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Impact of Building Technology, State and Community Programs on United States Employment and Wage Income

M. J. Scott
D. J. Hostick
D. B. Elliott
R. W. Schultz

April 1998

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

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Richland, Washington 99352

Summary

As part of measuring the impact of government programs on improving the energy efficiency of the nation's building stock, the Department of Energy Office of Building Technology, State and Community Programs (BTS) is interested in assessing the economic impacts of its portfolio of programs, specifically the potential impact on national employment and income. This assessment is being done for the first time in FY99 as a supplement to the Government Performance and Results Act (GPRA—formerly, Quality Metrics) estimates of primary energy savings and environmental and direct financial benefits of the BTS programs.

The programmatic needs of BTS suggest that a simple, flexible, user-friendly method is needed to derive national employment and income impacts of individual BTS programs. Therefore, BTS funded Pacific Northwest National Laboratory (PNNL) to develop a special-purpose version of the IMpact Analysis for PLANning (IMPLAN) national input-output model (Minnesota IMPLAN Group, Inc. 1997) specifically to estimate the employment and income effects of building energy technologies. IMPLAN was developed originally by the U.S. Forest Service in cooperation with the Federal Emergency Management Agency and the Bureau of Land Management to assist the Forest Service in land and resource management planning. Since 1979, it has been used by a wide variety of government and private agencies to assess economic impacts. The special-purpose version of the IMPLAN model used in this study is called ImBuild. Extensive documentation and a user's guide are provided in Scott et al. (1998). Compared with simple economic multiplier approaches, such as the published multipliers from the Department of Commerce Regional Input-Output Modeling System (RIMS II), ImBuild allows for more complete and automated analysis of the economic impacts of energy efficiency investments in buildings. ImBuild is also easier to use than existing macroeconomic simulation models. In this report, we use the ImBuild model to calculate the impact of all 32 BTS programs reported in the *BTS GPRA Metrics Estimates, FY99 Budget Request*, December 19, 1997.[a]

BTS programs affect the economy through three primary mechanisms. First, if the incremental capital costs of the new technology per installed unit are different from those of the conventional technology, the level of purchases will change in the sectors involved in manufacturing, distribution, and installation for both technologies, changing the level of overall economic activity. Second, the efficiency investment may crowd out other domestic saving, investments, and consumer spending, offsetting some positive impact on the economy caused by the new efficiency investment. Third, energy and non-energy expenditures are reduced. On the one hand, this saving reduces final sales in the electric and gas utility sectors, as well as in the trade and services sectors that provide related maintenance, parts, and services. But, on the other hand, it increases net disposable income of households and businesses and increases general consumer and business spending in all sectors (including some increases in expenditures for electric and gas utility services and retail trade and services).

(a) Investment costs (in 1994 dollars in the original document) and energy savings (in 1995 dollars) were updated to 1997 dollars for this report.

Energy efficient technology is expected to have a measurable effect on the activity level of the U.S. economy. BTS programs are characterized by significant investment requirements and delivered energy cost savings, as shown in Figure S.1 and Table S.1.[a]

Figure S.1 and Table S.1 show the energy savings expected to be created by market penetration of the BTS programs have the potential of creating nearly 362,000 jobs and about $5.1 billion in wage income (1997$) by the year 2020. However, not all of the gains would be immediately apparent because intensive investment in new energy technology and new building practices would be required during the first 20 years of the next century. These effects are incorporated in the full investment scenario shown in the lower half of Table S.1. For the most part, this incremental investment in energy technology, contrary to its popular image, is likely to be more capital-intensive than the average consumption and investment in the economy. This difference is due to the fact that most of the increment to investment occurs in capital-intensive manufacturing processes. Because we assume the capital required to make the energy efficiency investments is diverted proportionately from all competing uses for money in the economy (a large proportion of which is personal and business consumption of labor-intensive goods and services such as groceries, clothing, travel services, and legal services), the investments reduce the employment level in the short run.

Only when the energy benefits of cumulative efficiency investments have grown large, relative to the costs of current investment, would the full impacts on employment and income become visible. Thus, in the full investment scenario, as the energy technologies and practices associated with the 32 BTS programs penetrate the U.S. marketplace over the next 21 years, the required capital investments are significant and increasing over most of the period, reaching about $16 billion *per year* in 2010. These required investments divert national spending into capital-intensive sectors and initially reduce employment below what it otherwise would have been. However, the energy savings associated with these same investments are true economic savings that provide new economic opportunities, generate ever-increasing numbers of jobs and higher income, and eventually become the dominant economic result of the BTS programs.

Slightly over half of the jobs and net wage income benefits of the BTS programs come from only three of the programs: Update State Codes/Voluntary Energy Codes, Lighting Collaborative, and Residential Appliance Test Procedures and Standards. These three programs are large-scale, cost-effective programs that are expected to produce large energy savings relative to the investments required. By the year 2020, these programs will produce net annual savings to the U.S. economy (*after* investment costs) of around $5.4 billion, $3.9 billion, and $2.1 billion per year, respectively. Four other slightly smaller scale programs, Rebuild America, Energy Tools, Advanced Light Sources, and Fuel Cell Building Microcogeneration, are expected to account for another 20% of the job and income impacts. They each save the economy between $1 billion and $1.4 billion per year.

(a) In this analysis, we used program information from PNNL (1998) that PNNL prepared with DOE/EE program managers. Delivered energy is used to calculate potential savings resulting from reduced demand for electrical generating capacity and natural gas pipeline capacity. See Scott et al. (1998).

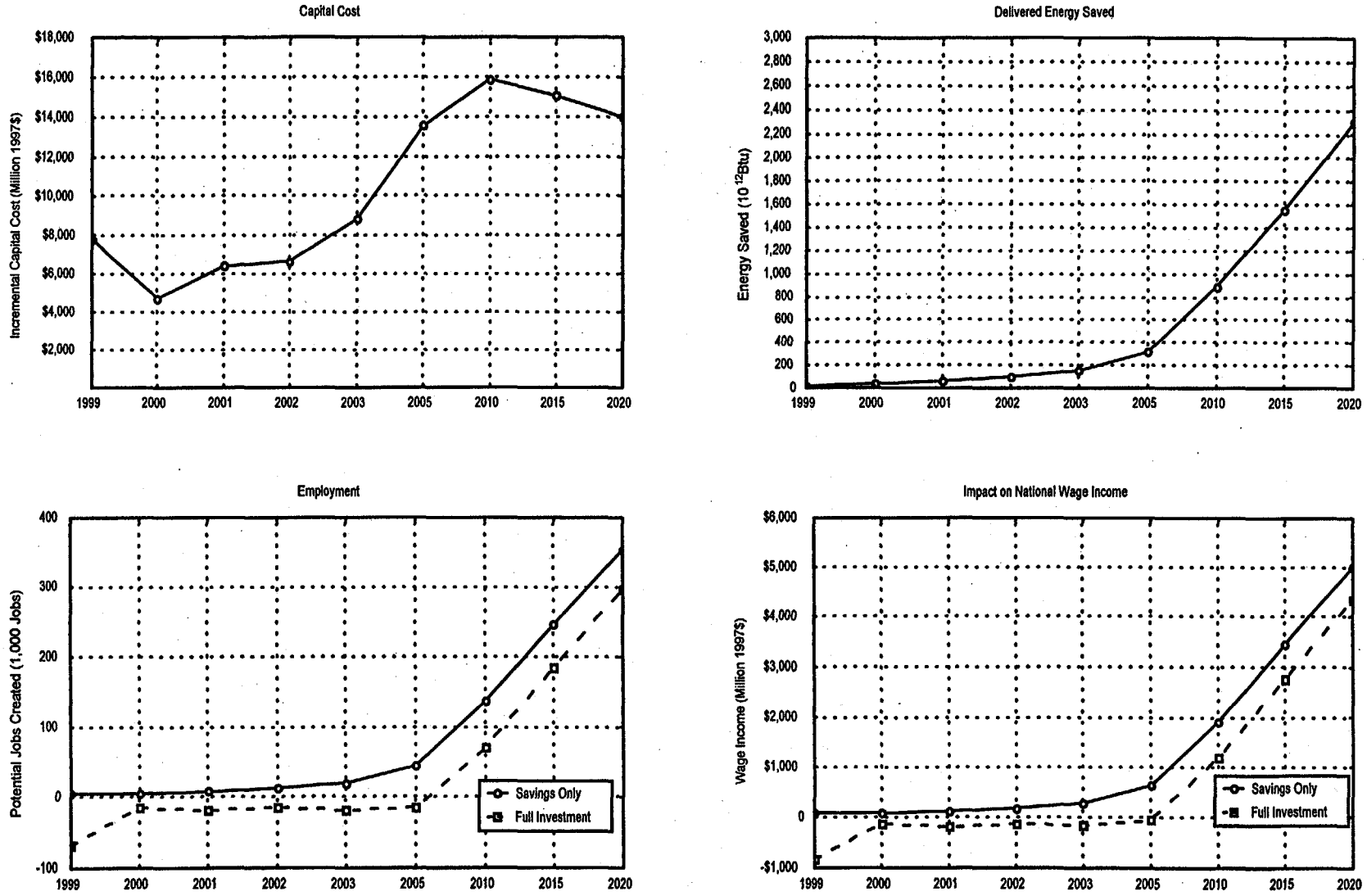

Figure S.1. Impact of 32 BTS Programs on the U.S. Economy

Table S.1. Impact of 32 BTS Programs on the U.S. Economy

	Incremental Capital Cost (Million 1997$)	Delivered Energy Saved (10^{12} Btu)	Potential Jobs Created	Impact on National Wage Income (Million 1997$)
Impact of Energy Savings Alone				
1999	0	18	4,500	$80
2000	0	37	5,000	$76
2001	0	61	7,900	$111
2002	0	98	12,700	$176
2003	0	154	19,600	$274
2005	0	316	44,200	$630
2010	0	895	136,500	$1,916
2015	0	1,558	245,300	$3,446
2020	0	2,297	353,600	$5,008
Impact of Full Investment Scenario				
1999	$7,784.7	18	-68,500	-$822
2000	$4,711.1	37	-15,000	-$141
2001	$6,379.5	61	-19,600	-$197
2002	$6,652.2	98	-15,200	-$128
2003	$8,820.5	154	-18,500	-$164
2005	$13,585.9	316	-15,100	-$68
2010	$15,885.2	895	70,000	$1,178
2015	$15,057.4	1,558	184,800	$2,762
2020	$14,002.4	2,297	295,300	$4,338

Acronyms

BTS	Office of Building Technology, State and Community Programs (DOE)
CCAP	Climate Change Action Plan
CFL	compact fluorescent lamp
DOE-EE	Department of Energy—Office of Energy Efficiency and Renewable Energy
EIA	Energy Information Administration
FY	fiscal year
GPA	Gross Domestic Product
GPRA	Government Performance and Results Act (formerly, Quality Metrics)
HP	heat pump
HUD	Housing and Urban Development
HVAC	Heating, Ventilating and Air Conditioning
ImBuild	Specific purpose version of IMPLAN (PNNL)
IMPLAN	Impact Analysis for Planning
LPSL	low power sulfur lamp
PNNL	Pacific Northwest National Laboratory
R&D	Research and Development
RIMS II	Regional Input-Output Modeling System
SIC	Standard Industrial Classification

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1.0 Methods

1.1 Introduction

As part of measuring the impact of government programs on improving the energy efficiency of the nation's building stock, the Department of Energy Office of Building Technology, State and Community Programs (BTS) is interested in assessing the economic impacts of these programs, specifically the impact on national employment and wage income. As a consequence, BTS funded Pacific Northwest National Laboratory to develop a simple-to-use method that could be used in-house to estimate economic impacts of individual programs.

Three fundamental methods are available to estimate employment and wage income impacts for selected energy efficiency improvements in the U.S. economy: multipliers, input-output models, and macroeconomic simulation models. PNNL staff reviewed the BTS programmatic needs and available methods and, based on this assessment and on realistic resource constraints, designed and developed a special-purpose version of the IMPLAN national input-output model, specifically to estimate the employment and income effects of building energy technologies. This model is called Impact of Building Energy Efficiency Programs (ImBuild). A companion report (Scott et al. 1998) discusses the methods, structure of the ImBuild model, its testing and performance. For a detailed discussion of the methodology used in this study, refer to the ImBuild report.

In comparison with simple multipliers, ImBuild allows for more complete and automated analysis of essential features of energy efficiency investments in buildings. ImBuild is also easier to use than extant macroeconomic simulation models. It does not include the ability to model certain dynamic features of markets for labor and other factors of production featured in these more complex models, but for most purposes these excluded features are not critical. Such impacts can be handled well by an input-output model and the analysis should be credible, as long as the assumption can be made that relative prices in the economy would not be substantially affected by energy efficiency investments. The expected scale of these investments is small enough in most cases that neither labor markets nor production cost relationships will seriously affect national prices as the investments are made. The exact timing of impacts on gross product, employment, and national wage income from energy efficiency investments is not well enough understood that much special insight can be gained from the additional dynamic sophistication of a macroeconomic simulation model. Thus, ImBuild is a cost-effective compromise.

1.2 Calculation of Impact Using ImBuild

As cost-effective, energy-efficient technologies penetrate the marketplace, BTS programs will affect national employment and wage income. To analyze these effects, the ImBuild model requires certain information on BTS programs: the size of the incremental investment in the technology over time, compared with the conventional technology it replaces; corresponding energy savings by fuel in physical

and monetary terms (which may include additional use of some fuels when one type of fuel replaces another); and non-energy operations savings (if any) in comparison with the current technology (Figure 1.1).

ImBuild calculates changes in the use of energy, labor, and materials due to incremental investments and economic savings associated with BTS-supported technologies and practices, as shown in Figure 1.1. As the figure illustrates, multiple pathways are used by which new investments in these technologies affect the level of employment and wage income in the economy. First, the procurement of equipment and installation services creates jobs and income in some industries, while diverting funds that otherwise would have been spent for other goods and services by businesses and consumers. At the same time, the investment in energy-efficient technologies or practices may make other investments in energy supply technologies (for example, power plants) unnecessary, directly and indirectly affecting jobs and income.

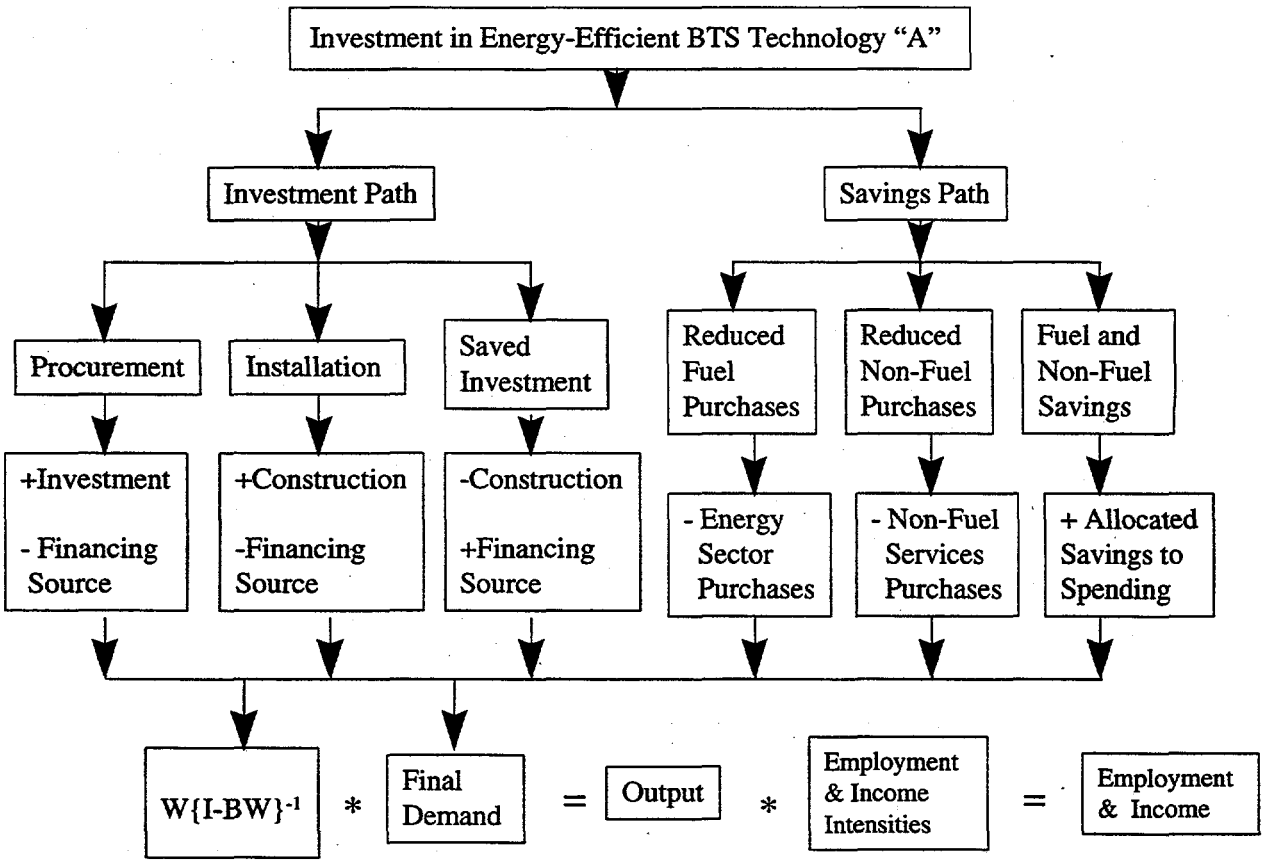

Figure 1.1. Detailed Calculations of the ImBuild Model

The issue is discussed in more detail in Scott et al. (1998).[a] For this report, we assumed that financing for the energy-efficient investments is drawn proportionately from the rest of the U.S. economy.[b] Figure 1.1 also shows that an investment in energy-efficient technology reduces the amount of energy needed. Reduced energy consumption reduces energy purchases (which in turn reduces employment and income in the energy-supplying sectors) and produces dollar savings that can be spent on any good or service, including energy (which creates employment and income). In addition, some energy efficiency investments may save the purchaser other costs such as maintenance services, and these savings also have impacts.

All of these pathways in Figure 1.1 either affect the interindustry intermediate procurement (the matrix $W\{I-BW\}^{-1}$ in Figure 1.1) or the final demand (the set of goods and services in the economy purchased for final consumption or new investment, as distinguished from those purchased merely as intermediate inputs to current production). In residential applications, the necessary model calculations are relatively straightforward, because residential savings are assumed to be entirely recycled into personal consumption and investment (that is, final demand). For commercial building applications, the process is more complicated because the interindustry relationships between specific sectors are affected, not just final demand. For savings in the commercial sector, the interindustry portion of the input-output table is automatically recomputed; then the model is run with the recomputed table. Because the energy and maintenance intensity of the commercial sector changes, the coefficients of the input-output structure are automatically recalculated at each time step. The financial impacts of energy and non-energy cost savings (for example, savings in building maintenance) are computed by the model. These savings are treated like "free" income, available to be saved or invested by the sector collecting the income.

A brief hypothetical example from Scott et al. (1998) illustrates the concepts and functioning of the ImBuild model. It is assumed that consumers spend a premium of $100 million on more-efficient residential heating and air-conditioning equipment in the year 2000, which each year thereafter saves them $15 million of electricity, $30 million in natural gas, and $5 million in building maintenance expenditures, for annual savings of $50 million. This $50 million annual savings yields a simple payback period of 2 years. The first two cases in Figure 1.2 show the employment effects of the $50 million savings alone. In the first case, the savings are confined to the residential sector. The second case shows how the impacts would change if these energy savings had instead been experienced in the commercial sector, where the savings are initially experienced as an increase in the profitability of

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(a) For this report, we estimated electric power plant construction savings at about $590/kW of delivered electric energy, based on data in EIA (1997). The equivalent value for natural gas, about $1.20/cubic foot/day capacity, based on EIA (1996), was not used because much pipeline capacity is being resold or turned back. Much of the new capacity is oriented toward new sources of supply, not delivery problems. See Tobin (1997) and EIA (1996).

(b) It is assumed that personal (household) consumption represents 70% of spending; gross private fixed investment, 10%; federal defense spending 2%; federal non-defense spending, 6%; and state and local government spending, about 12%. These percentages are close to the actual distribution of final demand among these sectors in the U.S. economy.

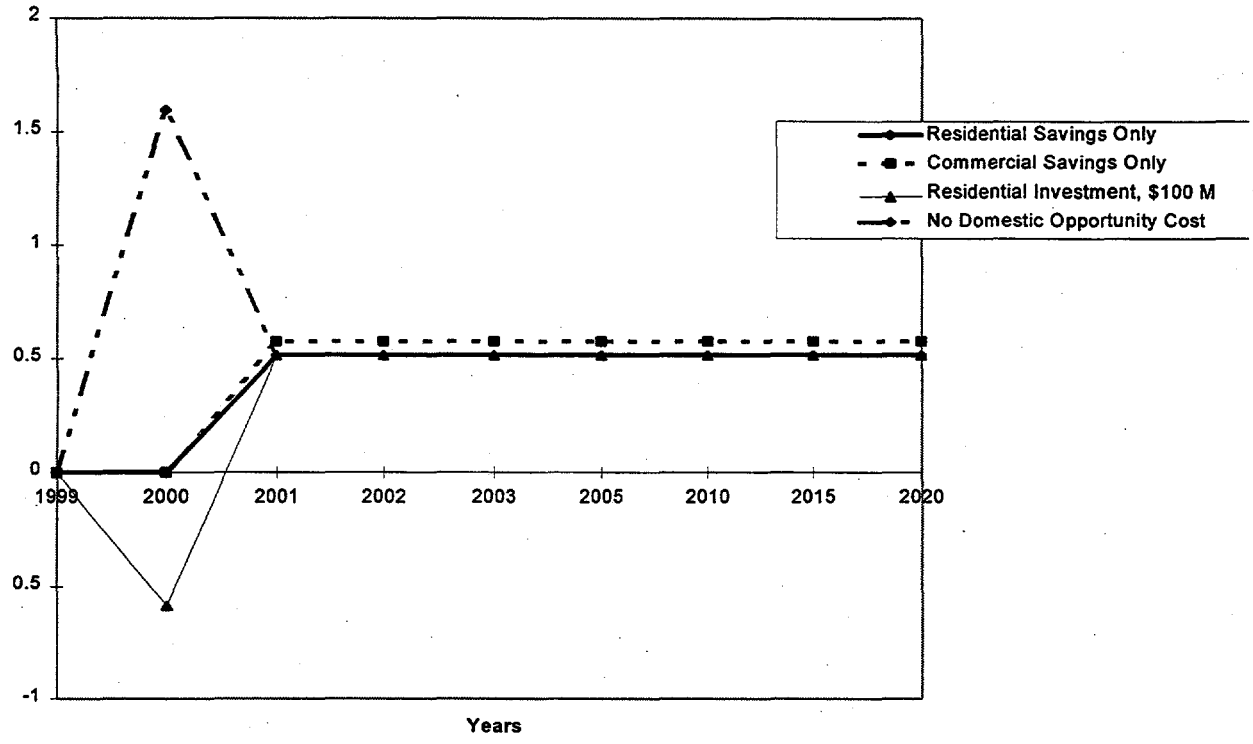

Figure 1.2. Impact on National Employment of a Hypothetical Once-Only $100 Million Investment in Appliance Efficiency

those businesses saving the energy. These profits are assumed to be recycled in the economy as spending by workers, by the firms themselves, and by governments experiencing increases in tax collections. In the first case, the energy savings in the residential sector of $50 million have a net impact of about 520 jobs on the U.S. economy, or about 1.1 additional jobs per $100 thousand dollars of direct energy savings. The impact is somewhat greater if the energy savings occur in the commercial sector (570 jobs). The impact is greater because the employment intensity of the spending mix of businesses, their workers, and government associated with commercial savings is slightly different from the spending intensity of the household sector alone, which is associated with residential savings. Next, Figure 1.2 adds a third and fourth case to show the employment impacts of the $100 million investment itself. The third case shows the impact of the investment premium. In this case, even though investment in the technology itself generates employment, the short run net employment impact is negative (*minus* 580 jobs). The opportunity cost of the investment premium is the amount the investment would have

produced elsewhere in the U.S. economy, which on average is more labor-intensive than the manufacturing sector that produces the new technology.[a]

Typically, efficiency programs are thought to be relatively labor-intensive, but this is not always the case. Heating and air conditioning equipment manufacture, for example, is quite capital-intensive. The strength and direction of the investment effect depends on the size of the investment premium and its combined domestic U.S. direct and indirect labor intensity, relative to that of other domestic spending (the opportunity cost of the investment). For the employment impact of the investment to be positive, the sectors supplying the new technology must on average create more domestic jobs per dollar of spending than does other domestic spending. An extreme form of this positive investment effect would occur if the investment were financed internationally (that is, if there were no domestic spending opportunities lost). This is the fourth case in Figure 1.2, which shows a short-run job impact of 1600 and a long-run job impact of 520.

The energy and non-energy savings from installation of efficient technology do not affect employment in the national economy until reinvested or spent. For purposes of the analysis conducted for this report, we assume that any increments to the economic value added in each sector as a result of the investment (that is, the energy and non-energy savings) are allocated to compensation of labor, capital, and business taxes in the same proportions as all other value added[b] in that sector. The income of each sector then is assumed to be spent on investment and consumption of goods and services (final demand) in the same proportions as existing compensation of labor, capital, and government. That is, if a given sector captures 1% of all personal consumption expenditures in the economy and a 0.7% share of all business fixed investment, it will receive these same percentage shares of the efficiency-related increase in spending. Similarly, if labor compensation represents 70% of the baseline total value added in an industry, it will receive 70% of any energy savings in that industry. Finally, labor compensation, business profits and taxes are allocated to consumption, investment, and government spending, according to current proportions.

ImBuild accumulates the energy and non-energy savings in the residential buildings sector and the changes in economic value-added associated with energy and non-energy savings within the commercial buildings sector. The program then calculates spending impacts associated with these savings by proportionately increasing final demand across all sectors as noted previously, while at the same time reducing final demand in the sectors supplying the resources that are saved. This step accounts for the spending associated with the monetary savings and improvements in technological efficiency and for the associated shift from energy to non-energy spending. It also accounts for changes in the patterns of

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(a) Strictly speaking, the labor intensity that counts is the employment, direct *and indirect*, that is created by each dollar of spending. Thus, it is theoretically possible for a capital-intensive industry to buy lots of labor-intensive inputs from other industries and the total effect to be labor intensive as a result.

(b) Economic value-added is the value of output of the sector, less the cost of purchased materials and services. The sum of value-added in all sectors is Gross Domestic Product (GDP).

activity in the economy due to technological change caused by the BTS programs (that is, less electricity is used per dollar of output in retailing because of more efficient lighting).[a]

ImBuild collects the estimates of the initial investments, energy and non-energy savings, and economic activity associated with spending of the savings (increases in final demand in personal consumption, business investment, and government spending), and provides overall estimates of the increase in national output for each economic sector using the adjusted input-output matrix. Finally, the model applies estimates of employment and wage income per dollar of economic output for each sector and calculates impacts on national employment and wage income.

(a) ImBuild does not account for all of the long-term run impacts of the technological change. The change in energy-using capital in the commercial sector would alter the marginal value of all of the factors of production (including both labor and capital) and would induce a rearrangement of capital and labor that would ultimately result in an increase in output and in final demand. We show part of this effect, that of the initial spending associated with the savings, but not the effect of increased capital stock that would be created by the investment portion of the spending. Most economic models, including many dynamic simulation models, do not completely reflect the effect of capital accumulation and growth in capacity on final output and employment.

2.0 Analysis

2.1 BTS Programs

Table 2.1 shows the level of incremental investments and net energy savings in the years 2000, 2010, and 2020 for the BTS programs evaluated as a supplement to the Fiscal Year 1999 Government Performance and Results Act (GPRA) Metrics Program for the DOE Office of Energy Efficiency and Renewable Energy (DOE/EE).[a] It is important to note the values in Table 2.1 represent levels of *current* investment and energy and non-energy savings in the year shown, because it is *current* investment and *current* energy and non-energy savings that determine the impact on employment and wage income. Reported in this way, the values in Table 2.1 cannot be used to determine a rate of return on any particular investment, as an investment in a given year provides a stream of savings over several years and the energy savings experienced in any particular year are a function of the cumulative previous investment in energy efficiency. The investment and energy savings levels in a given year affect the level of GDP in that year, in turn affecting the level of employment and personal income. Although the BTS programs differ from each other in size and timing, for the most part the annual investment exceeds the annual savings early in the period, and savings tend to dominate later on.

The differences in investment reflect differences identified by the GPRA Program as the size of the potential market opportunity or market niche for each program, differences in the expected rate of market penetration into each niche, and differences concerning the incremental cost of the new technologies and practices penetrating the market, compared to the more conventional technologies or practices that they replace. About 20% of the total energy savings occur in programs like Advanced Light Sources or Weatherization Assistance Programs that are not projected to require any incremental investment over and above standard construction practice. Current savings do not necessarily correlate well with current investments. Some technologies and practices are expected to be extremely cost-effective and require relatively little incremental investment; others a require relatively more incremental investment or may be less cost-effective. Savings are also sensitive to timing. For example, many programs are expected to be still in the midst of their intensive investment phase in the year 2020, while others are completed earlier and are enjoying all of their savings by that date. For BTS program details, refer to PNNL (1998).

Most of the BTS programs have increasing market penetration and investment levels through the year 2020. Thus, the energy savings levels for many of the programs are expected to increase far beyond 2020. By the end of the period shown in Table 2.1, total annual savings have exceeded total annual investments, and are continuing to accelerate. Investments as a group have begun to flatten out by 2020.

(a) The GPRA FY 1999 estimates for investments and energy savings were used, adjusted to 1997 dollars. More detail is provided in the attachment to this report.

Table 2.1. Levels of Investment Cost and Savings from BTS Programs in Years 2000, 2010, and 2020

Projcode	Name	Years					
		2000		2010		2020	
		Investment (Million 1997$)	Savings (Million 1997$)	Investment (Million 1997$)	Savings (Million 1997$)	Investment (Million 1997$)	Savings (Million 1997$)
111	Building America	$32.1	$3.9	$0.0	$298.0	$0.0	$916.4
112	Residential Energy Efficiency Programs (Includes Advanced Housing)	$0.0	$11.6	$231.3	$244.8	$0.0	$445.0
114	Industrialized Housing	$0.0	$11.4	$192.8	$196.8	$38.6	$348.1
132	Affordable Homes for Low-Income Families	$77.1	$10.6	$231.3	$180.9	$38.6	$275.3
133	Rebuild America	$1,916.5	$57.9	$2,923.1	$1,077.9	$0.0	$1,170.0
134	Commercial/Multifamily R&D	$0.0	$31.4	$4.4	$165.1	$12.9	$223.2
141	Design for Best Practice: Energy Tools	$0.0	$0.0	$239.3	$239.9	$506.3	$1,762.0
142	Passive Solar	$0.0	$0.1	$535.4	$47.2	$1,070.9	$196.6
231	Indoor Air Quality	$2.1	$0.1	$98.5	$103.2	$209.9	$434.5
805	Outreach	$0.0	$0.0	$0.0	$2.0	$11.4	$5.1
311	Residential Absorption Heat Pump	$0.0	$0.0	$64.3	$69.7	$203.5	$409.6
312	Hi-Cool Heat Pump	$0.0	$0.0	$32.1	$17.7	$289.1	$213.3
361	Advanced Desiccant Technology	$0.0	$0.0	$3.2	$19.1	$10.9	$94.9
352	Fuel Cell Building Microcogeneration	$130.2	$9.7	$665.0	$1,042.0	$751.8	$1,760.7
321	Furnaces & Boilers/Combustion Research	$0.0	$0.0	$0.0	$14.0	$0.0	$51.2
331	Advanced Refrigeration/Component Technology (HP)	$0.0	$0.0	$199.0	$114.2	$348.3	$412.3
332	Advanced Refrigeration/Component Technology (Refrig)	$2.0	$0.5	$74.9	$31.4	$181.3	$138.7
411	Advanced Light Sources & Electronics: Low Power S-lamps	$0.0	$1.0	-$62.5	$240.6	-$194.4	$1,145.9
417	Lighting Applications and Impacts	$0.0	$0.5	-$10.6	$46.1	-$34.7	$205.8
416	Lighting Collaborative (CFL)	-$2.3	$3.4	-$200.9	$661.4	-$815.9	$3,062.9
422	Energy Star Program	See Detail, Codes 423-427					
423	Energy Star: Clothes Washers	$107.2	$6.0	$689.7	$260.4	$667.8	$505.1
425	Energy Star: Refrigerators	$164.5	$54.2	$180.3	$116.9	$195.1	$239.6

Table 2.1 (contd)

Projcode	Name	Years					
		2000		2010		2020	
		Investment (Million 1997$)	Savings (Million 1997$)	Investment (Million 1997$)	Savings (Million 1997$)	Investment (Million 1997$)	Savings (Million 1997$)
426	Energy Star: Room Air Conditioners	$0.0	$0.5	$0.0	$3.3	$0.0	$5.9
427	Energy Star: Water Heaters	$4.3	$5.8	$53.5	$259.2	$79.2	$785.2
211	Building Materials	$1.2	$0.0	$56.4	$19.5	$118.7	$62.5
215	Roofs Walls & Foundations	$66.9	$8.1	$403.0	$253.1	$374.3	$546.2
806	Urban Heat Islands/Highly Reflective Surfaces	$2,097.4	$38.4	$3,239.3	$160.4	$2,444.0	$246.7
221	Electrochromic Research	$0.0	$1.2	$546.2	$250.8	$1,153.3	$1,169.0
222	Superwindows Technologies/Collaborative	$0.0	$3.1	$265.7	$230.0	$487.4	$951.5
223	Advanced Glazing	$0.0	$1.3	$162.3	$133.0	$322.4	$586.5
603	Test Procedures, Standards, and Labeling	See Detail, Codes 6031-6038					
6031	Test Procedures, Standards, and Labeling: Ballasts	$0.0	$0.0	$0.0	$660.3	$0.0	$1,237.3
6032	Test Procedures, Standards, and Labeling: Clothes Washers	$35.7	$3.5	$2,724.3	$780.3	$2,637.6	$1,755.9
6033	Test Procedures, Standards, and Labeling: Gas Water Heaters	$0.0	$0.0	$299.3	$589.9	$291.3	$1,249.9
6034	Test Procedures, Standards, and Labeling: Oil Water Heaters	$0.0	$0.0	$0.0	$2.7	$0.0	$4.5
6035	Test Procedures, Standards, and Labeling: Central Air Conditioners	$16.5	$1.2	$650.6	$629.6	$627.3	$1,379.4
6036	Test Procedures, Standards, and Labeling: Gas Furnaces	$0.0	$0.8	$0.0	$63.8	$0.0	$111.4
6037	Test Procedures, Standards, and Labeling: Oil Furnaces	$0.0	$0.1	$0.0	$12.9	$0.0	$23.0
6038	Test Procedures, Standards, and Labeling: Electric Water Heaters	$0.0	$0.0	$305.8	$102.5	$302.2	$212.3
501	Update State Codes/Voluntary & Federal Energy Codes	$59.5	$54.9	$1,088.1	$2,320.7	$1,673.4	$7,089.1
901	Weatherization Assistance Program	$0.0	$61.3	$0.0	$357.2	$0.0	$373.1
902	Municipal Energy Management Program	$0.0	$3.9	$0.0	$23.3	$0.0	$23.7
903	State Energy Program	$0.0	$85.0	$0.0	$534.2	$0.0	$553.3
	Totals	$4,711.1	$471.4	$15,885.2	$12,575.9	$14,002.4	$32,382.6

Note: Detail may not sum to total due to rounding error.

2.2 Results

The investments and energy savings attributable to the penetration of BTS programs in the marketplace will result in substantial macroeconomic effects. The following tables summarize these effects. Table 2.2 shows the impact of the energy savings alone on potential national employment on a year-by-year and program-by program basis. Each BTS program is designated with a numerical project code or Projcode to ensure ease in numerical modeling and for tracing a given program as it undergoes periodic name changes. The employment effects are called potential here because this estimate is really of the change in demand for workers. Actual employment effects could include changes in wage rates and also would be affected by changes in labor supply conditions. Table 2.3 shows the comparable effects on national wage income. Before accounting for investment costs, the effects of savings alone in the year 2020 are an increase of almost 354,000 potential jobs and about $5 billion in national wage income.

As was previously discussed, obtaining these energy savings benefits requires a substantial national investment in energy efficient technologies and practices. For the most part, this incremental national investment will be made in manufacturing sectors that are relatively capital intensive to produce new or better equipment. We assume the source of the investment capital will be the U.S. economy as a whole, which is less capital intensive on average than is manufacturing. Just as the example in Figure 1.2, most of the energy efficiency investments will tend to reduce national employment while they are occurring, because they divert investment into capital-intensive sectors. Therefore, Table 2.4, which combines the employment effects of the required energy efficiency investments and the employment effects of the required savings, shows lower employment impacts than does Table 2.2, which includes only the effects of the energy and non-energy savings and ignores the investment effects. Comparing the effects on national wage income in Tables 2.3 and 2.5 presents a similar, but slightly more mixed picture. The net effect on wage income of the required investment, combined with the effect of resulting energy and non-energy savings, is a mixed effect because many of the jobs created in the capital-intensive manufacturing sectors as a result of energy-efficiency investments are also high-wage jobs. This tends to compensate to some degree for the reduction in overall employment levels associated with the diversion of national spending into capital-intensive manufacturing activity.

The individual BTS programs differ significantly from each other in scale, timing, and impact. Most of the positive job and wage impacts come from only three programs: Update State Codes/Voluntary Energy Codes, Lighting Collaborative, and Residential Appliances Test Procedures and Standards. Together they account for 51% of the jobs and 52% of the net wage income effects. These programs are large-scale, cost-effective programs that are expected to produce large energy savings relative to the investments required. By the year 2020, each of these programs will be producing net annual economic savings to the U.S. economy of about $5.4 billion, $3.9 billion, and $2.1 billion per year, even after investment costs in 2020 are subtracted. The savings from these three programs generate an estimated net 72 thousand, 48 thousand, and 37 thousand jobs, respectively. Four other slightly smaller scale programs, Rebuild America, Energy Tools, Advanced Light Sources, and Fuel Cell Building Micro-cogeneration, are expected to account for another 20% of the job and income impacts. Each program saves the economy a net $1 billion to $1.4 billion per year and generates a net 12 thousand to

Table 2.2. Effect of Energy Savings from BTS Programs on Potential National Employment

Projcode	Descriptor	Effect on Total National Employment (Thousands of Jobs)								
		1999	2000	2001	2002	2003	2005	2010	2015	2020
111	Building America	0.0	0.0	0.1	0.1	0.2	0.4	3.3	6.5	10.1
112	Residential Energy Efficiency Programs (Includes Advanced Housing)	0.3	0.1	0.3	0.3	0.4	0.7	2.7	3.9	4.9
114	Industrialized Housing	0.2	0.1	0.1	0.3	0.3	0.5	2.2	3.1	3.8
132	Affordable Homes for Low-Income Families	0.1	0.1	0.2	0.3	0.4	0.8	2.0	2.9	3.1
133	Rebuild America	0.4	0.6	1.2	2.0	2.8	4.2	11.8	13.1	12.7
134	Commercial/Multifamily R&D	0.5	0.3	0.4	0.6	0.7	1.0	1.8	2.3	2.5
141	Design for Best Practice: Energy Tools	0.0	0.0	0.0	0.0	0.0	0.1	2.7	9.7	19.8
142	Passive Solar	0.0	0.0	0.0	0.0	0.0	0.1	0.5	1.3	2.2
231	Indoor Air Quality	0.0	0.0	0.0	0.0	0.1	0.2	1.2	2.8	4.8
805	Outreach	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
311	Residential Absorption Heat Pump	0.0	0.0	0.0	0.0	0.0	0.1	0.8	2.5	4.6
312	Hi-Cool Heat Pump	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.0	2.3
361	Advanced Desiccant Technology	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6	1.1
352	Fuel Cell Building Microcogeneration	0.0	0.1	0.2	0.5	0.7	2.7	10.7	17.7	17.7
321	Furnaces & Boilers/Combustion Research	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2
331	Advanced Refrigeration/Component Technology (HP)	0.0	0.0	0.0	0.0	0.1	0.2	1.3	2.9	4.5
332	Advanced Refrigeration/Component Technology (Refrig)	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.9	1.5
411	Advanced Light Sources & Electronics: Low Power S-lamps	0.0	0.0	0.0	0.1	0.2	0.5	2.7	7.0	12.6
417	Lighting Applications and Impacts	0.0	0.0	0.0	0.0	0.0	0.1	0.5	1.3	2.3
416	Lighting Collaborative (CFL)	0.0	0.0	0.1	0.3	0.5	1.2	7.3	18.9	33.6
422	Energy Star Program	See Detail, Codes 423-427								
423	Energy Star: Clothes Washers	0.0	0.1	0.2	0.4	0.8	1.4	2.9	4.3	5.6
425	Energy Star: Refrigerators	0.3	0.6	0.2	0.2	0.3	0.6	1.3	2.0	2.6
426	Energy Star: Room Air Conditioners	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
427	Energy Star: Water Heaters	0.0	0.1	0.1	0.2	0.3	0.7	2.8	5.6	8.5
211	Building Materials	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.7

Table 2.2. (contd)

Projcode	Descriptor	Effect on Total National Employment (Thousands of Jobs)								
		1999	2000	2001	2002	2003	2005	2010	2015	2020
215	Roofs Walls & Foundations	0.0	0.1	0.2	0.3	0.4	0.9	2.8	4.9	6.1
806	Urban Heat Islands/Highly Reflective Surfaces	0.6	0.4	0.6	0.7	0.8	1.1	1.8	2.3	2.7
221	Electrochromic Research	0.0	0.0	0.0	0.1	0.2	0.5	2.8	7.3	13.0
222	Superwindows Technologies/Collaborative	0.0	0.0	0.1	0.1	0.2	0.5	2.4	5.8	10.0
223	Advanced Glazing	0.0	0.0	0.0	0.1	0.1	0.3	1.4	3.6	6.4
603	Test Procedures, Standards, and Labeling:	See Detail, Codes 6031-6038								
6031	Test Procedures, Standards, and Labeling: Ballasts	0.0	0.0	0.0	0.0	0.1	2.4	7.4	11.1	13.8
6032	Test Procedures, Standards, and Labeling: Clothes Washers	0.0	0.0	0.1	0.1	0.2	2.7	8.6	14.1	19.4
6033	Test Procedures, Standards, and Labeling: Gas Water Heaters	0.0	0.0	0.0	0.2	1.3	3.4	7.0	11.0	14.8
6034	Test Procedures, Standards, and Labeling: Oil Water Heaters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6035	Test Procedures, Standards, and Labeling: Central Air Conditioners	0.0	0.0	0.1	0.2	0.4	2.3	6.9	11.1	15.0
6036	Test Procedures, Standards, and Labeling: Gas Furnaces	0.0	0.0	0.1	0.2	0.3	0.5	0.8	1.2	1.5
6037	Test Procedures, Standards, and Labeling: Oil Furnaces	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
6038	Test Procedures, Standards, and Labeling: Electric Water Heaters	0.0	0.0	0.0	0.0	0.3	0.9	1.1	1.7	2.3
501	Update State Codes/Voluntary & Federal Energy Codes	0.4	0.6	1.3	2.3	3.8	8.0	25.5	51.1	78.2
901	Weatherization Assistance Program	0.6	0.6	0.9	1.2	1.4	2.0	3.3	3.5	3.5
902	Municipal Energy Management Program	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2
903	State Energy Program	0.9	0.8	1.3	1.7	2.2	3.0	5.0	5.3	5.1
	Total	4.5	5.0	7.9	12.7	19.6	44.2	136.5	245.3	353.6

Note: Detail may not sum to total due to rounding error.

Table 2.3. Effect of Energy Savings from BTS Programs on Potential National Wage Income

Projcode	Descriptor	Effect on Total National Wage Income (Million 1997$)								
		1999	2000	2001	2002	2003	2005	2010	2015	2020
111	Building America	$0.6	$0.8	$1.6	$2.6	$4.0	$8.4	$64.4	$128.1	$199.0
112	Residential Energy Efficiency Programs (Includes Advanced Housing)	4.9	2.5	5.1	5.3	7.7	12.7	53.0	77.2	96.6
114	Industrialized Housing	4.8	2.5	2.6	5.1	5.2	10.0	42.6	60.0	75.6
132	Affordable Homes for Low-Income Families	1.9	2.3	3.7	5.9	8.4	14.6	39.2	56.2	59.7
133	Rebuild America	6.1	4.3	8.3	13.5	18.7	28.4	78.5	87.6	85.7
134	Commercial/Multifamily R&D	9.4	5.5	5.5	10.2	10.6	15.3	29.3	38.4	39.7
141	Design for Best Practice: Energy Tools	0.0	0.0	0.1	0.1	0.3	1.2	25.0	90.0	185.4
142	Passive Solar	0.0	0.0	0.0	0.1	0.2	0.6	3.8	9.3	15.7
231	Indoor Air Quality	0.0	0.0	0.2	0.6	1.0	2.9	17.9	44.2	76.1
805	Outreach	0.0	0.0	0.0	0.1	0.2	0.3	0.4	0.7	1.1
311	Residential Absorption Heat Pump	0.0	0.0	0.0	0.0	0.2	0.8	12.6	40.2	75.1
312	Hi-Cool Heat Pump	0.0	0.0	0.0	0.0	0.0	0.1	2.6	13.8	32.1
361	Advanced Desiccant Technology	0.0	0.0	0.0	0.0	0.1	0.4	1.9	5.2	9.4
352	Fuel Cell Building Microcogeneration	0.0	1.2	2.3	4.6	6.8	26.8	104.9	175.8	178.2
321	Furnaces & Boilers/Combustion Research	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.6
331	Advanced Refrigeration/Component Technology (HP)	0.0	0.0	0.2	0.5	1.0	3.2	24.2	55.5	88.0
332	Advanced Refrigeration/Component Technology (Refrig)	0.0	0.1	0.1	0.2	0.5	1.2	7.1	18.3	31.6
411	Advanced Light Sources & Electronics: Low Power S-lamps	0.0	0.2	0.6	1.3	2.4	7.1	43.3	118.4	218.5
417	Lighting Applications and Impacts	0.0	0.0	0.1	0.3	0.3	0.8	4.6	11.7	20.5
416	Lighting Collaborative (CFL)	0.0	0.6	1.9	4.2	7.5	19.8	119.1	318.5	583.7
422	Energy Star Program	See Detail, Codes 423-427								
423	Energy Star: Clothes Washers	0.5	1.3	3.6	8.6	15.0	27.5	56.0	83.1	108.7
425	Energy Star: Refrigerators	6.3	12.3	4.0	4.8	6.9	12.6	26.6	40.8	54.6
426	Energy Star: Room Air Conditioners	0.0	0.1	0.1	0.3	0.3	0.4	0.8	1.1	1.3
427	Energy Star: Water Heaters	0.9	1.3	2.5	4.4	6.2	14.2	58.9	118.0	178.9
211	Building Materials	0.0	0.0	0.0	0.1	0.2	0.7	4.4	10.9	14.2

Table 2.3. (contd)

Projcode	Descriptor	Effect on Total National Wage Income (Million 1997$)								
		1999	2000	2001	2002	2003	2005	2010	2015	2020
215	Roofs Walls & Foundations	0.0	1.3	2.5	3.9	6.7	12.9	41.3	70.3	85.1
806	Urban Heat Islands/Highly Reflective Surfaces	11.1	5.9	7.9	9.5	11.7	14.3	23.4	29.9	35.7
221	Electrochromic Research	0.0	0.1	0.5	1.0	1.8	4.9	26.6	69.8	124.9
222	Superwindows Technologies/Collaborative	0.3	0.5	1.0	1.8	3.0	7.1	32.0	77.2	132.5
223	Advanced Glazing	0.0	0.2	0.4	0.8	1.3	3.3	16.2	40.7	71.2
603	Test Procedures, Standards, and Labeling:	See Detail, Codes 6031-6038								
6031	Test Procedures, Standards, and Labeling: Ballasts	0.0	0.0	0.0	0.0	1.2	21.0	65.5	99.2	123.5
6032	Test Procedures, Standards, and Labeling: Clothes Washers	0.5	0.7	1.0	1.3	2.9	53.1	167.6	275.8	378.2
6033	Test Procedures, Standards, and Labeling: Gas Water Heaters	0.0	0.0	0.0	2.6	22.3	60.2	124.3	195.5	263.9
6034	Test Procedures, Standards, and Labeling: Oil Water Heaters	0.0	0.0	0.0	-0.2	-0.4	-0.7	-1.1	-1.5	-1.9
6035	Test Procedures, Standards, and Labeling: Central Air Conditioners	0.0	0.1	1.1	2.1	3.2	41.2	130.6	213.7	291.6
6036	Test Procedures, Standards, and Labeling: Gas Furnaces	0.0	0.1	0.7	1.4	2.0	3.2	5.7	8.0	10.0
6037	Test Procedures, Standards, and Labeling: Oil Furnaces	0.0	0.0	-0.6	-1.1	-1.7	-2.8	-5.4	-7.6	-9.6
6038	Test Procedures, Standards, and Labeling: Electric Water Heaters	0.0	0.0	0.0	0.7	7.1	19.4	23.3	36.2	48.4
501	Update State Codes/Voluntary & Federal Energy Codes	6.1	6.6	14.6	26.5	43.2	92.2	293.7	575.7	868.6
901	Weatherization Assistance Program	9.8	9.8	14.6	19.5	24.3	33.5	55.4	58.8	57.8
902	Municipal Energy Management Program	0.5	0.7	1.0	1.4	1.6	2.3	4.0	4.1	4.0
903	State Energy Program	16.0	14.6	24.0	31.9	39.7	54.7	91.5	96.7	94.4
	Total	$79.8	$75.7	$111.2	$175.9	$273.5	$629.8	$1,915.7	$3,446.1	$5,008.4

Note: Detail may not sum to total due to rounding error.

Table 2.4. Effect of the Full Investment Scenario on Potential National Employment

Projcode	Descriptor	Effect on Total National Employment (Thousands of Jobs)								
		1999	2000	2001	2002	2003	2005	2010	2015	2020
111	Building America	0.0	0.1	0.1	0.2	0.2	0.5	3.3	6.5	10.1
112	Residential Energy Efficiency Programs (Includes Advanced Housing)	-1.0	0.1	-0.4	0.2	-0.3	-0.1	2.0	3.7	4.9
114	Industrialized Housing	-0.8	0.1	0.1	-0.3	0.2	-0.1	1.6	2.8	3.7
132	Affordable Homes for Low-Income Families	-0.2	-0.1	0.1	0.1	0.1	0.2	1.3	2.4	2.9
133	Rebuild America	-6.7	-5.9	-6.2	-6.5	-5.8	-4.3	1.7	11.3	12.7
134	Commercial/Multifamily R&D	0.5	0.3	0.4	0.6	0.7	1.0	1.8	2.3	2.4
141	Design for Best Practice: Energy Tools	0.0	0.0	0.0	0.0	0.0	0.1	1.9	8.2	18.1
142	Passive Solar	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.4	1.1
231	Indoor Air Quality	0.0	0.0	0.0	0.0	0.0	0.1	1.0	2.5	5.4
805	Outreach	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
311	Residential Absorption Heat Pump	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.7	3.5
312	Hi-Cool Heat Pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7
361	Advanced Desiccant Technology	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	1.0
352	Fuel Cell Building Microcogeneration	0.0	-0.5	-0.4	-0.4	-0.1	-0.3	7.5	14.0	14.0
321	Furnaces & Boilers/Combustion Research	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2
331	Advanced Refrigeration/Component Technology (HP)	0.0	0.0	0.0	0.0	0.1	-0.1	0.2	1.1	2.6
332	Advanced Refrigeration/Component Technology (Refrig.)	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.2	0.6
411	Advanced Light Sources & Electronics: Low Power S-lamps	0.0	0.0	0.1	0.1	0.2	0.5	2.9	7.5	13.3
417	Lighting Applications and Impacts	0.0	0.0	0.0	0.0	0.0	0.1	0.6	1.4	2.4
416	Lighting Collaborative (CFL)	0.0	0.0	0.2	0.4	0.6	1.5	8.1	20.9	36.8
422	Energy Star Program	See Detail, Codes 423-427								
423	Energy Star: Clothes Washers	-0.3	-0.5	-1.0	-2.2	-2.7	-2.0	-0.5	1.0	2.3
425	Energy Star: Refrigerators	-0.3	-0.2	0.1	0.0	-0.3	-0.2	0.4	1.0	1.7
426	Energy Star: Room Air Conditioners	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
427	Energy Star: Water Heaters	0.0	0.0	0.1	0.2	0.2	0.6	2.6	5.3	8.2
211	Building Materials	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2

Table 2.4. (contd)

Projcode	Descriptor	Effect on Total National Employment (Thousands of Jobs)								
		1999	2000	2001	2002	2003	2005	2010	2015	2020
215	Roofs Walls & Foundations	0.0	-0.1	0.0	0.1	0.1	0.4	1.9	3.7	5.2
806	Urban Heat Islands/Highly Reflective Surfaces	-61.2	-10.1	-15.3	-11.8	-16.5	-16.7	-14.5	-10.5	-9.6
221	Electrochromic Research	0.0	0.0	0.0	0.1	0.1	0.3	0.8	4.0	8.9
222	Superwindows Technologies/Collaborative	0.0	0.0	0.1	0.1	0.2	0.4	1.8	4.9	8.8
223	Advanced Glazing	0.0	0.0	0.0	0.0	0.1	0.2	0.9	2.7	5.2
603	Test Procedures, Standards, and Labeling	See Detail, Codes 6031-6038								
6031	Test Procedures, Standards, and Labeling: Ballasts	0.0	0.0	0.0	0.0	0.1	2.4	7.4	11.1	13.8
6032	Test Procedures, Standards, and Labeling: Clothes Washers	-0.3	-0.1	-0.1	-0.1	-0.7	-10.9	-4.7	1.1	6.5
6033	Test Procedures, Standards, and Labeling: Gas Water Heaters	0.0	0.0	0.0	0.0	-0.2	2.0	5.5	9.5	13.4
6034	Test Procedures, Standards, and Labeling: Oil Water Heaters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6035	Test Procedures, Standards, and Labeling: Central Air Conditioners	0.0	-0.1	-0.7	-0.6	-0.5	-1.3	3.4	7.6	11.6
6036	Test Procedures, Standards, and Labeling: Gas Furnaces	0.0	0.0	0.1	0.2	0.3	0.5	0.8	1.2	1.5
6037	Test Procedures, Standards, and Labeling: Oil Furnaces	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
6038	Test Procedures, Standards, and Labeling: Electric Water Heaters	0.0	0.0	0.0	-0.1	-1.3	-0.6	-0.4	0.3	0.8
501	Update State Codes/Voluntary & Federal Energy Codes	0.2	0.4	0.9	1.7	2.9	5.9	21.8	45.0	72.5
901	Weatherization Assistance Program	0.6	0.6	0.9	1.2	1.4	2.0	3.3	3.5	3.5
902	Municipal Energy Management Program	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2
903	State Energy Program	0.9	0.8	1.3	1.7	2.2	3.0	5.0	5.3	5.1
	Total	-68.5	-15.0	-19.6	-15.2	-18.5	-15.1	70.0	184.8	295.3

Note: Detail may not sum to total due to rounding error.

Table 2.5. Effect of the Full Investment Scenario for BTS Programs on Potential National Wage Income

Projcode	Descriptor	Effect on Total National Wage Income (Million 1997$)								
		1999	2000	2001	2002	2003	2005	2010	2015	2020
111	Building America	$0.4	$0.6	$1.2	$2.2	$3.5	$7.4	$64.4	$128.1	$199.0
112	Residential Energy Efficiency Programs (Includes Advanced Housing)	-3.9	2.5	0.6	4.9	2.6	7.5	47.7	75.5	96.6
114	Industrialized Housing	-4.5	2.5	2.6	0.0	4.8	4.6	37.9	58.2	74.6
132	Affordable Homes for Low-Income Families	0.2	0.5	2.8	4.2	5.8	11.1	33.9	52.6	58.9
133	Rebuild America	-45.3	-43.0	-45.4	-48.1	-42.9	-33.2	6.4	74.9	85.7
134	Commercial/Multifamily R&D	9.4	5.5	5.5	10.2	10.6	15.3	29.1	37.8	39.1
141	Design for Best Practice: Energy Tools	0.0	0.0	0.1	0.1	0.2	1.1	19.5	79.3	173.8
142	Passive Solar	0.0	0.0	0.0	0.1	0.2	-2.3	-3.5	-2.3	1.1
231	Indoor Air Quality	0.0	0.0	0.1	0.4	0.8	2.2	15.9	40.8	71.8
805	Outreach	0.0	0.0	0.0	0.1	-0.1	0.3	0.4	0.5	0.9
311	Residential Absorption Heat Pump	0.0	0.0	0.0	0.0	0.2	0.0	7.9	29.2	60.2
312	Hi-Cool Heat Pump	0.0	0.0	0.0	0.0	0.0	0.1	0.2	2.0	10.9
361	Advanced Desiccant Technology	0.0	0.0	0.0	0.0	0.1	0.3	1.6	4.6	8.6
352	Fuel Cell Building Microcogeneration	0.0	-2.5	-1.2	-0.3	2.2	9.5	86.1	154.5	156.9
321	Furnaces & Boilers/Combustion Research	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.6
331	Advanced Refrigeration/Component Technology (HP)	0.0	0.0	0.2	0.5	1.0	-0.5	9.7	31.8	62.5
332	Advanced Refrigeration/Component Technology (Refrig)	-0.1	0.0	-0.2	-0.4	-0.3	-0.3	2.1	8.5	19.4
411	Advanced Light Sources & Electronics: Low Power S-lamps	0.0	0.2	0.6	1.3	2.5	7.3	43.8	119.6	220.1
417	Lighting Applications and Impacts	0.0	0.0	0.1	0.3	0.3	0.8	4.7	12.1	21.0
416	Lighting Collaborative (CFL)	0.0	0.6	2.2	4.5	8.1	20.9	122.2	326.2	596.1
422	Energy Star Program	See Detail, Codes 423-427								
423	Energy Star: Clothes Washers	-4.3	-5.9	-13.2	-27.5	-33.1	-20.2	9.4	37.5	63.7
425	Energy Star: Refrigerators	-1.4	1.2	3.2	1.2	-1.7	0.9	14.4	28.1	41.4
426	Energy Star: Room Air Conditioners	0.0	0.1	0.1	0.3	0.3	0.4	0.8	1.1	1.3
427	Energy Star: Water Heaters	0.9	1.0	2.2	3.7	5.5	12.7	55.3	113.1	173.5
211	Building Materials	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	1.8	6.3	8.7
215	Roofs Walls & Foundations	0.0	-0.3	0.8	2.0	2.9	7.8	31.2	57.8	75.7
806	Urban Heat Islands/Highly Reflective Surfaces	-800.4	-132.5	-201.0	-153.9	-216.2	-219.6	-190.4	-137.3	-125.6
221	Electrochromic Research	0.0	0.1	0.5	0.9	1.8	4.8	25.8	68.4	123.1

Table 2.5. (contd)

Projcode	Descriptor	Effect on Total National Wage Income (Million 1997$)								
		1999	2000	2001	2002	2003	2005	2010	2015	2020
222	Superwindows Technologies/Collaborative	0.3	0.5	0.9	1.6	2.7	6.3	27.0	69.7	123.4
223	Advanced Glazing	0.0	0.2	0.4	0.8	1.3	3.3	15.9	40.3	70.7
603	Test Procedures, Standards, and Labeling:	See Detail, Codes 6031-6038								
6031	Test Procedures, Standards, and Labeling: Ballasts	0.0	0.0	0.0	0.0	1.2	21.0	65.5	99.2	123.5
6032	Test Procedures, Standards, and Labeling: Clothes Washers	-4.3	-1.7	-1.4	-1.1	-9.1	-135.1	-16.1	95.5	200.3
6033	Test Procedures, Standards, and Labeling: Gas Water Heaters	0.0	0.0	0.0	0.3	1.6	39.7	104.1	175.6	244.2
6034	Test Procedures, Standards, and Labeling: Oil Water Heaters	0.0	0.0	0.0	-0.2	-0.4	-0.7	-1.1	-1.5	-1.9
6035	Test Procedures, Standards, and Labeling: Central Air Conditioners	0.0	-1.1	-10.4	-9.4	-8.2	-7.7	83.0	166.8	245.7
6036	Test Procedures, Standards, and Labeling: Gas Furnaces	0.0	0.1	0.7	1.4	2.0	3.2	5.7	8.0	10.0
6037	Test Procedures, Standards, and Labeling: Oil Furnaces	0.0	0.0	-0.6	-1.1	-1.7	-2.8	-5.4	-7.6	-9.6
6038	Test Procedures, Standards, and Labeling: Electric Water Heaters	0.0	0.0	0.0	-1.7	-15.1	-2.3	2.7	15.7	28.0
501	Update State Codes/Voluntary & Federal Energy Codes	4.8	5.1	11.7	22.0	36.9	77.3	266.9	531.8	827.4
901	Weatherization Assistance Program	9.8	9.8	14.6	19.5	24.3	33.5	55.4	58.8	57.8
902	Municipal Energy Management Program	0.5	0.7	1.0	1.4	1.6	2.3	4.0	4.1	4.0
903	State Energy Program	16.0	14.6	24.0	31.9	39.7	54.7	91.5	96.7	94.4
	Total	-$822.0	-$141.3	-$197.1	-$127.9	-$164.3	-$68.4	$1,177.5	$2,762.4	$4,337.8

Note: Detail may not sum to total due to rounding error.

18 thousand jobs, respectively. On the other side, the GPRA metrics estimate that Urban Heat Island/Highly Reflective Surfaces investments will still be relatively high in 2020 ($2.4 billion per year) and the forecasted energy savings payoff by 2020 will still be quite modest ($247 million). As a result, this program reduces the total net effect of BTS programs on employment in the year 2020 by 3% and the total net effect on wage income by 3%. The impacts of most of the other BTS programs are on a much smaller scale.

The effect of the required investment is a short-run reduction in jobs and income in the economy, but the net effect is small. By the year 2002, the effects of energy savings more than compensate for the effects of investment. Even though many of the BTS programs are in the middle of market penetration at the end of the period, the overall positive net impact on positive employment (295,000) and wage income ($4.4 billion) in the year 2020 still is a significant boost to the economy, an effect that would continue to grow after 2020 as savings increase and investments are completed.

3.0 References

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Attachment

Detailed Calculations on BTS Programs

Attachment: Detailed Calculations on BTS Programs

Table Notes

Table A.1: This table shows the effects of individual BTS programs (identified by their 1999 GPRA project codes and titles) on national incremental investment in energy-efficient technology or practices in individual years. Current investment spending is reported each year because current investment spending affects current employment and wage income. Also shown for each year and program are the effects of the accumulated investments on current expenditures for oil, natural gas, and electricity. (Impacts on non-energy expenditures for items such as maintenance services are not shown.) Current spending affects current employment and wage income. In some cases (such as the 901-Weatherization Assistance Program), the program is not expected to require any investment over and above current conventional practice, so the net effect on investment spending (and employment and income) is shown as zero. In the case of Project Code 416-Lighting Collaborative, the superior durability of compact fluorescent technology is expected to result in net savings on replacement light bulbs to the point of an annual capital cost savings. In most cases, the investment is expected to reduce net fuel expenditure, but sometimes one fuel will replace another, resulting in an increased expenditure for that fuel. Thus, for example, for Project Code 312, the High-Cool Heat Pump, Table A.1 shows the nation investing $160.6 million more for air-conditioning in the year 2015 than it otherwise would have, because it is adopting more costly high-cool heat pumps in place of conventional technology. The stock of these residential heat pumps in 2015 (the 2015 investment, plus all previous investments) save $115.7 million in electricity ($59.9 million in the residential sector, and $55.8 million in the commercial sector). However, because they use natural gas, high-cool heat pumps require an additional $23.0 million worth of natural gas (net use increases only in the residential sector), resulting in a net savings in energy expenditures of $92.7 million in 2015.

Table A.2: This table shows how the incremental investment associated with each BTS program is assumed distributed among industrial sectors. The assumed allocation in each case was made in consultation with the GPRA researchers, based on program information provided by DOE program managers, as well as the characteristics of the technologies that are expected to be adopted as a result of the program. For example, the Residential Energy Efficiency Programs are expected to result in incremental investments for housing, which we allocated as follows: 30% for more advanced heating system components, 30% for higher efficiency appliances, 20% for advanced lighting technologies, and 20% for higher construction costs to improve building shell integrity and to install more advanced systems. The justification is shown in the last column. Another example is Project Code 312-High Cool Heat Pumps, where the entire incremental investment is allocated to Service Industry Machinery (the industrial sector that builds heat pumps). Because no incremental installation cost or retail markup is expected on these units, the entire premium results from the fact that these units are expected to be more expensive to manufacture than with the conventional technology.

Table A.1. BTS Project Investment Costs and Energy Savings, by Year (Million 1997$)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
111 Building America									
Investment	$16.1	$32.1	$48.2	$64.3	$80.3	$144.6	$0.0	$0.0	$0.0
Expenditures on Oil, Residential	0.0	-0.1	-0.2	-0.4	-0.5	-1.1	-9.0	-17.3	-26.3
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	-0.6	-1.7	-3.2	-5.3	-7.8	-16.6	-122.3	-234.2	-350.6
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	-0.8	-2.0	-3.8	-6.5	-10.2	-20.9	-166.7	-339.6	-539.5
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	-$1.4	-$3.9	-$7.2	-$12.2	-$18.6	-$38.7	-$298.0	-$591.2	-$916.4
112 Residential Energy Efficiency Programs (Includes Advanced Housing)									
Investment	$192.8	$0.0	$192.8	$16.1	$224.9	$224.9	$231.3	$77.1	$0.0
Expenditures on Oil, Residential	-0.3	-0.3	-0.5	-0.6	-1.0	-1.7	-7.1	-10.2	-12.5
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	-4.8	-5.0	-9.9	-10.3	-14.8	-25.1	-102.8	-147.2	-179.3
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	-6.3	-6.3	-12.9	-13.3	-20.0	-32.0	-134.8	-199.0	-253.2
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	-11.4	-11.6	-23.3	-24.2	-35.8	-58.8	-244.8	-356.3	-445.0
114 Industrialized Housing									
Investment	$192.8	$0.0	$0.0	$208.8	$16.1	$224.9	$192.8	$77.1	$38.6
Expenditures on Oil, Residential	-0.3	-0.3	-0.3	-0.6	-0.7	-1.3	-5.7	-7.9	-9.8
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	-4.7	-4.8	-5.1	-9.9	-10.1	-19.8	-82.9	-114.5	-140.5
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	-6.1	-6.3	-6.6	-12.8	-13.2	-25.1	-108.3	-154.6	-197.8
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
Change in Energy Expenditures	-11.1	-11.4	-12.0	-23.3	-24.0	-46.2	-196.8	-277.0	-348.1
132 Affordable Homes for Low-Income Families									
Investment	$38.6	$77.1	$38.6	$77.1	$115.7	$154.2	$231.3	$154.2	$38.6
Expenditures on Oil, Residential	-0.1	-0.3	-0.5	-0.7	-1.1	-1.9	-5.2	-7.3	-7.5
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	-1.8	-4.5	-7.2	-11.6	-16.2	-29.0	-76.9	-110.5	-117.7
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	-2.5	-5.8	-9.3	-15.1	-21.7	-36.6	-98.9	-141.6	-150.1
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	-4.4	-10.6	-17.0	-27.4	-39.0	-67.5	-180.9	-259.3	-275.3
133 Rebuild America									
Investment	$1,040.9	$1,916.5	$2,173.5	$2,494.8	$2,494.8	$2,494.8	$2,923.1	$514.0	$0.0
Expenditures on Oil, Residential	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Expenditures on Oil, Commercial	-$0.8	-$2.4	-$4.6	-$7.7	-$10.7	-$17.0	-$48.8	-$54.3	-$52.9
Expenditures on Natural Gas, Residential	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Expenditures on Natural Gas, Commercial	-$5.2	-$15.4	-$29.4	-$48.4	-$67.0	-$102.7	-$281.5	-$316.4	-$311.9
Expenditures on Electricity, Residential	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Expenditures on Electricity, Commercial	-$13.7	-$40.1	-$77.4	-$126.6	-$175.0	-$267.2	-$747.6	-$828.7	-$805.2
Change in Energy Expenditures	-$19.7	-$57.9	-$111.5	-$182.7	-$252.7	-$386.9	-$1,077.9	-$1,199.5	-$1,170.0
134 Commercial/Multifamily R&D									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$4.4	$12.9	$12.9
Expenditures on Oil, Residential	-0.5	-0.5	-0.5	-1.0	-1.1	-1.7	-3.5	-4.4	-4.5
Expenditures on Oil, Commercial	0.0	-0.4	-0.4	-0.3	-0.8	-1.1	-1.8	-2.1	-2.2
Expenditures on Natural Gas, Residential	-9.3	-9.4	-9.3	-18.4	-17.8	-26.2	-50.5	-66.4	-67.2
Expenditures on Natural Gas, Commercial	0.0	-2.5	-2.6	-2.5	-4.9	-7.2	-11.4	-13.3	-15.1
Expenditures on Electricity, Residential	-11.9	-12.1	-12.4	-23.8	-23.7	-33.2	-65.4	-86.8	-88.8

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
Expenditures on Electricity, Commercial	0.0	-6.5	-6.5	-6.7	-12.8	-19.3	-32.5	-39.2	-45.5
Change in Energy Expenditures	-21.7	-31.4	-31.6	-52.8	-61.0	-88.6	-165.1	-212.2	-223.2
141 Design for Best Practice: Energy Tools									
Investment	$0.0	$0.0	$0.0	$0.0	$2.2	$6.7	$239.3	$467.4	$506.3
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	-1.9	-4.2
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	-0.1	-2.8	-10.1	-20.6
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	-0.1	-0.5	-9.3	-31.6	-62.6
Expenditures on Natural Gas, Commercial	0.0	0.0	-0.1	-0.1	-0.4	-1.7	-34.6	-125.8	-260.0
Expenditures on Electricity, Residential	0.0	0.0	0.0	0.0	0.0	-0.7	-16.3	-61.3	-134.0
Expenditures on Electricity, Commercial	0.0	0.0	-0.5	-0.9	-2.1	-8.7	-176.4	-630.2	-1,280.6
Change in Energy Expenditures	0.0	0.0	-0.6	-1.1	-2.5	-11.8	-239.9	-860.9	-1,762.0
142 Passive Solar									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$214.2	$535.4	$856.7	$1,070.9
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	-0.1	-0.1	-0.2	-1.5	-3.7	-6.2
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	-0.1	-0.2	-0.4	-0.8	-2.4	-15.2	-38.0	-64.7
Expenditures on Electricity, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Commercial	0.0	0.0	-0.2	-0.7	-1.6	-4.7	-30.5	-75.4	-125.6
Change in Energy Expenditures	0.0	-0.1	-0.4	-1.2	-2.5	-7.3	-47.2	-117.1	-196.6

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
231 Indoor Air Quality									
Investment	$0.0	$2.1	$5.4	$8.6	$12.9	$31.1	$98.5	$169.2	$209.9
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	-0.1	-0.2	-1.3	-3.4	-6.1
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	-0.1	-0.5	-1.2	-2.0
Expenditures on Natural Gas, Residential	0.0	-0.1	-0.4	-0.8	-1.5	-4.1	-23.8	-54.8	-88.7
Expenditures on Natural Gas, Commercial	0.0	0.0	-0.1	-0.1	-0.3	-0.9	-5.9	-14.7	-24.9
Expenditures on Electricity, Residential	0.0	0.0	-0.5	-1.3	-2.3	-6.4	-41.7	-106.4	-189.8
Expenditures on Electricity, Commercial	0.0	0.0	-0.5	-0.9	-1.6	-4.7	-30.1	-73.7	-123.0
Change in Energy Expenditures	0.0	-0.1	-1.4	-3.1	-5.7	-16.3	-103.2	-254.1	-434.5
805 Outreach									
Investment	$0.0	$0.0	$0.0	$0.0	$11.4	$0.0	$0.0	$11.4	$11.4
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	-0.1	-0.2	-0.2	-0.5	-0.8	-1.2	-1.7
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	0.0	0.0	0.0	-0.3	-0.5	-0.7	-1.2	-2.1	-3.4
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	0.0	0.0	-0.1	-0.4	-0.7	-1.2	-2.0	-3.4	-5.1
311 Residential Absorption Heat Pump									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$10.7	$64.3	$149.9	$203.5
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	-0.1	-0.3	-2.1	-30.7	-98.0	-183.9
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	0.0	0.0	0.0	0.0	-0.3	-1.2	-18.0	-57.1	-106.0
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	-0.2	-1.3	-21.1	-65.8	-119.6

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
Change in Energy Expenditures	0.0	0.0	0.0	-0.1	-0.8	-4.6	-69.7	-221.0	-409.6
312 Hi-Cool Heat Pump: Component R&D									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$32.1	$160.6	$289.1
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.1	4.4	23.0	54.9
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	0.0	0.0	0.0	0.0	0.0	-0.2	-11.3	-59.9	-140.6
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	-0.2	-10.8	-55.8	-127.7
Change in Energy Expenditures	0.0	0.0	0.0	0.0	0.0	-0.3	-17.7	-92.7	-213.3
361 Advanced Desiccant									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$1.3	$3.2	$8.4	$10.9
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Commercial	0.0	0.0	0.0	-0.2	-0.7	-3.6	-19.1	-52.6	-94.9
Change in Energy Expenditures	0.0	0.0	0.0	-0.2	-0.7	-3.6	-19.1	-52.6	-94.9
352 Fuel Cell Building Microcogeneration									
Investment	$0.0	$130.2	$122.9	$173.5	$162.7	$611.1	$665.0	$751.8	$751.8
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	-0.1	-0.3	-0.4	-2.0	-8.2	-14.2	-14.6
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	4.9	11.0	23.0	35.0	140.5	554.9	970.6	1,019.9
Expenditures on Electricity, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
Expenditures on Electricity, Commercial	0.0	-14.6	-32.2	-66.7	-100.8	-399.1	-1,588.7	-2,704.4	-2,766.1
Change in Energy Expenditures	0.0	-9.7	-21.3	-44.0	-66.2	-260.6	-1,042.0	-1,748.0	-1,760.7
321 Furnaces & Boilers/Combustion Research									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$1.1	$0.0	$0.0	$0.0
Expenditures on Oil, Residential	0.0	0.0	-0.1	-0.3	-0.5	-1.9	-14.0	-32.1	-51.2
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	0.0	0.0	-0.1	-0.3	-0.5	-1.9	-14.0	-32.1	-51.2
331 Advanced Refrigeration/Component Technology (HP)									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$49.8	$199.0	$323.4	$348.3
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	0.0	0.0	-0.8	-2.3	-4.0	-13.3	-100.8	-230.9	-366.3
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	-0.7	-1.8	-13.4	-30.0	-46.1
Change in Energy Expenditures	0.0	0.0	-0.8	-2.3	-4.7	-15.1	-114.2	-260.9	-412.3

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
332 Advanced Refrigeration/Component Technology (Refrig)									
Investment	$1.0	$2.0	$3.9	$8.9	$11.8	$22.7	$74.9	$144.8	$181.3
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	0.0	-0.5	-0.5	-1.0	-2.3	-5.4	-31.4	-80.5	-138.7
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	0.0	-0.5	-0.5	-1.0	-2.3	-5.4	-31.4	-80.5	-138.7
411 Advanced Light Sources: Electronics and New Concepts (LPSL)									
Investment	$0.0	$0.0	-$3.8	-$3.8	-$9.6	-$20.9	-$62.5	-$138.1	-$194.4
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.8
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.5
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.1	0.1	0.5	2.8	7.9	14.8
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.1	0.1	1.0	2.3	3.7
Expenditures on Electricity, Residential	0.0	-0.5	-2.0	-4.5	-8.2	-24.8	-154.5	-435.7	-826.5
Expenditures on Electricity, Commercial	0.0	-0.5	-1.4	-3.0	-5.7	-16.6	-90.1	-214.1	-339.1
Change in Energy Expenditures	0.0	-1.0	-3.4	-7.4	-13.8	-40.8	-240.6	-638.9	-1,145.9
417 Lighting Applications and Impacts									
Investment	$0.0	$0.0	$0.0	$0.0	-$1.9	-$1.9	-$10.6	-$26.0	-$34.7
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.1	0.4	1.3	2.3
Expenditures on Electricity, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Commercial	0.0	-0.5	-1.4	-2.8	-3.0	-8.1	-46.6	-119.7	-208.3

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
Change in Energy Expenditures	0.0	-0.5	-1.4	-2.8	-3.0	-8.0	-46.1	-118.3	-205.8
416 Lighting Collaborative (CFL)									
Investment	$0.0	-$2.3	-$14.6	-$23.3	-$38.9	-$68.6	-$200.9	-$500.7	-$815.9
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.0	2.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.8	1.2
Expenditures on Natural Gas, Residential	0.0	0.0	0.1	0.3	0.5	1.3	7.8	21.3	39.7
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.1	0.1	0.4	2.6	6.1	9.8
Expenditures on Electricity, Residential	0.0	-2.0	-6.6	-14.3	-25.7	-68.9	-425.2	-1,171.6	-2,208.2
Expenditures on Electricity, Commercial	0.0	-1.4	-4.9	-10.3	-18.1	-45.9	-247.3	-576.9	-907.4
Change in Energy Expenditures	0.0	-3.4	-11.3	-24.3	-43.1	-112.9	-661.4	-1,719.3	-3,062.9
422 Energy Star	See Details, Codes 423-427								
423 Energy Star: Clothes Washers									
Investment	$35.7	$107.2	$249.7	$534.4	$712.5	$706.7	$689.7	$676.6	$667.8
Expenditures on Oil, Residential	0.0	-0.1	-0.6	-1.3	-2.5	-4.4	-9.4	-13.8	-17.8
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	-0.6	-2.6	-7.0	-16.6	-29.3	-53.8	-109.7	-163.8	-215.7
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	-0.5	-3.3	-9.3	-21.8	-37.9	-69.6	-141.3	-209.0	-271.6
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	-1.1	-6.0	-16.9	-39.7	-69.7	-127.8	-260.4	-386.6	-505.1
425 Energy Star: Refrigerators									
Investment	$57.1	$164.5	$11.8	$53.2	$126.1	$173.4	$180.3	$188.2	$195.1
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
Expenditures on Electricity, Residential	-13.9	-54.2	-17.4	-21.1	-30.2	-55.3	-116.9	-179.1	-239.6
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	-13.9	-54.2	-17.4	-21.1	-30.2	-55.3	-116.9	-179.1	-239.6
426 Energy Star: Room Air Conditioners									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	0.0	-0.5	-0.5	-1.5	-1.5	-2.0	-3.3	-4.7	-5.9
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	0.0	-0.5	-0.5	-1.5	-1.5	-2.0	-3.3	-4.7	-5.9
427 Energy Star: Water Heaters									
Investment	$0.0	$4.3	$4.3	$10.7	$10.7	$21.4	$53.5	$72.8	$79.2
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	-2.0	-5.8	-11.1	-19.3	-27.4	-62.5	-259.2	-518.5	-785.2
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	-2.0	-5.8	-11.1	-19.3	-27.4	-62.5	-259.2	-518.5	-785.2

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
211 Building Materials									
Investment	$0.0	$1.2	$1.2	$5.4	$5.4	$16.2	$56.4	$98.3	$118.7
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	0.0	0.0	0.0	-0.5	-0.7	-2.9	-19.5	-48.1	-62.5
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	0.0	0.0	0.0	-0.5	-0.7	-2.9	-19.5	-48.1	-62.5
215 Roofs, Walls & Foundations									
Investment	$0.0	$66.9	$67.9	$78.0	$151.1	$200.6	$403.0	$494.2	$374.3
Expenditures on Oil, Residential	0.0	-0.1	-0.1	-0.3	-0.5	-1.0	-3.2	-5.4	-6.3
Expenditures on Oil, Commercial	0.0	-0.1	-0.1	-0.2	-0.4	-1.0	-3.3	-5.7	-6.7
Expenditures on Natural Gas, Residential	0.0	-2.0	-4.0	-6.1	-10.0	-19.7	-59.8	-97.8	-112.1
Expenditures on Natural Gas, Commercial	0.0	-0.8	-0.9	-1.7	-3.2	-6.6	-21.8	-39.6	-51.3
Expenditures on Electricity, Residential	0.0	-3.0	-6.1	-9.0	-15.2	-28.3	-89.3	-147.9	-173.5
Expenditures on Electricity, Commercial	0.0	-2.1	-2.6	-5.2	-9.7	-20.6	-75.8	-144.3	-196.3
Change in Energy Expenditures	0.0	-8.1	-13.8	-22.6	-39.2	-77.1	-253.1	-440.8	-546.2
806 Urban Heat Islands/Highly Reflective Surfaces									
Investment	$6,148.1	$2,097.4	$3,164.7	$2,476.4	$3,453.0	$3,543.7	$3,239.3	$2,534.7	$2,444.0
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.4	-0.5	-0.6
Expenditures on Natural Gas, Commercial	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2
Expenditures on Electricity, Residential	-12.4	-16.6	-22.2	-26.9	-32.7	-36.6	-58.9	-73.9	-87.0
Expenditures on Electricity, Commercial	-15.9	-21.6	-28.8	-35.0	-43.0	-60.1	-101.0	-131.9	-158.9

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
Change in Energy Expenditures	-28.4	-38.4	-51.2	-62.0	-75.8	-97.1	-160.4	-206.4	-246.7
221 Electrochromic Research									
Investment	$0.0	$0.0	$0.0	$10.9	$25.0	$69.3	$546.2	$919.8	$1,153.3
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	0.0	0.0	-0.3	-0.5	-1.0	-2.7	-15.3	-39.9	-71.5
Expenditures on Electricity, Commercial	0.0	-1.2	-4.1	-8.6	-16.3	-43.4	-235.5	-615.5	-1,097.5
Change in Energy Expenditures	0.0	-1.2	-4.3	-9.1	-17.3	-46.1	-250.8	-655.4	-1,169.0
222 CCAP - Superwindows Technologies/Collaborative									
Investment	$0.0	$0.0	$4.2	$10.9	$18.9	$42.3	$265.7	$404.4	$487.4
Expenditures on Oil, Residential	-0.1	-0.1	-0.4	-0.7	-1.2	-2.9	-14.0	-33.9	-58.5
Expenditures on Oil, Commercial	0.0	-0.1	-0.2	-0.3	-0.5	-1.3	-6.1	-14.8	-25.3
Expenditures on Natural Gas, Residential	-0.2	-0.6	-1.4	-2.6	-4.3	-10.1	-45.2	-109.8	-189.3
Expenditures on Natural Gas, Commercial	-0.1	-0.3	-0.6	-1.3	-2.1	-5.0	-22.9	-56.4	-98.2
Expenditures on Electricity, Residential	-0.3	-1.0	-2.0	-3.8	-6.2	-14.8	-66.4	-159.5	-272.2
Expenditures on Electricity, Commercial	-0.2	-0.9	-2.1	-4.3	-7.0	-16.4	-75.4	-181.0	-307.8
Change in Energy Expenditures	-0.8	-3.1	-6.7	-12.9	-21.4	-50.5	-230.0	-555.4	-951.5
223 Advanced Glazing									
Investment	$0.0	$0.0	$1.2	$4.7	$9.3	$23.0	$162.3	$261.5	$322.4
Expenditures on Oil, Residential	0.0	-0.1	-0.1	-0.2	-0.3	-0.8	-3.9	-9.4	-16.2
Expenditures on Oil, Commercial	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-1.7	-4.1	-7.0
Expenditures on Natural Gas, Residential	-0.1	-0.2	-0.4	-0.7	-1.2	-2.8	-12.5	-30.4	-52.4
Expenditures on Natural Gas, Commercial	0.0	-0.1	-0.2	-0.3	-0.6	-1.4	-6.3	-15.6	-27.2
Expenditures on Electricity, Residential	0.0	-0.3	-0.5	-1.3	-2.0	-4.9	-22.5	-55.3	-95.1

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
Expenditures on Electricity, Commercial	0.0	-0.7	-1.6	-3.4	-6.3	-16.4	-86.0	-220.2	-388.6
Change in Energy Expenditures	-0.1	-1.3	-2.9	-6.1	-10.6	-26.7	-133.0	-334.9	-586.5
603 Test Procedures, Standards, and Labeling	See Details, Codes 6031-6038								
6031 Test Procedures, Standards, and Labeling: Ballasts									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.3	1.0	1.4	1.7
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.1	2.4	7.2	11.0	13.9
Expenditures on Electricity, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	-12.1	-215.1	-668.4	-1,008.8	-1,252.9
Change in Energy Expenditures	0.0	0.0	0.0	0.0	-12.0	-212.4	-660.3	-996.4	-1,237.3
6032 Test Procedures, Standards, and Labeling: Clothes Washers									
Investment	$35.7	$35.7	$35.7	$35.6	$178.1	$2,791.5	$2,724.3	$2,672.7	$2,637.6
Expenditures on Oil, Residential	0.0	-0.1	-0.1	-0.1	-0.4	-8.6	-28.4	-45.6	-60.9
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	-0.6	-1.3	-1.9	-2.6	-5.7	-104.2	-328.9	-544.5	-751.5
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	-0.5	-2.0	-2.5	-3.3	-7.5	-134.3	-423.0	-692.0	-943.5
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	-1.1	-3.5	-4.6	-6.0	-13.6	-247.1	-780.3	-1,282.1	-1,755.9

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
6033 Test Procedures, Standards, and Labeling: Gas Water Heaters									
Investment	$0.0	$0.0	$0.0	$33.7	$305.7	$304.1	$299.3	$295.0	$291.3
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	-9.8	-98.7	-270.5	-563.8	-887.8	-1,199.2
Expenditures on Natural Gas, Commercial	0.0	0.0	-0.5	-5.5	-10.3	-19.4	-26.2	-39.0	-50.7
Expenditures on Electricity, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	0.0	0.0	-0.5	-15.2	-109.0	-289.9	-589.9	-926.8	-1,249.9
6034 Test Procedures, Standards, and Labeling: Oil Water Heaters									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	-0.4	-0.9	-1.8	-2.7	-3.6	-4.5
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	0.0	0.0	0.0	-0.4	-0.9	-1.8	-2.7	-3.6	-4.5
6035 Test Procedures, Standards, and Labeling: Central Air Conditioners									
Investment	$0.0	$16.5	$157.4	$157.4	$155.9	$667.8	$650.6	$640.3	$627.3
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	0.0	0.0	0.0	0.0	0.0	-159.1	-532.5	-879.1	-1,203.7
Expenditures on Electricity, Commercial	0.0	-1.2	-11.7	-21.8	-32.3	-51.3	-97.1	-138.2	-175.7

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
Change in Energy Expenditures	0.0	-1.2	-11.7	-21.8	-32.3	-210.4	-629.6	-1,017.3	-1,379.4
6036 Test Procedures, Standards, and Labeling: Gas Furnaces									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	-0.8	-8.2	-15.5	-22.6	-35.6	-63.8	-89.3	-111.4
Expenditures on Electricity, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	0.0	-0.8	-8.2	-15.5	-22.6	-35.6	-63.8	-89.3	-111.4
6037 Test Procedures, Standards, and Labeling: Oil Furnaces									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	-0.1	-1.4	-2.6	-4.0	-6.6	-12.9	-18.3	-23.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	0.0	-0.1	-1.4	-2.6	-4.0	-6.6	-12.9	-18.3	-23.0
6038 Test Procedures, Standards, and Labeling: Electric Water Heaters									
Investment	$0.0	$0.0	$0.0	$36.4	$329.5	$322.2	$305.8	$304.0	$302.2
Expenditures on Oil, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	0.0	0.0	0.0	-3.3	-31.2	-85.6	-102.5	-159.3	-212.3

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	0.0	0.0	0.0	-3.3	-31.2	-85.6	-102.5	-159.3	-212.3
501 Update State Codes/Voluntary & Federal Energy Codes									
Investment	$26.2	$59.5	$114.5	$179.7	$257.0	$603.1	$1,088.1	$1,780.0	$1,673.4
Expenditures on Oil, Residential	-0.6	-1.9	-4.6	-8.8	-15.0	-33.4	-109.8	-202.1	-293.9
Expenditures on Oil, Commercial	-0.1	-0.2	-0.3	-0.5	-0.7	-1.1	-2.5	-4.4	-7.2
Expenditures on Natural Gas, Residential	-0.5	-1.5	-3.5	-6.7	-11.2	-24.4	-75.1	-138.1	-200.7
Expenditures on Natural Gas, Commercial	-2.0	-6.4	-13.2	-22.7	-35.4	-70.8	-216.8	-465.1	-749.2
Expenditures on Electricity, Residential	-3.3	-10.6	-25.1	-47.5	-79.5	-172.5	-539.6	-983.0	-1,412.5
Expenditures on Electricity, Commercial	-10.9	-34.2	-71.7	-125.8	-201.1	-423.1	-1,376.9	-2,847.2	-4,425.8
Change in Energy Expenditures	-17.3	-54.9	-118.4	-212.2	-342.9	-725.3	-2,320.7	-4,640.0	-7,089.1
901 Weatherization Assistance Program									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Expenditures on Oil, Residential	-8.5	-17.5	-26.3	-35.1	-44.5	-62.8	-110.4	-117.5	-115.7
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	-17.0	-33.9	-50.6	-67.4	-84.1	-115.8	-190.5	-202.9	-199.7
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	-4.9	-9.9	-14.8	-19.6	-24.4	-33.7	-56.3	-59.2	-57.7
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	-30.4	-61.3	-91.7	-122.1	-152.9	-212.3	-357.2	-379.6	-373.1
902 Municipal Energy Management Program									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Expenditures on Oil, Residential	-0.4	-0.9	-1.3	-1.7	-2.2	-3.5	-5.9	-6.2	-6.1
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	-0.2	-0.5	-0.7	-1.0	-1.2	-1.7	-2.7	-2.9	-2.9
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table A.1. (contd)

Project & Category	Years								
	1999	2000	2001	2002	2003	2005	2010	2015	2020
Expenditures on Electricity, Residential	-0.9	-2.6	-3.4	-5.2	-6.0	-8.4	-14.7	-15.1	-14.7
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	-1.5	-3.9	-5.4	-7.9	-9.4	-13.6	-23.3	-24.2	-23.7
903 State Energy Program									
Investment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Expenditures on Oil, Residential	-10.7	-21.3	-32.3	-43.4	-55.0	-77.8	-136.2	-145.5	-143.3
Expenditures on Oil, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Natural Gas, Residential	-5.6	-5.2	-16.7	-22.2	-27.8	-38.2	-63.0	-67.0	-66.0
Expenditures on Natural Gas, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Expenditures on Electricity, Residential	-29.4	-58.5	-87.9	-117.2	-145.5	-200.4	-335.1	-353.4	-344.0
Expenditures on Electricity, Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Change in Energy Expenditures	-45.6	-85.0	-137.0	-182.8	-228.3	-316.4	-534.2	-565.9	-553.3
Note: Detail may not add to total due to rounding error.									

Table A.2. Allocation of BTS Project Investment Costs by Sector

Projcode	Name	Maximum Incremental Investment (1994 $/Year)	Percent Distributions	Comments
111	Building America	$135 M	Construction 100	Designed to build to higher standards at minimal incremental construction cost.
112	Residential Energy Efficiency Programs (Including Advanced Housing)	$216 M	Construction 20; Heating, Plumbing, Structural Metal 30; Appliances 30; Lighting 20	Efficiency comes from a variety of sources in the home. This is an arbitrary breakdown of potential increases in household costs for structures and equipment.
114	Industrialized Housing	$210 M	Wood Products 20; Heating, Plumbing, Structural Metal 30; Appliances 30; Lighting 20	Increased efficiency of prefabricated manufactured homes (SIC 2452) and equipment.
132	Affordable Homes for Low Income Families	$216 M	Construction 20; Heating, Plumbing, Structural Metal 30; Appliances 30; Lighting 20	Program focused on HUD housing shell, lights, equipment.
133	Rebuild America	$2.7 B	Construction 20; Heating, Plumbing, Structural Metal 30; Service industry Machinery 30; Lighting 20	Commercial Structures. Appliances are in Service Industry Machinery.
134	Commercial/Multifamily R&D	$12 M	Instruments (Other Mfg.) 50; Construction 10; Heating , Plumbing 15; Service Industry Machines 15; and Lighting 10	One-half Energy Management Control Systems (3822,3825); one-half retrofits - heating, cooling, daylighting, passive solar. The 50% that are retrofits is divided the same as the residential energy efficiency program estimate.
141	Design for Best Practice (Energy Tools)	$473 M	Construction 20; Heating, Plumbing, Structural Metal 30; Appliances 30; Lighting 20	Divided the same as the residential energy efficiency program estimate.

Table A.2. (contd)

Projcode	Name	Maximum Incremental Investment (1994 $/Year)	Percent Distributions	Comments
142	Passive Solar	$1.0 B	Construction 50; Stone and Clay 10; Glass 10; Wood 10; Fabricated Metal 10; Plastics (other mfg.) 10	May reduce size of HVAC systems, but not shown in this analysis. Most of the increases are for windows components or insulation.
231	Indoor Air Quality	$196 M	Construction 50; Heating, Plumbing 25; Service Industry Equipment 25	About half of the program is building tightening (increased construction cost); about half is improving furnace systems and ducting.
805	Outreach	$11 M	Construction 50; Heating , Plumbing 15; Service Industry Machines 15; Lighting 10; Other Manufacturing 10	This program is 50% retrofits; 50% improvements in construction practices (via construction worker training).
311	Residential Absorption Heat Pump	$190 M	Service Industry Machinery 100	Furnaces, air conditioners, and heat pumps are SIC 3585.
312	High Cool Heat Pump	$270 M	Service Industry Machinery 100	Furnaces, air conditioners, and heat pumps are SIC 3585.
361	Advanced Desiccant	$10 M	Service Industry Machinery 100	Desiccants here are essentially dehumidifier machinery. Assumed to be part of furnace or air conditioning unit.
352	Fuel Cell Building Microcogeneration	$702 M	Electrical Industrial Equipment 100	Fuel cells are in SIC 3652.
321	Furnaces and Boilers/Combustion Research	$1 M	General Industrial Equipment 50; Heating, Plumbing Structural Metal 50	The research is on residential oil furnaces. The relevant classifications are SIC 3443 for flues and furnaces (hot air systems); SIC 3567 for boilers (hot water/steam systems).

Table A.2. (contd)

Projcode	Name	Maximum Incremental Investment (1994 $/Year)	Percent Distributions	Comments
331	Advanced Refrigeration/ Component Technology (Heat Pumps)	$325 M	Service Industry Equipment 100	Furnaces, air conditioners, and heat pumps are SIC 3585.
332	Advanced Refrigeration/ Component Technology (Refrigerators)	$169 M	Appliances 100	Refrigerators are in Appliance Manufacturing, SIC 3632.
411	Advanced Light Sources, Electronics, and New Concepts (LPSL)	-$182 M	Glass 50; Electric Lighting and Wiring 50	Fiber optics are in SIC 3229; microwave sources in SIC 3679. Saves investment on a per-lumen basis.
417	Lighting Applications and Impacts	-$32 M	Electric Lighting and Wiring 100	Bulbs and tubes are in SIC 3641. Saves investment on a per-lumen basis.
416	Lighting Collaborative (CFL)	-$762 M	Electric Lighting and Wiring 100	Bulbs and tubes are in SIC 3641. Saves investment on a per-lumen basis.
422	Energy Star Program	See the following.	Individual programs follow.	Individual programs follow.
423	Energy Star: Clothes Washers	$665 M	Appliances 100	Clothes Washers are in Appliance Manufacturing, SIC 3633.
425	Energy Star: Refrigerators	$182 M	Appliances 100	Refrigerators are in Appliance Manufacturing, SIC 3632.
426	Energy Star: Room Air Conditioners	$0	Service Industry Equipment 100	Room Air Conditioners are in Service Industry Equipment, SIC 3585.
427	Energy Star: Water Heaters	$74 M	Appliances 100	Water Heaters are in Appliance Manufacturing, SIC 3639.

Table A.2. (contd)

Projcode	Name	Maximum Incremental Investment (1994 $/Year)	Percent Distributions	Comments
211	Building Materials	$111 M	Stone and Clay 50; Other Mfg. 50	This initiative is trying to improve insulation (fiber glass is SIC 3296; blown foam SIC 3086.
215	Roofs, Walls, and Foundations	$462 M	Stone and Clay 25; Wood Products 25; Fabricated Metal 25; Other Mfg. 25	This initiative is trying to improve thermal performance of insulation (SIC 3296 or 3086); foundations (concrete); walls (concrete panels SIC 3272, wood-cellulose SIC 2621, or aluminum SIC 3444); window units (wood SIC 2431, aluminum SIC 3442 , or plastic SIC 3089); and roofs (30/30 initiative - wood).
806	Urban Heat Islands/Highly Reflective Surfaces	$5.7 B	Other Mfg. 100	Paints and coatings.
221	Electrochromic Research	$1.1 B	Glass 100	"Smart" windows.
222	Superwindows Technologies/Collaborative	$455 M	Glass 25; Wood 25; Structural Metal 25; Other Mfg. 25	Window Units are in Wood SIC 2431; Metal SIC 3442; and Plastic SIC 3089. Initiative is working on high spectral efficiency in glazing; high efficiency/ low conductance window units.
223	Advanced Glazing	$301 M	Glass 100	Expected to increase the unit price of glass.
603	Test Procedures, Standards, and Labeling	As follows	Individual programs follow.	Heating and cooling systems are included in Service Industry Equipment.
6031	Test Procedures, Standards, and Labeling: Ballasts	$0	Electronic Equipment 100	Ballasts are in Electronic Equipment, SIC 3612.

Table A.2. (contd)

Projcode	Name	Maximum Incremental Investment (1994 $/Year)	Percent Distributions	Comments
6032	Test Procedures, Standards, and Labeling: Clothes Washers	$2.6 B	Appliances 100	Clothes Washers are in Appliance Manufacturing, SIC 3633.
6033	Test Procedures, Standards, and Labeling: Gas Water Heaters	$286 M	Appliances 100	Water Heaters are in Appliance Manufacturing, SIC 3639.
6034	Test Procedures, Standards, and Labeling: Oil Water Heaters	$0	Appliances 100	Water Heaters are in Appliance Manufacturing, SIC 3639.
6035	Test Procedures, Standards, and Labeling: Central Air Conditioners	$624 M	Service Industry Equipment 100	Heating and cooling systems are included in Service Industry Equipment, SIC 3585.
6036	Test Procedures, Standards, and Labeling: Gas Furnaces	$0	Service Industry Equipment 100	Heating and cooling systems are included in Service Industry Equipment, SIC 3585.
6037	Test Procedures, Standards, and Labeling: Oil Furnaces	$0	Service Industry Equipment 100	Heating and cooling systems are included in Service Industry Equipment, SIC 3585.
6038	Test Procedures, Standards, and Labeling: Electric Water Heaters	$308 M	Appliances 100	Water Heaters are in Appliance Manufacturing, SIC 3639.
501	Update State Codes/Voluntary Energy Codes	$1.7 B	Construction 20; Heating, Plumbing, Structural Metal 30; Service Industry Equipment 30; Lighting 20	Residential does not specify equipment, except for heating and cooling systems; but commercial may specify other equipment as well.

Table A.2. (contd)

Projcode	Name	Maximum Incremental Investment (1994 $/Year)	Percent Distributions	Comments
901	Weatherization Assistance Program	0	Construction 100	Increased activity in construction will be passed along to supplying sectors.
902	Municipal Energy Management	0	Construction 20; Heating, Plumbing, Structural Metal 30; Service Industry Equipment 30; Lighting 20	A mix of technologies and sectors are affected.
903	State Energy Program	0	Construction 20; Heating, Plumbing, Structural Metal 30; Service Industry Equipment 30; Lighting 20	A mix of technologies and sectors are affected.