	0.26	2.63	0.45	0.71	8.38
GEORGIA POWER	0.49	1.79	0.76	0.26	0.27	2.79	0.70	1.44	8.5
FPL	0.20	4.30	1.40	0.70	1.50	4.5[b]	0.80	1.20	14.60

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for school category.

(a) Defined as miscellaneous EUI.
(b) Light is combined value of indoor and outdoor.

TABLE A.7. Health Electricity Baseline Development Notes

	EUI Development (kWh/ft^2-yr)								
	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	2.7	6.5	2.4	2.5	0.4	5.9	0.6	2.4	23.4
GULF POWER	1.2	8.79	1.97	0.5	1.06	6.28	0.95	4.4	25.15
GEORGIA POWER	0.97	6.01	2.58	0.42	0.96	7.49	1.54	4.23	24.2
FPL(c)	2.0	9.90	7.80	3.80	1.0	9.6[b]	1.20	1.20	45.3

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for health category.

(a) Defined as miscellaneous EUI.
(b) Light is combined value of indoor and outdoor.
(c) Hospital data from FPL was used for health.

TABLE A.8. Lodging Electricity Baseline Development Notes

	EUI Development (kWh/ft^2-yr)								
	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	3	4.9	1.4	5.8	6.2	5.3	1.1	2.4	30.1
GULF POWER	3.35	5.82	1.15	0.75	0.68	5.17	0.75	4.45	22.12
GEORGIA POWER	2.22	4.02	0.95	0.5	0.34	3.49	1.34	2.72	15.58
FPL	0.5	6.40	2.50	3.0	1.6	5.9[b]	1.50	4.10	25.5

EPA/SERC, GULF POWER, and FPL data for lodging category. GEORGIA POWER data for hotel/motel category.

(a) Defined as miscellaneous EUI.
(b) Light is combined value of indoor and outdoor.

TABLE A.9. Miscellaneous Buildings Electricity Baseline Development Notes

	EUI Development (kWh/ft^2-yr)								
	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	4.5	2.7	1.3	0.4	0.7	3.1	0.9	1.3	14.9
GULF POWER	2.0	12.04	6.92	0.63	0.15	12.2	1.15	11.57	46.66
GEORGIA POWER	0.23	3.3	1.18	0.28	0.25	3.62	1.07	2.39	12.32
FPL	0.3	6.60	1.50	0.3	0.9	6.6[b]	1.40	5.80	23.4

EPA/SERC, GULF POWER, GEORGIA POWER, and FPL data for miscellaneous building category.

(a) Defined as miscellaneous EUI.
(b) Light is combined value of indoor and outdoor.

TABLE A.10. Church/Assembly Building Electricity Baseline Development Notes

	EUI Development (kWh/ft^2-yr)								
	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
GULF POWER	0.51	2.27	0.23	0.61	-	2.18	0.02	0.45	6.27
FPL(c)	0.3	6.60	1.50	0.3	0.9	6.6[b]	1.40	5.80	23.4

GULF POWER and FPL data for church/assembly building.

(a) Defined as miscellaneous EUI.
(b) Light is combined value of indoor and outdoor.
(c) Misc bldg EUI value, which includes church, is used for FPL data.

TABLE A.11. Residential Single-Family Electricity Baseline Development Notes

	EUI Development (kWh/ft^2-yr)								
	Heat	Cool	Vent	DHW	Cook	Light	Ref	Other[a]	Total
EPA/SERC	5.2	2.15	-	2.55	0.6	-	-	2.61	13.11
GEORGIA POWER	3.7	1.6	-	2.2	0.54	-	-	3.0	11.04
RECS(b)	-	-	-	-	-	-	-	-	10.92
FPL	0.53	3.05	-	1.29	0.31	-	-	2.95	8.13

All data available only as unit energy consumption (UEC). EUI calculated assumes 1500 ft^2/single family residence for EPA/SERC, GEORGIA POWER and RECS. FPL assumes 1597 ft^2/single family residence - detached.

(a) Other category includes refrigeration, lighting, and residual appliances.
(b) RECS data is for South Atlantic Region.

TABLE A.12. Office Fossil Fuel Baseline Development Notes

EUI Development (kBtu/ft^2-yr)

FUEL TYPE: Natural Gas

	Heating	DWH	Cooking	Cooling	Other[a]	Total
EPA/SERC	46.5	14.6	0.9	277.8	0.6	340.4
GULF POWER	14.92	1.02	-	-	0.38	16.32
GEORGIA POWER	26.86	5.84	0.31	1.44	3.3	37.76

FUEL TYPE: Fuel Oil

	Heating	DHW	Cooking	Cooling	Other[a]	Total
EPA/SERC	37.7	14.7	-	-	-	52.4
GULF POWER	3.65	-	-	-	-	3.65
GEORGIA POWER	1.18	0.34	-	-	-	1.52

All EUI data for office category.

(a) Defined as miscellaneous EUI.

TABLE A.13. Restaurant Fossil Fuel Baseline Development Notes

EUI Development (kBtu/ft^2-yr)

FUEL TYPE: Natural Gas

	Heating	DWH	Cooking	Cooling	Other[a]	Total
EPA/SERC	61	35.9	43.4	41.1	-	181.4
GULF POWER	23.44	47.65	0.85	-	0.39	72.33
GEORGIA POWER	37.94	80.97	90.88	5.1	2.03	216.92

FUEL TYPE: Fuel Oil

	Heating	DHW	Cooking	Cooling	Other[a]	Total
EPA/SERC	5.8	30.6	-	-	-	36.4
GULF POWER	0.05	0.84	-	-	-	0.89
GEORGIA POWER	-	1.06	-	-	-	1.06

All EUI data for restaurant category.

(a) Defined as miscellaneous EUI.

TABLE A.14. Retail Fossil Fuel Baseline Development Notes

EUI Development (kBtu/ft^2-yr)

FUEL TYPE: Natural Gas

	Heating	DWH	Cooking	Cooling	Other[a]	Total
EPA/SERC	43.8	18.6	2.2	67.2	-	131.8
GULF POWER	0.41	0.13	-	-	1.15	1.69
GEORGIA POWER	20.32	4.13	0.24	0.99	2.02	27.7

FUEL TYPE: Fuel Oil

	Heating	DHW	Cooking	Cooling	Other[a]	Total
EPA/SERC	41.1	99.4	-	-	-	140.5
GULF POWER	0.1	-	-	-	-	0.1
GEORGIA POWER	0.92	-	-	-	-	0.92

All EUI data for retail category.

(a) Defined as miscellaneous EUI.

TABLE A.15. Grocery Fossil Fuel Baseline Development Notes

EUI Development (kBtu/ft^2-yr)

FUEL TYPE: Natural Gas

	Heating	DWH	Cooking	Cooling	Other[a]	Total
EPA/SERC	214.1	57.8	107	147.2	-	526.1
GULF POWER	22.29	0.52	0.31	-	0.55	23.67
GEORGIA POWER	10.65	2.97	3.27	-	-	16.89

FUEL TYPE: Fuel Oil

	Heating	DHW	Cooking	Cooling	Other[a]	Total
EPA/SERC	47.8	37.6	-	-	-	85.4
GULF POWER	1.94	0.02	-	-	-	1.96
GEORGIA POWER	0.41	0.5	-	-	-	0.91

All EUI data for grocery category.

(a) Defined as miscellaneous EUI.

TABLE A.16. Warehouse Fossil Fuel Baseline Development Notes

EUI Development (kBtu/ft^2-yr)

FUEL TYPE: Natural Gas

	Heating	DWH	Cooking	Cooling	Other[a]	Total
EPA/SERC	31.3	8.6	-	11.7	1.3	52.9
GULF POWER	-	-	-	-	-	-
GEORGIA POWER	9.66	3.63	0.34	4.39	-	18.02

FUEL TYPE: Fuel Oil

	Heating	DHW	Cooking	Cooling	Other[a]	Total
EPA/SERC	89.2	108.4	-	-	-	197.6
GULF POWER	-	-	-	-	-	-
GEORGIA POWER	0.17	-	-	-	-	0.17

All EUI data for warehouse category.

(a) Defined as miscellaneous EUI.

TABLE A.17. School Fossil Fuel Baseline Development Notes

EUI Development (kBtu/ft^2-yr)

FUEL TYPE: Natural Gas

	Heating	DWH	Cooking	Cooling	Other[a]	Total
EPA/SERC	37.3	18.1	4.5	8.4	1.8	70.1
GULF POWER	14.32	3.52	0.09	-	0.24	18.17
GEORGIA POWER	25.98	10.35	5.78	0.195	2.89	45.19

FUEL TYPE: Fuel Oil

	Heating	DHW	Cooking	Cooling	Other[a]	Total
EPA/SERC	78.5	32	-	-	-	110.5
GULF POWER	0.01	-	-	-	-	0.01
GEORGIA POWER	1.18	0.12	-	-	-	1.3

All EUI data for school category.

(a) Defined as miscellaneous EUI.

TABLE A.18. Health Fossil Fuel Baseline Development Notes

EUI Development (kBtu/ft^2-yr)

FUEL TYPE: Natural Gas

	Heating	DWH	Cooking	Cooling	Other[a]	Total
EPA/SERC	198.6	40.7	4.2	65.7	8.1	317.3
GULF POWER	30.92	16.43	5.54	0.99	9.68	63.56
GEORGIA POWER	38.8	17.61	10.99	7.65	9.97	85.02

FUEL TYPE: Fuel Oil

	Heating	DHW	Cooking	Cooling	Other[a]	Total
EPA/SERC	53.2	39.8	-	-	-	93
GULF POWER	0.11	0.03	-	-	-	0.14
GEORGIA POWER	0.83	0.69	-	-	-	1.52

All EUI data for health category.

(a) Defined as miscellaneous EUI.

TABLE A.19. Lodging Fossil Fuel Baseline Development Notes

EUI Development (kBtu/ft^2-yr)

FUEL TYPE: Natural Gas

	Heating	DWH	Cooking	Cooling	Other[a]	Total
EPA/SERC	108.1	24.8	15.2	9.6	3.8	161.5
GULF POWER	5.09	14.52	3.87	0.68	10.27	34.43
GEORGIA POWER	16.55	16.46	8.36	4.88	14.81	61.06

FUEL TYPE: Fuel Oil

	Heating	DHW	Cooking	Cooling	Other[a]	Total
EPA/SERC	43.9	29	-	-	-	72.9
GULF POWER	0.01	0.01	-	-	-	0.02
GEORGIA POWER	0.65	1.73	-	-	-	2.36

All EUI data for lodging category.

(a) Defined as miscellaneous EUI.

TABLE A.20. Miscellaneous Fossil Fuel Baseline Development Notes

EUI Development (kBtu/ft^2-yr)

FUEL TYPE: Natural Gas

	Heating	DWH	Cooking	Cooling	Other[a]	Total
EPA/SERC	39.6	7.6	2.9	29.7	3.1	82.9
GULF POWER	0.48	0.38	-	-	3.56	3.56
GEORGIA POWER	9.87	14.2	7.36	0.91	7.63	39.97

FUEL TYPE: Fuel Oil

	Heating	DHW	Cooking	Cooling	Other[a]	Total
EPA/SERC	56.3	6.8	-	-	-	63.1
GULF POWER	-	-	-	-	-	-
GEORGIA POWER	1.11	0.1	-	-	-	1.12

All EUI data for miscellaneous category.

(a) Defined as miscellaneous EUI.

TABLE A.21. Church/Assembly Fossil Fuel Baseline Development Notes

EUI Development (kBtu/ft^2-yr)

FUEL TYPE: Natural Gas

	Heating	DWH	Cooking	Cooling	Other[a]	Total
GULF POWER	11.84	1.4	0.01	-	0.72	13.97

All EUI data for Church/Assembly category.

(a) Defined as miscellaneous EUI.

TABLE A.22. Single-Family Residence Fossil Fuel Baseline Development Notes

EUI Development (kBtu/ft^2-yr)

FUEL TYPE: Natural Gas

	Heating	DWH	Cooking	Cooling	Other	Total
EPA/SERC	22.6	13.5	5.5	-	-	41.6
RECS(a)	-	-	-	-	-	70.3

FUEL TYPE: Fuel Oil

	Heating	DHW	Cooking	Cooling	Other	Total
EPA/SERC	22.4	13.4	-	-	-	35.8
RECS(a)	-	-	-	-	-	67.4

All data available only as unit energy consumption (UEC). EUI calculated assumes 1500 ft^2/single-family residence.

(a) RECS data is for South Atlantic Region.

APPENDIX B

SUMMARY OF FLORIDA POWER & LIGHT METERED DATA FOR THE NORTH AND SOUTH SUBSTATIONS FOR 1985-1991

TABLE B.1. Florida Power & Light Electric Meter Readings
North Substation - 1985

Month	kWh On-Peak	kWh Off-Peak	kWh Total	Max kW	Load Factor
JAN	611,715	1,761,129	2,372,844	4,838	65.9%
FEB	569,528	1,639,672	2,209,200	4,919	60.4%
MAR	753,860	1,606,540	2,360,400	6,013	56.4%
APR	796,784	1,698,016	2,494,800	6,411	54.0%
MAY	1,045,966	1,978,034	3,024,000	7,525	57.7%
JUN	1,277,292	2,687,508	3,964,800	10,030	54.9%
JUL	1,491,076	3,137,324	4,628,400	10,503	61.2%
AUG	1,601,767	3,505,433	5,107,200	10,473	63.5%
SEP	1,469,097	3,100,503	4,569,600	10,231	62.0%
OCT	1,396,962	2,777,838	4,174,800	9,939	58.3%
NOV	834,276	2,223,324	3,057,600	7,137	57.6%
DEC	671,338	1,949,462	2,620,800	6,401	55.0%
TOTALS:	12,519,661	28,064,783	40,584,444		

TABLE B.2. Florida Power & Light Electric Meter Readings
South Substation - 1985

Month	kWh On-Peak	kWh Off-Peak	kWh Total	Max kW	Load Factor
JAN	1,287,015	3,761,726	5,048,741	9,225	73.6%
FEB	1,184,145	3,461,055	4,645,200	9,379	66.6%
MAR	1,178,047	3,215,153	4,393,200	8,936	70.6%
APR	1,345,557	3,198,843	4,544,400	8,623	73.2%
MAY	1,776,852	3,607,548	5,384,400	9,678	79.9%
JUN	2,035,339	4,432,661	6,468,000	12,358	72.7%
JUL	1,700,914	3,750,686	5,451,600	10,629	71.2%
AUG	1,861,751	4,354,249	6,216,000	10,584	76.5%
SEP	1,672,239	3,661,761	5,334,000	10,327	71.7%
OCT	1,923,387	3,897,813	5,821,200	11,642	69.4%
NOV	1,501,602	4,210,398	5,712,000	11,174	68.7%
DEC	1,224,118	3,664,682	4,888,800	10,574	62.1%
TOTALS:	18,690,966	45,216,575	63,907,541		

TABLE B.3. Florida Power & Light Electric Meter Readings
North Substation - 1986

Month	kWh On-Peak	kWh Off-Peak	kWh Total	Max kW	Load Factor
JAN	549,622	1,642,778	2,192,400	4,470	63.9%
FEB	565,881	1,475,319	2,041,200	4,939	59.4%
MAR	568,953	1,505,847	2,074,800	5,413	55.1%
APR	782,984	1,619,416	2,402,400	6,597	50.6%
MAY	963,976	2,118,824	3,082,800	6,698	59.9%
JUN	1,090,396	2,202,404	3,292,800	7,671	61.7%
JUL	1,187,582	2,500,018	3,687,600	7,953	64.4%
AUG	1,206,962	2,690,638	3,897,600	7,757	65.4%
SEP	1,160,024	2,510,776	3,670,800	7,857	64.9%
OCT	1,219,199	2,544,001	3,763,200	8,865	61.0%
NOV	978,783	2,591,217	3,570,000	7,792	59.7%
DEC	747,140	2,201,260	2,948,400	7,137	55.5%
TOTALS:	11,021,502	25,602,498	36,624,000		

TABLE B.4. Florida Power & Light Electric Meter Readings
South Substation - 1986

Month	kWh On-Peak	kWh Off-Peak	kWh Total	Max kW	Load Factor
JAN	1,189,241	3,539,959	4,729,200	9,531	64.6%
FEB	1,222,954	3,128,246	4,351,200	11,063	56.5%
MAR	1,184,811	3,090,789	4,275,600	9,909	62.0%
APR	1,280,455	2,432,345	3,712,800	8,835	58.4%
MAY	1,585,687	3,101,513	4,687,200	10,463	58.3%
JUN	2,000,081	4,199,119	6,199,200	12,242	72.8%
JUL	2,160,971	4,670,979	6,831,950	12,610	75.2%
AUG	2,203,259	5,101,237	7,304,496	12,605	75.5%
SEP	2,160,232	4,814,005	6,974,237	12,721	76.1%
OCT	1,931,900	4.074,100	6,006,000	12,671	68.1%
NOV	1,620,121	4,621,079	6,241,200	15,306	53.1%
DEC	1,306,990	3,959,810	5,266,800	11,108	63.7%
TOTALS:	19,846,702	46,733,181	66,579,883		

TABLE B.5. Florida Power & Light Electric Meter Readings
North Substation - 1987

Month	kWh On-Peak	kWh Off-Peak	kWh Total	Max kW	Load Factor
JAN	702,936	2,119,464	2,822,400	5,741	64.0%
FEB	727,312	1,943,888	2,671,200	5,862	65.5%
MAR	735,487	1,952,513	2,688,000	6,154	62.8%
APR	738,962	1,562,638	2,301,600	7,122	46.4%
MAY	1,085,853	2,383,347	3,469,200	6,905	63.4%
JUN	979,782	1,962,814	2,942,596	7,444	56.8%
JUL	892,907	1,887,493	2,780,400	6,310	57.4%
AUG	1,005,149	1,901,251	2,906,400	6,512	62.0%
SEP	945,305	1,868,695	2,814,000	6,416	60.9%
OCT	646,715	1,545,345	2,192,060	5,836	50.5%
NOV	453,747	1,084,241	1,537,988	4,571	48.3%
DEC	595,521	1,638,879	2,234,400	6,184	47.5%
TOTALS:	9,509,676	21,850,568	31,360,244		

TABLE B.6. Florida Power & Light Electric Meter Readings
South Substation - 1987

Month	kWh On-Peak	kWh Off-Peak	kWh Total	Max kW	Load Factor
JAN	1,126,024	3,393,176	4,519,200	8,845	66.5%
FEB	1,153,737	2,962,263	4,116,000	9,445	62.6%
MAR	1,118,855	2,921,545	4,040,400	8,412	69.0%
APR	1,408,632	3,303,768	4,712,400	9,858	68.7%
MAY	1,912,874	4,412,326	6,325,200	11,290	70.7%
JUN	2,118,534	4,517,466	6,636,000	12,671	75.2%
JUL	2,175,002	5,376,598	7,551,600	12,943	76.0%
AUG	2,433,483	5,134,917	7,568,400	13,472	78.0%
SEP	2,273,070	5,127,330	7,400,400	13,250	77.6%
OCT	1,848,060	4,367,940	6,216,000	12,600	66.3%
NOV	1,713,985	4,418,015	6,132,000	14,344	61.4%
DEC	1,335,421	3,754,979	5,090,400	9,102	77.7%
TOTALS:	20,617,677	49,690,323	70,308,000		

TABLE B.7. Florida Power & Light Electric Meter Readings
North Substation - 1988

Month	kWh On-Peak	kWh Off-Peak	kWh Total	Max kW	Load Factor
JAN	659,327	2,003,473	2,662,800	6,824	49.3%
FEB	894,805	2,381,195	3,276,000	7,245	62.8%
MAR	1,006,856	2,764,744	3,771,600	8,419	64.4%
APR	1,431,562	3,381,638	4,813,200	10,375	60.4%
MAY	1,591,603	3,221,597	4,813,200	10,828	63.9%
JUN	1,614,646	3,601,754	5,216,400	10,972	66.0%
JUL	1,698,503	4,080,697	5,779,200	11,476	65.6%
AUG	1,352,271	2,872,929	4,225,200	11,292	53.8%
SEP	1,055,162	2,397,238	3,452,400	6,764	64.4%
OCT	947,582	1,908,418	2,856,000	6,683	59.4%
NOV	769,353	2,195,847	2,965,200	7,600	54.2%
DEC	613,953	1,862,069	2,476,022	6,303	51.2%
TOTALS:	13,635,623	32,671,599	46,307,222		

TABLE B.8. Florida Power & Light Electric Meter Readings
South Substation - 1988

Month	kWh On-Peak	kWh Off-Peak	kWh Total	Max kW	Load Factor
JAN	1,211,190	3,896,010	5,107,200	9,309	69.3%
FEB	1,148,881	2,975,519	4,124,400	9,178	62.4%
MAR	912,880	2,304,320	3,217,200	7,580	61.0%
APR	1,098,294	2,706,906	3,805,200	8,749	56.6%
MAY	1,304,518	2,643,482	3,948,000	9,541	59.5%
JUN	1,524,189	3,314,211	4,838,400	9,672	69.5%
JUL	1,600,865	3,959,935	5,560,800	9,823	73.7%
AUG	2,027,093	4,356,907	6,384,000	13,714	66.9%
SEP	2,487,358	6,038,642	8,526,000	15,574	69.1%
OCT	2,122,329	4,345,671	6,468,000	13,658	65.8%
NOV	1,523,126	4,272,874	5,796,000	11,786	68.3%
DEC	1,315,826	4,107,157	5,422,983	10,408	67.8%
TOTALS:	18,276,549	44,921,634	63,198,183		

TABLE B.9. Florida Power & Light Electric Meter Readings
North Substation - 1989

Month	kWh On-Peak	kWh Off-Peak	kWh Total	Max kW	Load Factor
JAN	619,311	1,766,289	2,385,600	5,688	58.3%
FEB	681,998	1,821,202	2,503,200	6,111	56.9%
MAR	778,757	2,362,843	3,141,600	10,042	42.0%
APR	1,406,823	3,019,977	4,426,800	10,072	63.1%
MAY	1,571,141	3,233,659	4,804,800	11,017	62.7%
JUN	1,733,105	4,071,295	5,804,400	11,554	65.4%
JUL	1,782,692	3,912,508	5,695,200	12,010	65.9%
AUG	1,892,698	3,928,502	5,821,200	11,902	67.9%
SEP	1,727,803	4,202,597	5,930,400	12,083	63.9%
OCT	1,735,951	3,606,449	5,342,400	11,721	63.3%
NOV	1,203,458	3,492,142	4,695,600	10,463	58.4%
DEC	959,915	2,728,378	3,688,293	9,803	52.3%
TOTALS:	15,133,737	39,105,756	54,239,493		

TABLE B.10. Florida Power & Light Electric Meter Readings
South Substation - 1989

Month	kWh On-Peak	kWh Off-Peak	kWh Total	Max kW	Load Factor
JAN	1,320,341	3,795,259	5,115,600	9,521	74.6%
FEB	1,461,736	3,897,464	5,359,200	10,886	68.4%
MAR	1,272,048	3,767,952	5,040,000	10,332	65.6%
APR	747,084	1,621,716	2,368,800	7,666	44.4%
MAY	776,611	1,751,789	2,528,400	8,376	43.4%
JUN	1,353,918	3,190,482	4,544,400	9,153	64.6%
JUL	1,596,956	3,476,644	5,073,600	9,521	74.0%
AUG	1,739,720	3,569,080	5,308,800	10,146	72.7%
SEP	1,733,619	4,213,581	5,947,200	12,721	60.9%
OCT	1,559,288	3,211,912	4,771,200	10,403	63.7%
NOV	1,039,339	3,043,061	4,082,400	8,664	61.4%
DEC	1,011,583	2,979,770	3,991,353	13,880	39.9%
TOTALS:	15,612,243	38,518,710	54,130,953		

TABLE B.11. Florida Power & Light Electric Meter Readings
North Substation - 1990

Month	kWh On-Peak	kWh Off-Peak	kWh Total	Max kW	Load Factor
JAN	994,233	2,878,167	3,872,400	9,100	59.1%
FEB	1,089,396	3,261,804	4,351,200	9,601	60.9%
MAR	1,091,949	3,062,214	4,154,163	10,045	59.4%
APR	1,333,413	2,883,387	4,216,800	10,216	59.3%
MAY	1,221,951	2,448,849	3,670,800	8,558	59.6%
JUN	1,302,134	3,023,866	4,326,000	9,233	61.0%
JUL	1,276,971	2,805,429	4,082,400	9,236	61.4%
AUG	1,266,048	2,824,752	4,090,800	8,210	64.9%
SEP	1,158,279	2,588,121	3,746,400	8,185	65.8%
OCT	1,186,849	2,458,751	3,645,600	7,878	64.3%
NOV	838,221	2,378,979	3,217,200	7,497	54.2%
DEC	798,441	2,284,359	3,082,800	8,061	53.1%
TOTALS:	13,557,885	32,898,678	46,456,563		

TABLE B.12. Florida Power & Light Electric Meter Readings
South Substation - 1990

Month	kWh On-Peak	kWh Off-Peak	kWh Total	Max kW	Load Factor
JAN	924,157	2,553,443	3,477,600	7,515	64.3%
FEB	949,743	2,763,057	3,712,800	8,150	61.2%
MAR	942,684	2,476,116	3,418,800	7,646	64.2%
APR	1,165,016	2,598,184	3,763,200	8,810	61.4%
MAY	1,956,596	4,066,204	6,022,800	12,832	65.2%
JUN	2,005,172	4,840,828	6,846,000	12,136	73.5%
JUL	2,025,707	4,450,693	6,476,400	14,530	61.9%
AUG	2,325,504	5,343,696	7,669,200	13,038	76.6%
SEP	2,099,445	4,847,355	6,946,800	13,038	76.6%
OCT	2,192,125	4,653,875	6,846,000	12,519	76.0%
NOV	1,418,398	4,067,178	5,485,576	10,685	64.8%
DEC	1,203,893	3,315,307	4,519,200	9,768	64.3%
TOTALS:	19,208,440	45,975,936	65,184,376		

TABLE B.13. Florida Power & Light Electric Meter Readings
North Substation - 1991

Month	kWh On-Peak	kWh Off-Peak	kWh Total	Max kW	Load Factor
JAN	786,656	2,447,344	3,234,000	7,071	59.6%
FEB	790,126	2,186,146	2,976,272	7,326	58.4%
MAR	927,744	2,650,656	3,578,400	9,702	53.0%
APR	1,230,076	2,726,324	3,956,400	9,737	58.4%
MAY	1,446,146	3,005,854	4,452,000	10,020	63.8%
JUN	1,495,826	3,531,716	5,027,542	10,614	61.7%
JUL	1,584,073	3,464,327	5,048,400	10,793	65.0%
AUG	1,748,491	3,946,709	5,695,200	12,116	61.2%
SEP	1,770,130	3,883,070	5,653,200	12,038	65.2%
OCT	1,283,973	2,655,627	3,939,600	10,959	49.9%
NOV	910,578	2,499,822	3,410,400	7,550	58.8%
DEC	836,083	2,448,317	3,284,400	7,633	56.0%
TOTALS:	14,809,902	35,445,912	50,255,814		

TABLE B.14. Florida Power & Light Electric Meter Readings
South Substation - 1991

Month	kWh On-Peak	kWh Off-Peak	kWh Total	Max kW	Load Factor
JAN	1,185,234	3,695,166	4,880,400	8,870	71.6%
FEB	1,170,952	3,164,605	4,335,557	9,168	67.9%
MAR	1,027,700	2,668,300	3,696,000	8,296	64.0%
APR	1,400,480	2,992,720	4,393,200	11,242	56.1%
MAY	1,711,298	3,681,502	5,392,800	11,990	64.6%
JUN	1,711,298	4,487,902	6,199,200	14,472	55.8%
JUL	1,858,423	4,189,577	6,048,000	11,053	76.0%
AUG	1,941,457	4,450,943	6,392,400	11,300	73.7%
SEP	1,840,752	4,215,648	6,056,400	11,315	74.3%
OCT	1,944,708	4,145,292	6,090,000	12,446	68.0%
NOV	1,612,648	4,082,552	5,695,200	11,171	66.4%
DEC	1,441,188	3,976,812	5,418,000	10,314	68.4%
TOTALS:	18,846,138	45,751,019	64,597,157		

APPENDIX C

LOAD PROFILE DATA

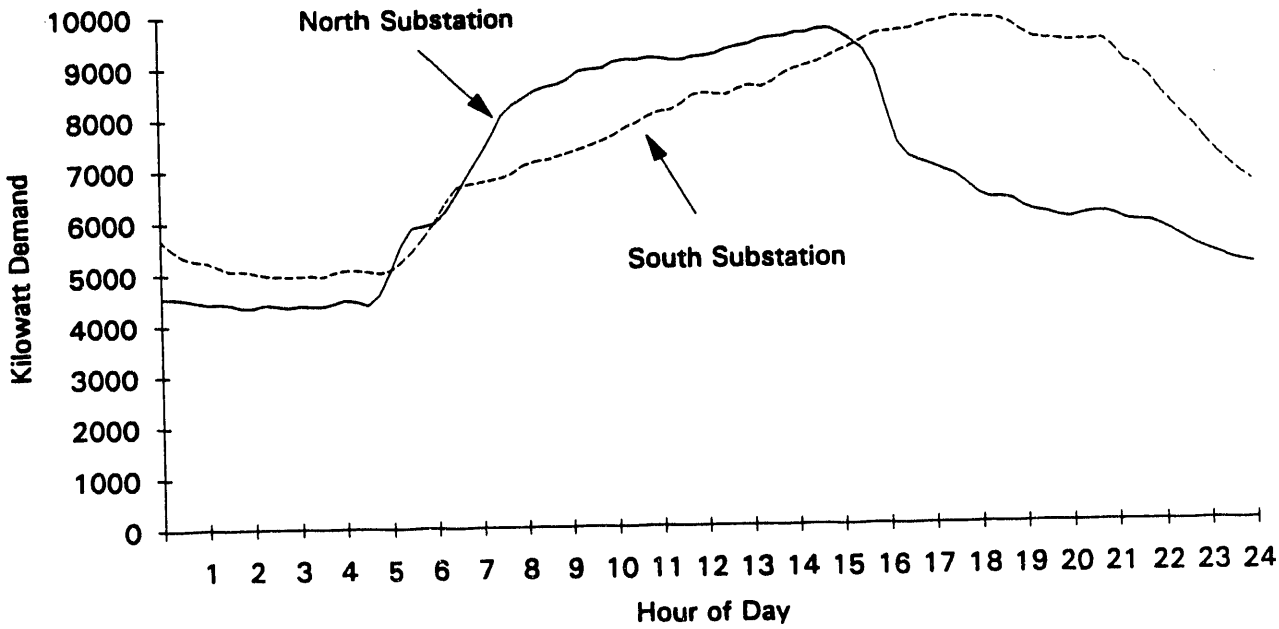

FIGURE C.1. Patrick AFB - Substation Load Profiles - May 15, 1991

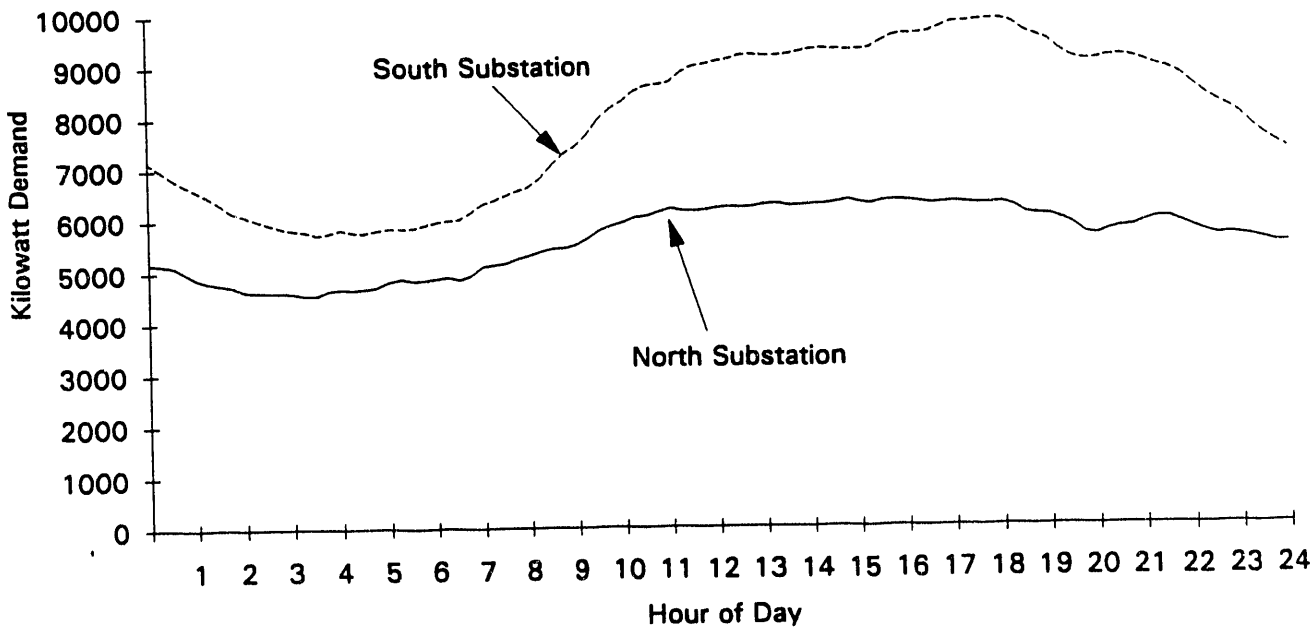

FIGURE C.2. Patrick AFB - Substation Load Profiles - May 18, 1991

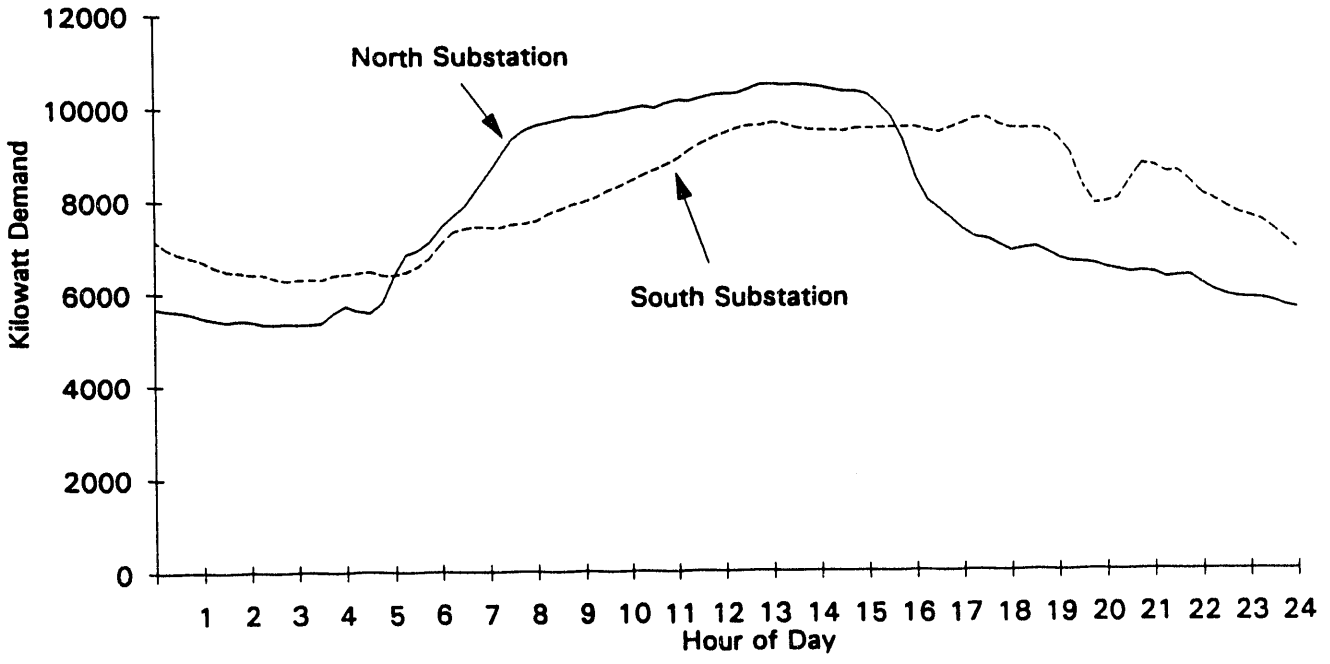

FIGURE C.3. Patrick AFB - Substation Load Profiles - August 20, 1991

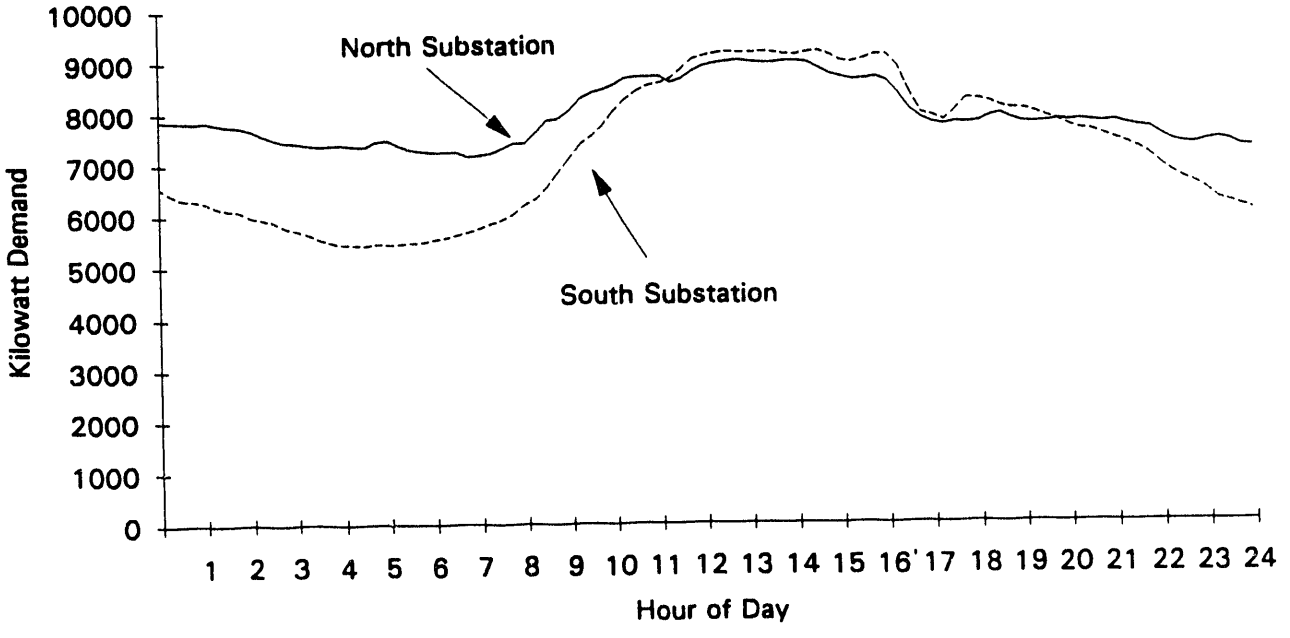

FIGURE C.4. Patrick AFB - Substation Load Profiles - August 24, 1991

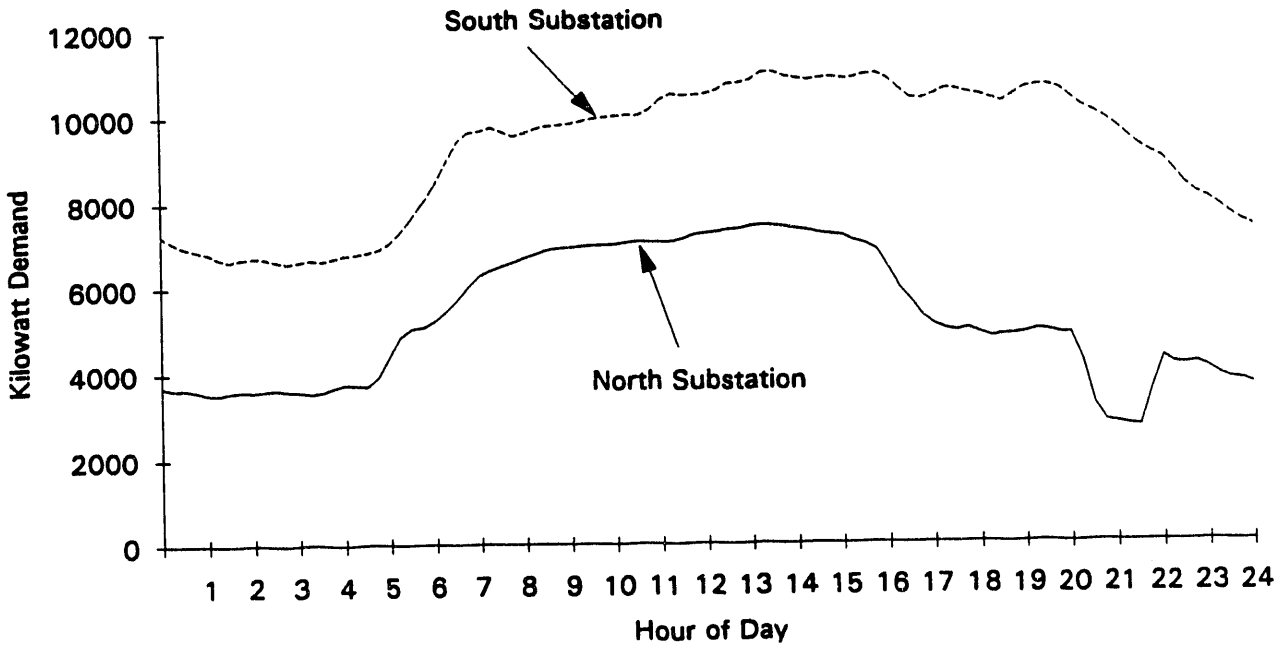

FIGURE C.5. Patrick AFB - Substation Load Profiles - October 9, 1991

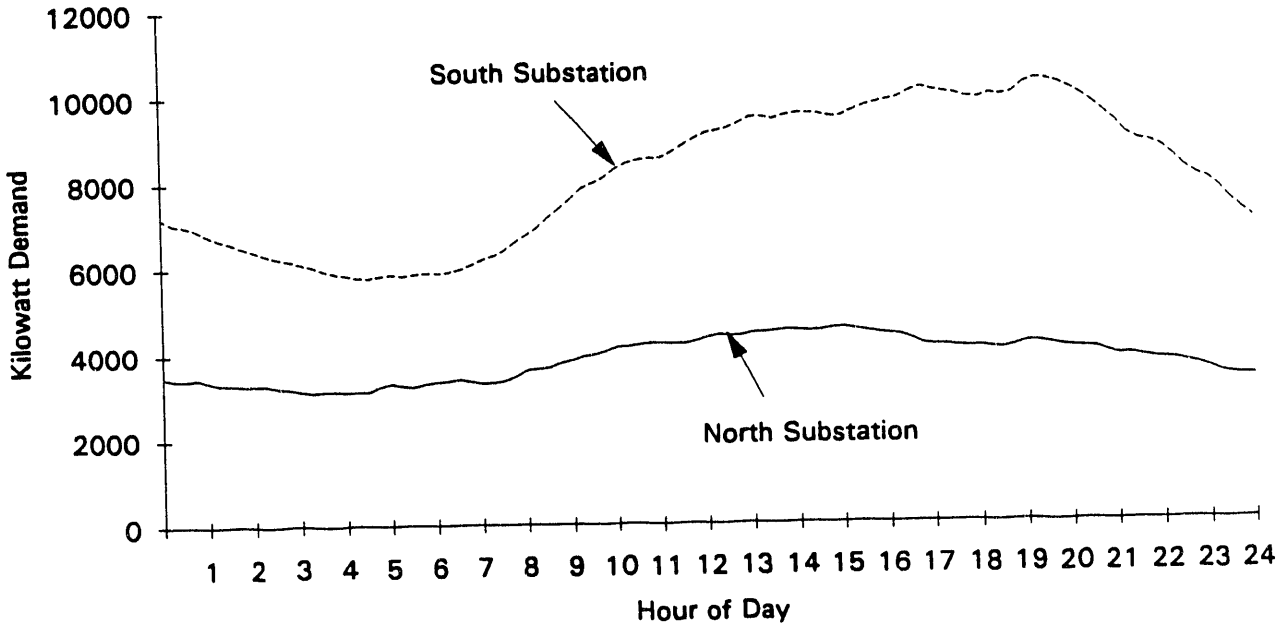

FIGURE C.6. Patrick AFB - Substation Load Profiles - October 12, 1991

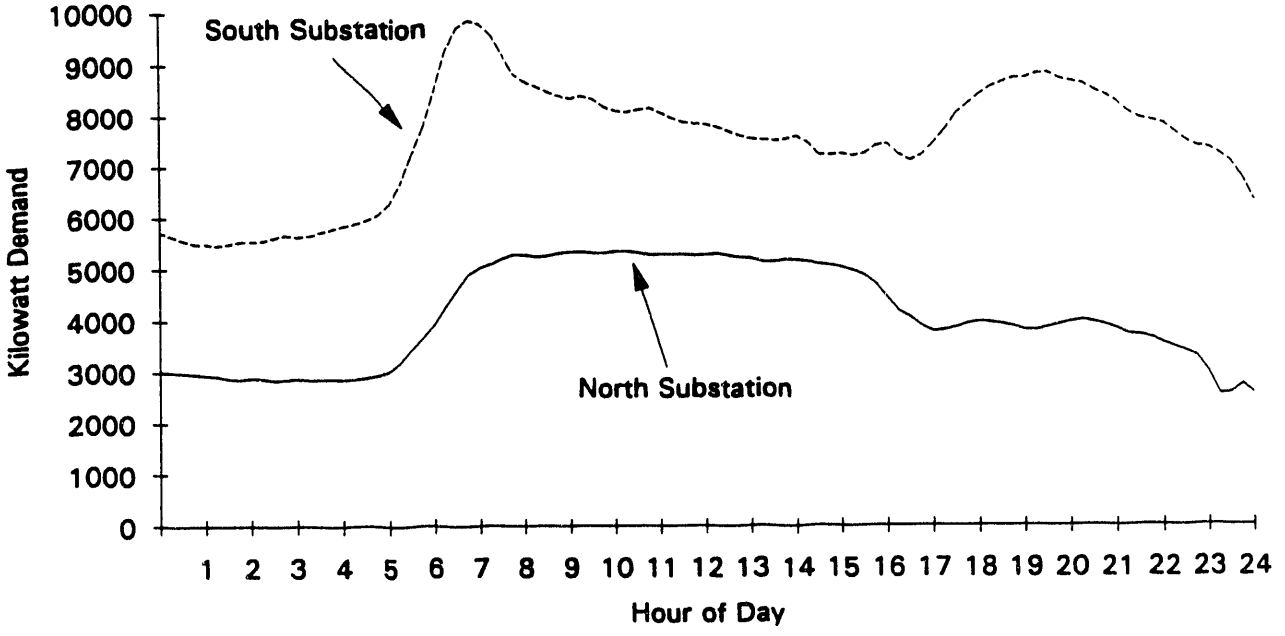

FIGURE C.7. Patrick AFB - Substation Load Profiles - January 15, 1992

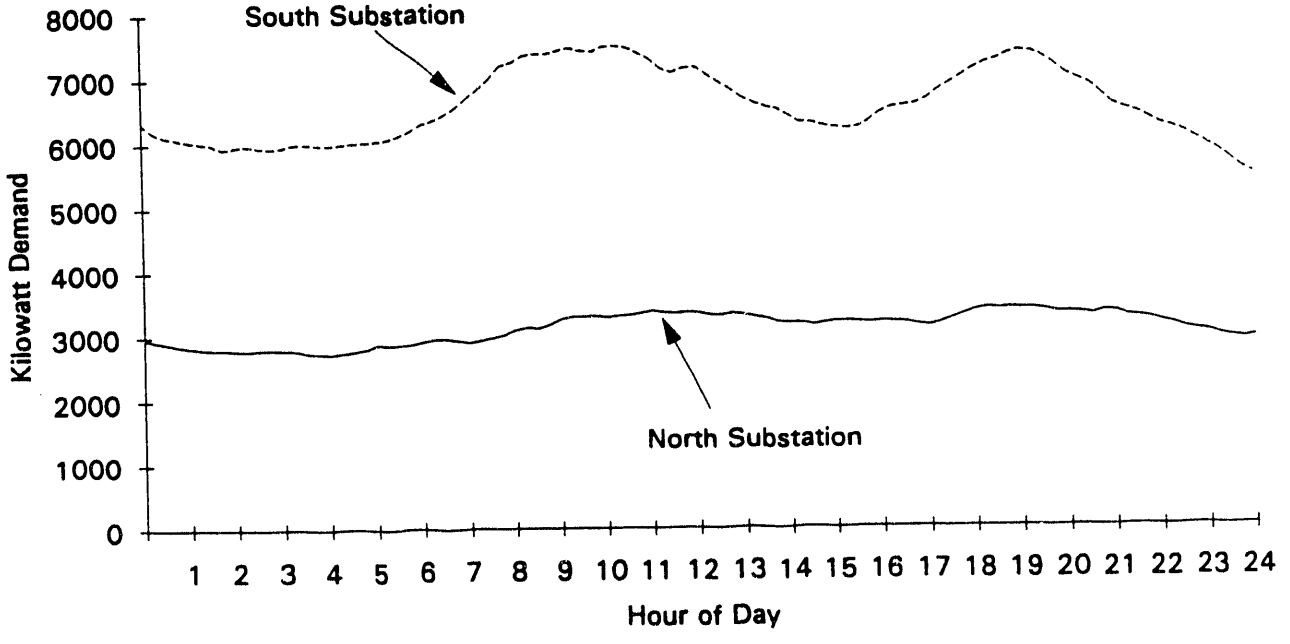

FIGURE C.8. Patrick AFB - Substation Load Profiles - January 18, 1992

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