Federal Programs 7

The Federal Government sponsors a wide range of programs that support electric utility energy efficiency initiatives. Most of the programs are concentrated in the U.S. Department of Energy (DOE), however several other Federal agencies, including the Environmental Protection Agency (EPA), the Rural Electrification Administration (REA), and the Tennessee Valley Authority (TVA), also administer energy efficiency efforts. Federal programs include those that directly encourage the development and adoption of utility integrated resource planning (IRP) and demand-side management (DSM) efforts such as DOE's Integrated Resource Planning program and the initiatives of the Federal power marketing administrations. Other programs with a more indirect contribution to utility energy savings include energy supply and demand research and development (R&D) and technology transfer activities, mandatory energy efficiency standards and labels, and efforts to encourage voluntary adoption of energy efficiency technologies. This chapter provides an overview of the more notable Federal programs.

THE FEDERAL GOVERNMENT AND ENERGY EFFICIENCY

The strong Federal interest in energy efficiency arises from the importance of reliable and economic electric power production to the economy, concerns over the environmental impacts of power production, and the Government diverse roles of wholesale power producer, utility regulator, and utility customer. The Federal mission for encouraging energy efficiency through electric utilities is based on both legislative and executive actions. Over the past two decades, Congress has passed a number of laws that either directly or indirectly affect consumer electricity demand or utility resource planning and operations.

For example, electric utility involvement in helping customers to save energy was given impetus by the National Energy Conservation Policy Act,[1] which required utilities to provide information on energy conserving measures to their residential customers and to offer energy audits. The act also established Federal minimum energy efficiency standards for appliances such as refrigerators and fluorescent lamp ballasts, eventually contributing to lower electricity consumption per unit. Table 7-1 lists some of the major legislation shaping Federal energy efficiency programs and policies. The Energy Policy Act of 1992 builds on many of these existing programs, for example, expanding Federal support for State and utility energy efficiency efforts and extending building and appliance energy efficiency standards.[2]

On the executive side, President Bush's 1991 National Energy Strategy (NES) embraced energy efficiency as a key resource in meeting future energy needs. The NES set forth two goals for Federal programs related to electricity generation and use: to "encourage efficiency and flexibility in electricity supply and demand choices, " and to "promote diversity of electricity technology and fuel choices. "[3] It listed a variety of policy initiatives to achieve those goals. Among them were DOE-led efforts to support reform of Federal and State utility regulation to encourage wider use of IRP and DSM and an expanded commitment to R&D on improved methodologies for measurement and evaluation of IRP and DSM efforts. In other areas, Federal R&D and demonstration activities designed to improve the reliability of electrotechnologies and the cost-effectiveness of energy resources, including renewable energy technologies, could contribute to improved efficiency of electricity use and production.[4]

Federal support for energy efficiency R&D (as identified in the NES) is shown in table 7-2. Out of total funding of some $1.2 billion requested in FY 1993, only about $6 million was allocated to direct support for electric utility energy efficiency initiatives. Some indirect contributions to utility energy efficiency efforts may flow from the roughly $150 million in consumer energy efficiency under building energy R&D programs and from the hundreds of millions of dollars expended for R&D in fossil, nuclear, and renewable energy power generation.

The Clinton Administration has also given energy efficiency a high priority and has proposed increased spending on several Federal energy efficiency programs as part of its economic stimulus plan and budget requests

US. DEPARTMENT OF ENERGY PROGRAMS

DOE's responsibility for formulating national energy policy and implementing energy conservation and efficiency programs make it the lead Federal agency in promoting energy conservation

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[1] Public Law 95-619, as amended, sec. 215, 42 U.S.C. 8216.

[2] Public Law 102-486, 102 Stat. 2776, Oct. 24, 1992.

[3] National *Energy Strategy: Powerful Ideas for America,* First Edition 1991/1992 (Washington DC: U.S. Government Printing Office, February 1991), p. 31.

[4] Ibid.

[5] The proposal calls for an additional $188 million in FY 1993 for DOE broad-based energy conservation programs including $47 million for the low-income weatherization assistance, and $19 million for model projects for commercializing building energy conservation technologies. The proposal would also allocate $14 million to improved energy efficiency in Federal Government facilities and $23 million for EPA's "Green Lights" program which encourages voluntary installation of energy efficient lighting. Steve Daniels and Steve Gorman, "Emergency Supplemental Appropriations Act of 1993—HR ?," *Energy andEnvironmental Study Conference Weekly Bulletin, Mar. 15,1993, pp.* A6-7.

Table 7-l-Selected Federal Legislation: Energy Efficiency and Electric Utilities

Legislation	Efficiency-Relatad Provisions
Energy Policy a nd Conservat ion Act (Public Law 94-163, December 22, 1975, 89 Stat. 870, 42 U.S.C. 6201 et seq., as amended)	Requires energy use labels for new appliances. Requires appliance energy efficiency standards (later made mandatory). Establishes State Energy Conservation Program. Provides Federal technical and financial assistance for development and implementation of State energy conservation plans.
Energy Conservation and Production Act (Public Law 94-385, August 14, 1976, 90 Stat. 1125, 42 U.S.C. 6801 et seq., as amended)	Establishes Weatherization Assistance Program to fund retrofits for low-income households. Required mandatory building energy efficiency standards for all new buildings (later made voluntary for nonfederal buildings). DOE to support innovative electric utility rate design initiatives and demonstrations to encourage energy conservation. At State request, authorizes DOE to intervene or participate in State ratemaking proceedings. Provides financial assistance for State consumer services offices to participate in State regulatory hearings.
National Energy Extension Service Act (Public Law 95-39, Title V, June 3, 1977, 91 Stat. 191, 42 U.S.C. 7001 et seq., as amended)	Establishes Energy Extension Service to fund State and local energy information, training, and demonstration programs.
National Energy Conservation Policy Act (Public Law 95-619, November 9, 1978, 92 Stat. 3206, 42 U.S.C. 8201 et seq. and elsewhere, as amended)	Establishes Residential Conservation Service and institutional Conservation Program. DOE to approve State plans requiring regulated utilities to implement residential energy conservation programs offering audits, information, and financing. Extends residential mortgage credit for energy conservation and solar energy improvements through Federal housing finance programs.
Powerplant and Industrial Fuel Use Act of 1978 (Public Law 95-620, November 9, 1978, 92 Stat. 3289, 42 U.S.C. 8340, as amended)	Imposed restrictions on use of natural gas and oil as primary fuels in existing and new powerplants (most provisions later repealed).
Public Utility Regulatory Policies Act of 1978 (Public Law 95-617, November 9, 1978, 92 Stat. 3117, 42 U. S. C.2601 et seq. and elsewhere, as amended)	Amends Federal Power Act to require State public utility commissions to consider adopting various energy conservation and ratemaking standards. Amends Energy Conservation and Production Act to provide Federal grants to States to carry out new requirements. Requires utilities to interconnect with and purchase power from qualifying small power producers and cogeneration facilities.
Energy Security Act *1980* (Public Law 96-294, June 30, 1980, 94 Stat. 611)	Amends National Energy Conservation and Production Act residential conservation programs to require warranties for conservation measures, cap audit fees at$15, and limit utility installation of conservation measures. Establishes DOE residential energy efficiency demonstration program. Establishes Commercial and Apartment Conservation Service (CACS).
Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Public Law 96-501, December 5.1980, 94 Stat. 2697.16 U.S.C. 839)	Establishes the Pacific Northwest Power Planning Council to develop regional conservation and electric power plans to guide BPA resource acquisition.

(Continued on next page)

Table 7-l-Selected Federal Legislation: Energy Efficiency and Electric Utilities+Continued)

	Authorizes BPA to acquire new energy resources consistent with the regional plan and to encourage cost effective energy conservation and renewable energy resources. Gives priority to conservation and renewable energy sources in BPA resource plans. Requires Council and BPA to collaborate on and implement a fish and wildlife protection plan.
Omnibus Budget Reconciliation Act (Public Law 97-35, August 3, 1981,95 Stat. 357)	Amends the Powerplant and Industrial Fuel Use Act to allow DOE to ban the use of oil or natural gas in new powerplants where alternatives exist. Requires electric utilities using natural gas as a primary source to implement a conservation plan that will reduce at least 10 percent of electricity consumption attributable to natural gas over 5 years. Creates the imw-income Home Energy Assistance Program (LIHEAP). Makes building energy performance standards voluntary for non-federal buildings under the Energy Conservation and Production Act.
Hoover Power Plant Act of 1984 (Public Law 98-381, August 17,1984,38 Stat. 1333,43 U.S.C. 7275 et seq., as amended)	Requires Western Area Power Administration long-term firm power service contracts to require customers to develop and implement energy conservation programs.
Conservation Service Reform Act of 1986 (Public Law 99-412, August 28, 1986, 100 Stat. 932)	Amends National Energy Conservation Policy Act. Reforms the Residential Conservation Service and extends its expiration to 1989. Eliminates requirement that utilities arrange for conservation measures installation and related loans. Allows States to develop alternative conservation plan for residential buildings. Abolishes the Commercial and Apartment Conservation Service.
Powerplant and Industrial Fuel Use Act of 1978, Amendments (Public Law 100-42, May 21, 1978, 101 Stat. 310)	Repeals and amends certain sections of the 1978 Act restricting utility use of oil and natural gas. Requires that no new electric powerplant may be constructed or operated as a base load powerplant without the capability to use coal or other alternative to petroleum as a primary energy source, unless it receives an exemption.
National Appliance Energy Conservation Act of *1987* (Public Law 100-12, March 17, 1987, 101 Stat. 103)	In absence of DOE implementation, establishes mandatory minimum energy efficiency standards under Energy Policy and Conservation Act and requires DOE to update standards periodically. Adds additional appliance categories for which standards must be developed.
Renewable Energy and Energy Efflciency Technology Competitiveness Act of 1989 (Public Law 101-218, December 11, 1989, 103 Stat. 1859, 42 U.S.C. 12001-1 2007)	Directs DOE to participate in cost share joint venture demonstrations of renewable energy and advanced district cooling technologies. Establishes cost and performance goals for Federal wind, photovoltaic, and solar thermal research programs.

SOURCE: Office of Technology Assessment, 1993.

Table 7-2—National Energy Strategy Funding Levels for Energy Research and Development Fiscal Years 1991-93 ($ millions)

Research area	FY 1991 actual	FY 1992 enacted	FY 1993 requested	FY 1991-93 percent change
Surface transportation efficiency				
Transportation materials development	$21,6	$23.5	$26.4	22.20/0
Heat engine development	15.8	16.8	17.5	10,8
Electric and hybrid propulsion	25.0	42.9	75.3	201.2
Other transportation efficiency	7.6	9.6	11.5	51.6
Intelligent vehicle-highway systems	23.0	27.5	37.5	63.0
High-speed rail, maglev	12.0	20.0	28,0	133.3
High-performance communications	58.0	92.0	123.0	112.1
Total	$163.0	$232.3	$319.2	95.8%
Air transportation efficiency				
Energy-efficient aeronautics	$51.6	$63.0	$68.0	31 .8%
Air traffic control systems	35.0	32.0	46.0	31.4
Total	$86.6	$95.0	$114.0	31.670
New transportation fuels				
Alternative fuels utilization	$13.6	$ 17.4	$31.7	133.1 %
Fuels from biomass	28.7	34.8	46.4	61.7
Advanced oil recovery	31.7	36.9	46.5	46.7
Natural gas[a]	15.9	12.6	40.0	151.6
Total	$89.9	$101.7	$164.6	8 3 . 1 %
Efficiency In buildings and Industry				
Integrated resource planning	$ 3.0	$ 3.9	$ 6.0	1 00.0%
Industry efficiency	78.9	92.2	95.7	21.3
Alternate industry feedstocks	0.3	0.5	2.0	566.7
Buildings energy technologies	44.9	49.4	54.5	21.4
Total	$127.1	$146.0	$158.2	24.50/.
Advanced electric technology				
Municipal solid waste	$ 0.0	$ 1.6	$ 4.0	NA
Cogeneration	4.1	3.2	3.5	-14.6%
Photovoltaics	46.4	60.4	63.5	36.9
Other solar and renewable	103.4	123.0	113,6	9.8
Superconductivity	18.6	22.0	22.5	21.0
Advanced light-water reactors	44.3	62.5	58.7	32.5
Advanced reactor concepts	61.3	59.5	50.0	-18.4
Advanced reactor facilities	91.1	97.8	95,1	4.4
Total	$369.2	$ 430.0	$ 410.9	11.370
Grand total	$835.8	$1,005.0	$1,166.9	39.60/0
Total DOE	$660.2	$ 782.5	$ 878.4	33.1%

a Includes only **funding contained** within the Fossil Energy appropriation.

SOURCE: **Office of Technology Assessment, 1993, based on data from U.S. Department of Energy, "National Energy Strategy: Powerful ideas for America: One Year Later," DOE/S--92008000, February 1992, p. 5.**

at electric utilities.[6] The primary DOE programs involving electric utilities are under the 0ffice of the Assistant Secretary for Energy Efficiency and Renewable Energy (formerly Conservation and Renewable Energy). The R&D and technology transfer efforts of the Office of Fossil Energy, the Clean Coal Technology Program, and the Office of Nuclear Energy, also offer some benefits for increasing the energy efficiency, cost-effectiveness, and environmental compatibility of utility power generation options.

Federal support for energy conservation and efficiency has varied significantly, usually reflecting shifting political priorities. From FY 1980 to 1990, appropriations for DOE conservation R&D, where much of the utility-related energy efficiency R&D is focused, fell by more than half. The Bush Administration and Congress reversed that trend, but in real terms, DOE's conservation R&D budget in FY 1991 was only 60 percent of what it had been in FY 1980.

In FY 1992, DOE budgeted an estimated $426 million on programs that the General Accounting Office (GAO) identified as promoting conservation and efficiency in the use of electricity and other forms of energy.[7] While marking an increase over prior years, this budget level was only 11 percent of the $3.8 billion in funds allocated to energy supply technology R&D. Adjusted for inflation, DOE's FY 1992 conservation R&D budget was some 18 percent lower than in 1980.[8] Moreover, within the conservation R&D programs, the emphasis has shifted fro buildings and utility systems technologies to transportation and renewable energy technologies and to longer-term, high-risk research on industrial processes and materials, and superconducting materials.[9]

Determining g what portion of Federal spending actually supports electric utility energy efficiency initiatives or technology development is not easy. DOE programs have multiple goals, and improving energy efficiency is often a minor objective of DOE energy supply and demand technology programs. According to a GAO analysis, DOE's FY 1993 budget request to Congress reflected some $2.1 billion in civilian R&D identified by DOE as supporting the NES objective of "improving electric efficiency."[10] A more detailed breakout of the proposed spending showed $1.2 billion related to various DOE civilian nuclear programs (including light water reactors, high-efficiency and ultrahigh-efficiency power systems, fusion energy, first repository, monitored retrievable storage facility, and nuclear facilities). The Clean Coal program and renewable energy systems accounted for an additional $644 million. Altogether, demand-side efficiency programs (including $50 million for unspecified ''utility demand efficiency," $26 million for industrial programs, and $27 million for buildings efficiency programs) made up less than 0.5 percent of the budget request for electric efficiency R&D.

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6 The Department of Energy Organization Act of 1977, 42 U.S.C. 7131 et seq., consolidated the energy functions of a number of agencies under a single department. DOE absorbed the Energy Research and Development Administration the Federal Energy Administration, the Federal power administrations, the power marketing functions of the Department of the Interior, as well as some functions of other agencies. A new independent agency established within DOE, the Federal Energy Regulatory Commission, took over the responsibilities of the Federal Power Coremission and the oil pipeline regulatory functions of the Interstate Commerce Commission.

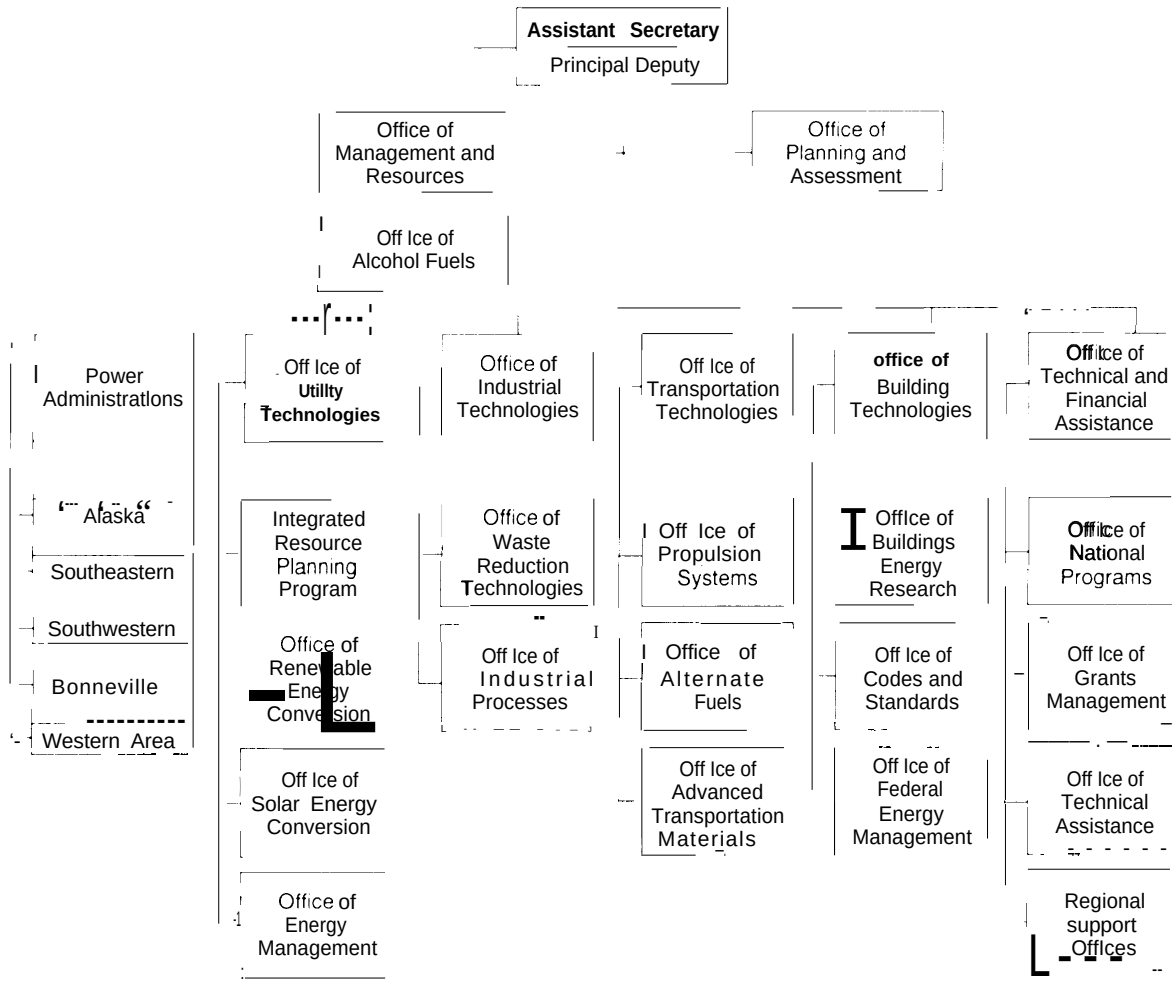
7 The GAO estimate excluded transportation sector efficiency programs, but did include DOE's conservation grant programs paid for by Petroleum Overcharge funds. General Accounting Office, ' 'DOE's Efforts to Promote Conservation and Efficiency," GAO/RCED-92-103, April 1992, pp. 2-3.

8 Ibid.

9 For more on the fate of DOE energy conservation R&D, see U.S. Congress, Office of Technology Assessment, *Building Energy Efficiency, OTA-E-518* (Washington, DC: U.S. Government Printing Office, May 1992), pp. 104-107 (hereafter referred to as OTA, *Building Energy Efficiency). See also, Fred J.* Sissine, *Congressional* Research Service, "Energy Conservation: Technical Efficiency and Program Effectiveness," CRS Issue Brief 85130, April 1991.

10 General Accounting Office, "Energy R&D: DOE's prioritization and Budgeting Process for Renewable Energy Research,'' GAO/RCED-92-155, April 1992, pp. 13-16.

Figure 7-l-Organization Chart of DOE's Assistant Secretary for Energy Efficiency and Renewable Energy



SOURCE: Office of Technology Assessment, 1993, adapted from information provided by the U.S. Department of Energy, April 1993.

Office of Energy Efficiency and Renewable Energy

The Office of the Assistant Secretary for Energy Efficiency and Renewable Energy manages R&D and technology transfer programs for renewable energy technologies, end-use energy efficiency, and utility systems. It also oversees the operations of the five Federal power marketing agencies and Federal technical and financial assistance programs.[11] As shown in figure 7-1, the major program offices are organized by end-use sectors: Utility, Buildings, Industrial, and Transportation Technologies, plus Technical and Financial Assistance.

11 Office of Federal Register, United Stares *Government Manual,* 1991/92 (Washington DC: U.S. Government Printing Office, July 1991) pp. 279-280. Hereafter referred to as *U.S. Government Manual, 1991/92.*

Table 7-3-Program Funding for DOE Office of Utility Technologies, FY 1992

Programs:	Appropriations ($millions)
Office of Solar Energy Conversion	86.7
Solar thermal	21.1
Biomass power	4.4
Photovoltaics	60.4
Resource assessment	1.2
Integrated Resource Planning	4.0
Off Ice of Energy Management	37.7
Transmission and distrlbutlon	3.1
Health effects of electrlc and magnetic fields	5.0
Energy storage	5.4
High-temperature superconductivit y	22.0
Hydrogen fuels	1.4
District heating and cooling	0.8
Office of Renewable Energy Conversion	50.6
Wind	21.4
Hydroelectric	1.0
Geothermal	26.2
Ocean	2.0

SOURCE: Office of Technology Assessment, 1993, based on data from U.S. Department of Energy, Assistant Secretary for Conservation and Renewable Energy, "Conservation and Renewable Energy Tech nologies for Utilities," DOE/CH10093-865 (prepared by the National Renewable Energy Laboratory, Golden, CO), April 1992, p. 5.

The Office of Utility Technologies a dministers programs dealing with utility systems, IRP, DSM, and renewable energy technologies R&D. Other programs also fund activities that can contribute to utility energy efficiency efforts. The Office of Buildings Technologies and the Office of Industrial Technologies direct programs that are designed to improve the energy efficiency of building and industrial systems and related processes primarily through support of R&D and information projects. The 0ffice of Technical and Financial Assistance promotes the use of renewable energy and energy-efficient technologies and practices through technology transfer, grants, cooperative activities with State and local governments and private and nonprofit organizations.

Office of Utility Technologies

The Office of Utility Technologies, created in the FY 1990 DOE restructuring, manages various programs to encourage the development and adoption of cost-effective energy efficiency and renewable energy technologies (see table 7-3).[12] The office has four utility-related research, development, demonstration, and technology transfer programs:

- The Integrated Resource Planning Program, which deals with all aspects of utility planning and operations;
- The Office of Solar Energy Conversion, which promotes the development and adoption of solar thermal, photovoltaic, and biomass energy technologies;
- The Office of Renewable Energy Conversion, which promotes wind, hydroelectric, geothermal, and ocean energy systems; and
- The Office of Energy Management, which manages research to improve the efficiency and reliability of electricity delivery and storage systems.

All of the foregoing programs share the broad goals of ensuring that energy conservation and DSM programs are considered equally with new sources of supply, reducing institutional constraints deterring adoption of energy efficiency and renewable energy technologies, and expanding cooperative efforts with utilities and private industry to realize the large market potential of these energy resources.[13]

Integrated Resource Planning Program

The IRP Program was established to encourage the development and implementation of IRP processes to ensure that cost-effective energy

12 U.S. Department of Energy, Assistant Secretary for Conservation and Renewable Energy, "Conservation and Renewable Energy Technologies for Utilities," DOIVCH1OO93-86 (prepared by the National Renewable Energy Laboratory, Golden, CO), April 1992, p. 1, Hereafter referred to as DOE, "Conservation and Renewable Energy Technologies for Utilities. "

13 Ibid., p. 4.

conservation and DSM programs are considered equally with new sources of supply .14 The IRP Program encourages utilities and State regulators to use resource planning and regulatory approaches that emphasize electricity conservation and efficiency.

The IRP Program has evolved from the Least-Cost utility Planning Program (LCUP), established in 1986 in response to congressional directives. The LCUP Program was setup to aid the adoption of least-cost planning through technology transfer to utilities, regulators, consumers, and government agencies. [15] The current structure of the IRP Program has gradually evolved over the past 8 years to support three activity areas:

- *Planning* Processes--developing methods that will integrate regulatory and DSM programs into utility planning;
- *Demand-Side Management—working* to ease adoption of DSM by utilities; and
- *Regulatory Analysis--examining the economic* regulatory environment and its barriers to demand-side investment.

The IRP Program has a very small staff (2 full-time equivalents in FY 1993), and thus, little institutional presence; its program efforts focus on channeling Federal funds for technical assistance and information transfer to State regulators and utilities. Program activities are primarily carried out through arrangements with several national laboratories to direct research, to manage grant applications and awards for cooperative research efforts and other cost-shared research.[16] The IRP Program has underwritten various conferences, workshops, publications, and training programs on IRP and DSM in collaboration with the National Association of Regulatory Utility Commissioners, the Edison Electric Institute, the Electric Power Research Institute, and similar organizations. The program has funded work evaluating and measuring utility DSM energy savings and the reliability of energy-efficient technologies. The program also is supporting development of analytical tools and methods for comparing the costs and benefits of various energy production and consumption options, including methods for incorporating total fuel-cycle analysis and consideration of environmental, social, and other external costs in utility resource planning. In recent years, the program has underwritten efforts to expand the application of IRP and DSM concepts to local gas distribution utilities. Table 7-4 shows selected projects supported in FY 1991. The program continues to support similar efforts today. According to IRP program representatives, requested budget increases will be passed through to support expanded activities through national laboratory programs and perhaps some additional direct research contracts.

Among its most successful early efforts according to program officials were the creation of organizations that have continued, independently of DOE funding, to promote LCP objectives. One of these projects, NORDAX, a regional utility-sponsored DSM data exchange is discussed in box 7-A.

For most of its history, the IRP Program has had an annual budget of some $1 million, rising to $3 million for FY 1992-93, as shown in figure 7-2. With this modest budget, DOE has defined its role as the gatherer and disseminator of information. DOE requested a 50 percent increase for the IRP program for FY 1993 for a total of $6 million to fund additional research and information activities. Actual funds received in FY 1993 were $4.9

14 Linda Berry and Eric Hirst, *Recent Accomplishments of the U.S. DOE Least-Cost Utility Program,* ORNL/CON—288 (Oak Ridge, TN: *Oak* Ridge National Laboratory, August 1989) p. 5.

15 *Hearing* on *Least Cost Utility Planning* before the Subcommittee on Energy Development and Applications of the House Committee on Science and Technology, 99th Congress, 1st sess., Sept. 26, 1985.

16 The major recipients of IRP program funds are the Oak Ridge National Laboratory in Tennessee; the Lawrence Berkeley Laboratory in California, and the National Renewable Energy Laboratory in Colorado.

Table 7-4-Recipients, Research Topics, and Funding of DOE Integrated Resource Planning Program Projects, FY 1991

Lawrence Berkeley Laboratory
- Gas Integrated Resource Planning (IRP) ($180,000)
- Evaluation of Financial Incentives to Utilities ($100,000)
- Transmission Issues in IRP ($75,000)
- Environmental Externalities and IRP ($125,000)
- Analysls of Fuel Price Risk In All Source Bidding ($450,000)
- Competitive Bidding for Demand-Side Resources ($80,000)
- Integrated Resource Bidding in New York ($60,000)
- Database on Energy Efficiency Programs ($50,000)
- End-Use Resource Planning: Transferability of End-Use Load Shape Data ($25,000)
- Technical Assistance to National Association of Regulatory Utility Commissioners, Commissions, Utilities, and DOE ($80,000)
- Technical Assistance to Power Marketing Agencies (n/a)
- Technical Potential for Efficiency improvements in the Residential and Commercial Sectors (n/a)
- Advanced IRP Seminar ($50,000)

Oak Ridge National Laboratory
- Fundamentals of Electrlc-Utility IRP (n/a)
- Analytical Foundation for Demand-Side Management (DSM) Programs (n/a)
- DSM Planning Processes (n/a)
- Analysis of the Role of DSM as a Resource (n/a)
- DSM Collaboratives (n/a)

National Renewable Energy Laboratory
- Renewable Energy and IRP Strategy ($25,000)
- Renewable Energy Profiles ($40,000)
- Technical Assistance to National Association of Regulatory Utility Commissioners ($30,000)
- State Renewable Energy Policies and Incentives ($55,000)
- Utility Fuel-Cycle Analysis Requirements Review ($30,000)
- Net Energy Analysis Study ($25,000)
- Center for Clean Air Policy Analysis and Dialogue on Global Warming and Energy Policy ($85,000)
- Scoping Study of Renewable Energy-Related Utility Modeling Issues ($30,000)
- Scoping Study of IRP Needs in the Public Utility Sector ($25,000)
- IRP Definitional Study ($25,000)
- DSM Pocket Guides ($38,000)
- Compendium of Total Fuel-Cycle Studies for Use in IRP Processes ($5,000)
  - Residential technologies
  - Commercial technologies
  - Agricultural technologies
  - industrial technologies
- Renewable resource technologies IRP ($198,000)

Bangor Hydro-Electric
- Development of a Market Implementation Strategy for Water and Space Heating Technologies (n/a)

Burlington Electric Department
- Small Utility Approach to DSM (n/a)

Central Vermont Public Service Corp.
- innovative Approaches to Commercial Lighting for Rural Electric Customers (n/a)

Fitchburg Gas and Electric Light Co.
- Small Commercial Lighting Program (n/a)

Massachusetts Municipal Wholesale Electric Co.
Electric Thermal Storage Lease/Loan Program for Residential and Small Commercial Customers (n/a)

Niagara Mohawk Power Corp., NY State Electric& Gas, Rochester Gas & Electric
Assessment of New York State Farmstead DSM (n/a)

Northeast Utilities
Evaluation of the Effectiveness of a Low-Income Weatherization Program for Rural Customers (n/a)

Washington Electric Cooperative, VT
Integrated Demand Control Project for Small Rural Utilities (n/a)

KEY: n/a = funding level not published.

SOURCE: Office of Technology Assessment, 1993, based on data from the U.S. Department of Energy, Integrated Resource Planning Program, "Volume 1: IRP Program Reviews and Catalogue of Projects," 1991.

million. The budget request for FY 1994 is $6.8 million.[17]

Although the program is small (two full-time staff members) and expenditure levels practically invisible within the overall DOE budget, DOE, nevertheless, has projected significant energy savings from its investment. DOE has projected that in the next 10 years, the program will contribute up to 30,000 MW reduction in otherwise necessary supply options. (The estimates assume that adoption of IRP will spur utilities to greater investments in more efficient generating technologies and expanded electricity savings from utility DSM programs.) In the longer run, according to DOE, this could amount to 80,000 MW, with over 4 quads of primary energy saved annually.[18] DOE'S announced program goal 1992 was to increase the number of States with comprehensive IRP from 15 to 40 by the year 2000.[19] DOE was silent on the mechanisms for accomplishing its IRP implementation goals. As noted in chapter 6 of this report, State progress in adopting and implementing IRP requirements for their jurisdictional utilities has been accelerating, even in the absence of expansive Federal programs or Federal regulatory requirements. OTA estimates that more than 30 States have established IRP policies (see ch. 6).

Evaluation of the effectiveness of the IRP Program has been limited. A 1989 review by Oak Ridge National Laboratory (funded by the IRP Program), detailed the activities completed, and concluded that at the time the program was:

> .. playing a small but effective role in ensuring that the large potential of integrated utility planning is realized DOE's role has been primarily catalytic, providing the motivation for other organizations to join in cost-sharing and information-sharing projects. DOE's participation in these projects helps to publicize and legitimize the ideas of integrated planning and aids the technology transfer processes among utilities, commissions, and other interested groups.[20]

No formal evaluation has been done since. DOE continues to view its role primarily as publicizing and legitimizing IRP and DSM concepts.

Given the modest amounts devoted to the program and the lack of alternative sources of

17 Diane Pirkey, Manager, DSM Programs, Office of Utility Technologies, U.S. Department of Energy, personal communication, Apr. 8, 1993.

18 *U.S.* Department of Energy, *FY 1992 Congressional Budget Request,* vol. 4, DOE/CR-0001, February 1991, p. 438. Hereafter referred to as DOE, *FY* 1992 *Congressional Budget Request,* vol. 4.

19 Testimony of J. Michael Davis, Assistant Secretary, Conservation and Renewable Energy, U.S. Department of Energy, Hearings on FY 1993 Department of Energy Appropriations before the Subcommittee on Interior and Related Agencies of the House Committee on Appropriations, 102d Cong., 2d sess., Apr. 8, 1992, p. 5.

20 Linda Berry and Eric Hirst, supra note 14, p. 1.

Box 7-A--NORDAX: Sharing Utility DSM Experiences

NORDAX, the NortheastRegion DSM Data Exchange, is a cooperative *projectsponsored by a kgroup of some 20* utilities in the northeastern United States and Canada. NORDAX is an example of DOE's institution*building* efforts. The Least-Cost Utility Planning Program (LCUP) provided money for development of a high quality DSM database and establishment of a regional organization to maintain and update the database. Participants in developing NORDAX included all of New York State's utilities, a number of otherortheastern utilities, the New York Public Service Commission, State and city energy agencies, the Edison Electric Institut,the Electric Power Research Institute, the Alliance to Save Energy, several national laboratories, and DOE'S LCUP program NORDAX was incorporated as a nonprofit corporation in May 1989 to carry on the project and operates independent of DOE funds.

Development of the NORDAX data base required establishing standards for collecting and presenting data on actual DSM program experiences, technologies, and costs that allow utilities to exchange data for DSM programs and resource planning. The NORDAX database, created in 1988, provides comprehensive information on over 90 DSM programs from participating utilities plus detailed data on other utility systemcharacterostocs, such as demographics, load and weather. The data is organized to assist utlilties compare and select future programs with abetter idea of their costs, market penetration, and load imparct.

From DOE's perspective, the NORDAX project helped toaddress the need for improved information on DSM technologies and programs. TheNORDAX experience will contribute to better methods for developinganddtahg DSM data to improve program effectiveness and to help incorporate real world load impacts and costs of DSM programs in IRP models. NORDAX also presents an organizational model for development of a regional DSM database that potentially could be replicated in other regions.

SOURCE: Office of Technology Assessment, 1993, based on Berry Linda and Eric Hirst, Recent tAccomplishments of the U.S. Department of Energy's Least-Cost Utility Planning Program, ORNL/CON--288 (Oak Ridge, TN: Oak Ridge National Laboratory, August 1989), pp. I5-18.

support, many of the program's clients have been reluctant to criticize it. Nevertheless, anecdotal information suggests that its emphasis on promotion of IRP and DSM as general concepts is rapidly falling behind the needs of client State regulators and utilities who are well advanced in implementing IRP and DSM programs. With growing reliance on IRP and DSM measures to meet future customer demand reliably and at least cost, the need increases for more sophisticated planning and evaluation methodologies and independent analyses of the cost and performance of various energy supply and demand-side efficiency options. With its current size and scope, it seems unlikely that the IRP Program will be able to provide institutional leadership or significant financial contributions to overcoming these challenges.

Federal funds and technical assistance are not the sole sources for financing or directing research and education efforts on IRP and DSM methodologies. As utility involvement in these programs has expanded, so too has the institutional expertise within the industry and the regulatory community. The Electric Power Research Institute maintains active research and information programs on utility planning methods, DSM programs and efficient end-use technologies. Professional and trade associations, including such specialized groups as the Association of Demand-Side Management Professionals, sponsor seminars, conferences, publications, and other educational efforts. A plethora of consulting firms offer analytical services to utilities and regulators.

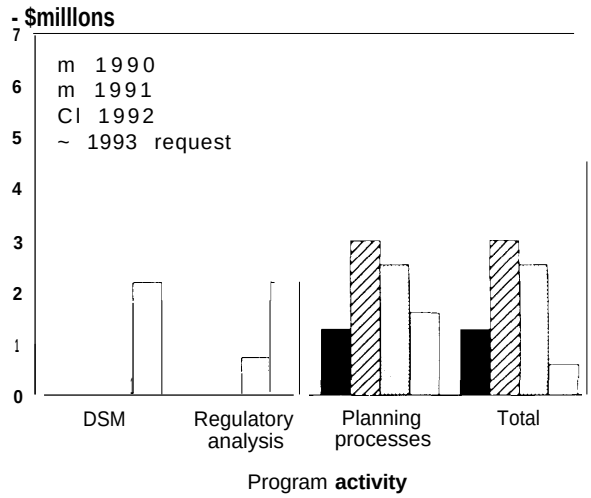
Solar and Renewable Energy Conversion Research Programs

The bulk of the Office of Utility Technologies annual budget is devoted to DOE-funded R&D to accelerate the development, demonstration, and commercialization of advanced renewable technologies for electric power generation. The major potential benefits to utilities from these research efforts are increased diversity in technology and fuel choices, reduced costs and increased confidence in the performance of solar, wind, biomass, hydro, and geothermal power technologies.[21] DOE also supports activities that target institutional factors influencing potential markets for and commercial deployment of renewable energy technologies.

Renewable energy technologies offer several significant benefits as part of utility resource plans including opportunities to reduce the operating and maintenance costs and planning uncertainties. In particular, renewable power generation technologies have the advantages of reduced fuel costs and fewer adverse environmental impacts on-site than fossil fuel alternatives.[22] Another attractive feature is that renewable energy generating technologies are available in small, modular units offering utilities capacity additions in smaller size increments and with shorter construction lead times than more conventional generators.[23]

The Office of Solar Energy Conversion manages projects to encourage solar thermal, biomass, and photovoltaic technologies. The Office of Renewable Energy Conversion oversees geothermal, wind, hydroelectric and ocean energy technologies. Both offices support research aimed at lowering the costs of renewable energy technologies in the mid- and long-term to make them more competitive economically with conventional fossil energy resources, As part of market-development for renewable energy technologies, DOE is supporting resource assessments of U.S. solar radiation and wind power potential and participates in cooperative efforts to boost U.S. renewable energy technology exports. Many renewable energy research projects are carried out on a cost-shared basis with private industry. Box 7-B shows some of the recent research efforts supported by these programs.

Figure 7-2—Funding for Integrated Resource Planning Program, FY 1990-93



SOURCE: Office of Technology Assessment, 1993, based on data from, U.S. Department of Energy, FY 1993, Congressional Budget Request, vol. 4, January 1992, p. 468.

Office of Energy Management Programs

The Office of Energy Management supports development of technologies to increase the efficiency and reliability of energy transmission, distribution, and storage and to increase the flexibility, and safety of utility systems. The Office administers research programs on transmission and distribution technologies, power systems and materials, high-temperature superconductivity, energy storage technologies, and

21 U.S. Department of Energy, DOE/CR-0006, January 1992, pp. 17-23. Hereafter referred to as DOE, *FY 1993 Congressional Budget Request, vol.* 2.

22 "Conservation and Renewable Energy Technologies for Utilities," supra note 12, p. 5.

23 Ibid., at pp. 11-26.

Box 7-B-Renewable Energy Technologies R&D Projects of DOE

DOE participates in a variety of cooperative, cost-shared research, development demonstration, and teohnology transfer activitiesbencourage the expanded use of renewable energy technogies. These efforts by the solar and renewable energy programs of the Office of UtilityTechnologies are directed at overcoming both the technical and institutional constraints that have slowed market penetration by renewable energy technologies. These programs also support activities designed to build the international competitiveness of the U.S. renewable energy industry and establish technological leadership in the marketplaoe.

Renewable Energy Conversion Programs

The core of the Wind Energy Program is research on materials, components, devices, and systems to increase power output and lower costs of wind energy systems. The program goal for the year 2000 is development of wind pow systems that can compete economicaiiy with conventionai power systems by producing electricity at a cost of $0.04/kWh (in 1990 dollars) in moderate wind speeds. The program is emphasizing cost-shared development of utility-scale advanced wind turbines and working to resolve critical reliability and performance issues by examining wind/airfoil interactions and turbine structural response. DOE also continues to support assessments of U. S. wind resources to assist State and utility energy planners and power producers in identifying new opportunities for deploying wind energy systems. Funding for the program was about $21 million in FY 1992.

The Geothermal Energy Program emphasizes cooperative R&D on technologies for reducing the cost of exploration development, and conversion to make more of the domestic geothermal resource available and economic, The program is examining the peak load following capabilities of existing geothermal plants, and exploring technologies for tapping the energy potential of hot dry rooks, and geopressurized brines. Geothermal Energy Program activities were budgeted at $26 million in FY 1992.

The Hydropower Program sponsors research on the costs, benefits, and effectiveness of environmental mitigation practices with the goal of reducing the uncertainties in the regulatory review of proposed hydropower development. FY 1992 funding was about $1 million.

the health effects of electric and magnetic fields. The major recipients of R&D funds under these programs are the various national laboratories.

Long-term goals for DOE research on transmission and distribution (T&D) technologies are to reduce energy losses on T&D systems (now estimated at 8 to 9 percent) by 10 percent, to reduce nuisance outages by 20 percent, and to increase post-outage recovery speed by 50 percent.[24] DOE is engaged in cooperative R&D on higher capacity transmission and automated control systems incorporating advanced electronics, communications, and computer technologies to increase power systems flexibility, efficiency, and reliability .25 To improve the cost-effectiveness of higher efficiency transmission technologies, for example, the DOE program is looking at the technologies necessary for converting alternating-current (AC) transmission lines to high-voltage direct current (DC) effectively doubling the capacity over the same right-of-way. Development of new technologies for improved real-time control of utility T&D will result in more efficient transmission and increased transmission capacity utilization.

[24] Ibid, pp. 27-28.

[25] DOE, *FY* 1993 *Congressional Budget Request, vol. 2,* pp. 119-123.

The Ocean Energy Technology program with a budget of $2 million is cooperating with the State of Hawaii in the design and construction of an experimental ocean thermal energy conversion (OTEC) facility using seawater as its working fluid.

Solar Energy Conversion Programs

The **Photovoitaic (PV) Program is pursuing efforts to aid development of more cost-effective PV energy systems and to expand the market potential for PVS in utility applications. The program has set a goal of cutting the cost of PV systems from today's $0.25 to $0.35/kWh to $0.12 to $0.20/kWh by the late 1990s. The long-term goal is PV power generation at $0.06/kWh (in 1990 dollars). The PV Program is targeting improvements in PV materials, components, and system design to boost the solar conversion efficiency of thin-film and concentrator materials, and to advance the development of mass-production manufacturing capability. DOE also is participating in a PV demonstration project called Photovoltaics for Utility-Scale Applications (PVUSA), a joint-venture with EPRI, the California Energy Commission, and several utilities to test PV arraysfromseven manufacturers in a utility setting. The FY 1992 budget for the PV program was $60 million.**

The SolarThermai Program is sponsoring research on improving basic thermal conversion technology and is supporting cost-shared development of central receiver systems for grid-connected electric generation and dish concentrators for remote-site power generation. The program is participating in joint ventures with industry in development and commercialization of solar thermal systems for remote applications at $0.1 to $0.2/kWh as a stepping stone to less-costly utility applications. Funding for solar thermal activities was $ 21 million in FY 1992.

The **Biomass Power Program, budgeted at $4 million in FY 1992, is focused on research on biomass gasification and high-efficiency turbine conversion to expand the range of applications and performance of biomass power generating systems. The long-term goal is producing electricity at $0.04/kWh (in 1990 dollars) allowing biomass power systems to compete with conventional fuels for utility baseload applications.**

SOURCES: Office of Technology Assessment, 1993, based on information from U.S. Department of Energy, FY 1993 Congressional *Budget Request, vol.* 2, *January 1992,* pp. 15-23; and US. Department of Energy, Assistant Secretary *for* Conservation and Renewable Energy, Conservation and Renewable Energy Technologies for Utilities," DOE/CH10093-86 (prepared by National Renewable Energy Laboratory, Golden Colorado), April 1992, pp. 11-26.

DOE's support of R&D on high-temperature superconductivity (HTS)[26] offers several potential long-term efficiency benefits for utilities, including lower power losses on T&D systems, more efficient generators, and advanced magnetic energy storage systems. Development of a strong domestic HTS industry could prove of strategic importance to U.S. industrial competitiveness. Significant technical challenges stand in the way of realizing any of this potential, however. DOE's collaborative research program is focused on improving the performance of high-temperature superconducting materials to allow fabrication of HTS wires, coils, and cables for long-term utility applications and is budgeted around $21 million a year.

Research on thermal energy storage systems includes the District Heating and Cooling (DHC) Program supporting joint ventures to develop technical strategies to cut the capital costs and increase the energy efficiency of major DHC components.[27] DHC technologies offer utilities

26 High-temperature superconductivity refers to materials that can conduct electricity with zero resistance and expel magnetic fields (dimagnetism) at temperatures substantially higher than liquid helium (4 degrees Kelvin(K) or 4 degrees C above absolute zero which is minus 273 degrees C). Sustaining superconductivity of high electric currents in high magnetic fields at temperatures of liquid nitrogen (about 77 degrees C above absolute zero) now commonly used in industrial applications could make HTS motors generators, magnets, and similar devices potentially practical. Ibid, p. 122.

27 The DHC program was mandated by the Renewable Energy and Efficient Technology Act, Public Law 101-218, sec. 6, Dec. 11, 1989.

opportunities to lower electricity peaks and improve energy efficiency and fuel flexibility. The DHC program was budgeted at $4.2 million in FY 1990-92 with more than $1 million expected from nonfederal sources for demonstration projects in FY 1992.[28] Because DOE views the technology as sufficiently mature to permit commercial growth of DHC systems, it proposed termination of the program and documentation of research results during FY 1993.[29] DOE also supports research on improved battery storage systems for utility applications and technologies for future hydrogen energy systems.

The Electric Energy Systems program also oversees DOE's research efforts on potential health effects of exposure to electric and magnetic fields. DOE is supporting research on characterizing EMF exposures, potential biological mechanisms of EMF interaction with living systems, and epidemiological studies. DOE is also expanding efforts on public information and engineering research on EMF mitigation options.

Office of Utility Technologies programs are geared specifically towards utilities. However, several other programs in DOE perform work that is potentially beneficial to utilities. This includes other programs under the 0ffice of Energy Efficiency and Renewable Energy and in the 0ffices of Fossil Fuels and Nuclear Energy, to be discussed later in this chapter.

Demand-Side Energy Efficiency Programs

The Office of Energy Efficiency and Renewable Energy also administers programs that promote energy-efficient demand-side technologies through R&D, technical and financial assistance, and energy codes and standards. With buildings and industry contributing 30 percent each to U.S. energy use, the potential contributions from efficiency improvements in these sectors is substantial. DOE support for the development and commercialization of energy-efficient buildings and industrial technologies yields products that in turn create energy-saving opportunities for utilities and consumers.

Office *of Building Technologies*[30]*—The* commercial and residential sectors are frequently referred to as the buildings sector because most of their energy use is for building systems (i.e., heating, cooling, lighting, and appliances). Building energy use accounts for more than a third of all U.S. energy use and is continuing to grow even as the efficiency of buildings and appliances is improving. DOE-supported buildings R&D have provided several energy-efficient technologies successfully in use today, including solid-state fluorescent lamp ballasts, advanced refrigerator and freezer technologies, and low-emissivity window coatings. These technologies, resulting from R&D efforts initiated in the late-1970s, produced results that will save energy into the next century. Advances in fluorescent lamp ballasts aided by $3 million of DOE research funds, are expected to save billions of dollars in lighting energy costs in the coming decades. DOE-funded research efforts in improved insulation and wall and ceiling structures have also yielded successful energy-saving applications.

The Office of Building Technologies is currently supporting research to develop cost-effective technologies to reduce building energy loads by 30 percent in the near-term and by as much as 80 percent in the long-term. Major emphasis is given to development of high-efficiency lighting systems, energy efficiency HVAC conversion and distribution systems, advanced building materials, more energy-efficient appliances and replacements for chlorofluorocarbons in building systems. Advances in these areas will contribute to the technology base for utility

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28 DOE, *FY* 1992 Congressional *Budget Request,* vol. 4, pp. 440-441.

29 U.S. Department of Energy, *FY* 1993 *Congressional Budget Request,* vol. 4, DOE/CR-0006, January 1992, pp. 478-79. Hereafter referred to as DOE, *FY* 1993 *Congressional Budget Request,* vol. 4.

30 For more information on DOE's building technology research, see OTA, *Building Energy Efficiency,* supra note 9.

DSM programs. Buildings Technologies is also supporting R&D on cost-effective solar technologies to meet some or all of the energy needs of new buildings.

Office *of Industrial Technologies*[31]*-DOE* efforts to improve industrial efficiency have zeroed in on reducing the waste streams generated in industrial processes to improve energy efficiency and eliminate harmful environmental pollutants. DOE is also supporting development and adoption of more energy-efficient technologies and processes in energy-intensive industries and more extensive use of industrial cogeneration and municipal solid waste energy systems. These efforts could offer benefits to utilities in more diverse opportunities for new energy supplies as well as a stream of efficient industrial electric technologies for DSM programs.

Among the successes from DOE-funded industrial research are a control mechanism for a high-efficiency transformer used in the welding process, biomass grain driers, and slow-speed diesel motors for cogeneration systems. Present DOE industrial research is focused on improving the efficiency of electric motors, which now account for some 70 percent of industrial electricity use. DOE's cooperative efforts to spur adoption of adjustable-speed drives and high performance electric motors for new and retrofit applications include efforts to develop and provide information to justify including industrial motor programs in utility integrated resource plans.[32]

Technical and Financial Assistance Programs

Federal efforts to save energy and promote energy efficiency and renewable energy technologies have led to a variety of programs that offer technical assistance and Federal funds to government and private entities. Many of these programs were originally established during the energy scares of the 1970s and they have had varying degrees of success. Among the most notable are the various programs administered by the Office of Technica1 and Financial Assistance, the now expired Residential Energy Conservation and Institutional Energy Conservation Programs, and the Federal Energy Management Program.

The Office of Technical and Financial Assistance (OFTA) administers a variety of programs that provide technical advice and grants to States, local governments, nonprofit institutions, and low-income individuals. OFTA also oversees State programs funded from the petroleum overcharge violations settlements. OFTA'S portfolio consists of various State and local partnerships, information and technical assistance programs, and energy management programs .[33] The State and local partnerships encompass the State Energy Conservation Program, the Energy Extension Service, the Weatherization Assistance Program, and the Institutional Conservation Program.

The State Energy Conservation Program, established in 1975 under the Energy Policy and Conservation Act, provides financial and technical assistance to States and localities to develop and implement comprehensive energy conservation plans to encourage energy efficiency and reduce energy demand growth. All States have implemented the act's mandatory energy conservation programs (including lighting efficiency, insulation, and thermal efficiency standards for nonfederal public buildings) and most now include supplementary programs in energy education, technology demonstration, and technical

31 Technical opportunities for energy-savin, technologies for industrial application and relevant Government programs are examined in detail in U.S. Congress, Office of Technology Assessment, *Industrial Energy Efficiency*, released in April 1993 and to be published in summer 1993.

32 DOE, *FY 1993 Congressional Budget Request,* vol. 4, p. 365.

33 OFTA also administers a number of modest programs providing technical and financial assistance for small energy inventors and innovators, technology transfer and information programs, and international market development and energy technology information exchange programs. These programs are not particularly relevant to utility energy efficiency efforts and are not discussed here.

Table 7-5-Budgets for DOE Energy Grant Programs, Fiscal Years 1991-93 (thousands of dollars)

Grant program	1991	1992	1993 request	1993 actual
Weatherization Assistance Program	198,952	193,925	80,000	187,000
State Energy Conservation Program	16,620	16,194	45,000	15,600
Institutional Conservation Program	31,022	30,246	30,000	29,200
Total	246,594	240,365	155,000	231,800

SOURCE: Office of Technology Assessment 1993, based on data from U.S. Department of Energy, FY 1993 *Congressiona Budget Request, vol.* 4, January 1992, pp. 28&281, and other sources.

assistance reflecting local priorities. A major goal of the program is to build State and local institutional capabilities for energy conservation planning and implementation.

Funds are provided in the form of formula grants (requiring a 20 percent State match) and incentive awards for innovative State/industry cooperative programs. While appropriations for the program have decreased since 1979, overall funding of State program activities has ballooned because of the availability of oil overcharge funds.[34] See table 7-5 for a summary of funding. DOE technical assistance to State energy agencies focuses on education and information exchange and has included publications, training manuals, an information clearinghouse, seminars, workshops, and conferences. States have used the funds to support a variety of energy conservation activities, including demonstration projects installing energy-efficient lighting, HVAC, and energy management systems and solar technologies in public buildings.[35] Beginning in FY 1992, DOE has supported an initiative aimed at encouraging States to attract nonfederal resources to supplement the grants provided by offering additional incentives to support State-led joint ventures with industry to encourage the near-term adoption of emerging renewable energy and energy-efficient technologies.[36]

A companion program, the **Energy Extension Service (EES) was** created in 1977 to provide information, technical assistance, and training tailored to the needs of small energy users such as homeowners, municipalities, and small businesses. Under the program, State energy agencies or other designated entities design projects serving specific local information needs. Cost-share funds are disbursed from DOE through State agencies to local programs.

Among the successful projects have been energy on-site audits, self-help workshops, and auditor-training programs. The program is intended to be flexible and responsive to local needs and leveraging of private funds is encouraged.

In Rhode Island, grant funds were used in a cooperative effort with local electric utilities and a nonprofit group to conduct energy audits of State buildings and recommend lighting efficiency retrofits. The utilities provided rebates of up to 82 percent of relamping costs, with State

34 Funding for the program in FY 1989 was about $60 million (in current dollars), by 1989, total funding including oil overcharge funds was in excess of *$300* million. OTA, *Building Energy Efficiency*, supra note 9, figure 4-6, p. 121, citing various DOE reports to Congress.

35 A detailed report on the diversity of State use of oil overcharge funds made available through various Federal/State partnerships by 1989 is provided in Consumer Energy Council of America Research Foundation A *State-by-State Compendium of Energy Efficiency Programs Using Oil Overcharge Funds,* EPRI CU-7541 (Palo Alto, CA: Electric Power Research Institute, March 1991). By 1989 over $7 billion in various oil overcharge settlements had been collected and additional eases (with anticipated recoveries of $0.5 to $1.0 billion) were still under negotiation. Expenditures of funds from the escrow amounts from the Exxon settlement were limited to various Federal and State programs including the State Energy Conservation Program, the Energy Extension Service, Institutional Conservation Program, Weatherization Assistance Program, and Low-Income Home Energy Assistance Program. Funds from other settlements can be used for other ways as well. By 1989 about half of the overcharge funds had been expended, but a huge pool of funds remains to be tapped by State and local governments.

36 Office of Management *and* Budget, *Budget for Fiscal Year 1993*, Appendix One, p. 472.

funds paying the remainder. The State estimates that the project will result in a 20-percent reduction in total annual State electric costs.[37]

EES funds have also supported providing training for school districts in Washington on how to reduce energy use through lighting changes on school grounds and installation of a cogeneration demonstration at a community and business center, in Taos, New Mexico expected to save $10,000 annually in energy costs.

The Energy Policy Act of 1992 repealed the National Energy Extension Service Act that established EES.[38] The repeal is unlikely to result in lost energy savings given the overlap with other programs.

OTA's *Building Energy Efficiency* report noted that both the Energy Extension Program and the State Energy Conservation Programs lack evaluations of cost-effectiveness or reliable energy-savings estimates. However, OTA observed:

> . . .IB]oth programs are important networks for conveying Federal monies and expertise to the State and local level, and both programs are connected to small-scale energy users that could help **DOE** demonstrate technologies emerging from its energy conservation research and development projects. In addition, the auditor and other training offered by these programs help establish and sustain local expertise and markets for weatherization and other conservation services.[39]

The experience in Rhode Island also demonstrates that the programs provide opportunities for State/utility/private partnerships that can leverage Federal grant funds and expand the reach of utility-sponsored efficiency programs. With the large pool of oil overcharge funds still remaining, these opportunities should prove attractive to States and utilities.

The Weatherization Assistance Program (WAP) was originally established in 1976 under the Energy Conservation and Production Act to help weatherize the homes of low-income families. The program aims to reduce the energy costs of low-income families.

WAP allocations to States are made under a formula reflecting the number of low-income households, residential heating and cooling energy use, and local climate conditions. Families qualify for weatherization assistance if they meet certain eligibility conditions, including a household income at or below 125 percent of the poverty level. The weatherization assistance programs are usually carried out by local community organizations that provide energy audits and installation of cost-effective weatherization measures. In addition to the grants for weatherization activities, DOE also provides funds for training, technical assistance and client education.

According to DOE, energy savings of 25 percent or more are possible at residences eligible for WAP funds. Families earning less than $5,000 a year consume an average of 68 percent more energy to heat a square foot of living space than higher-income families. This difference is attributable in part to the fact that lower-income residences are old and in disrepair, and hence less energy efficient than the homes of higher-income households.

An early national evaluation of WAP found that the average energy savings is 10 percent per household from WAP retrofits.[40] However, since there have been many program changes since 1981, the evaluation may no longer be valid. DOE

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37 *U.S.* Department of Energy, The *Secretary's Annual Report to Congress 1990*, DOE/S-0010P(91), p. 58. Hereafter DOE *Annual Report to Congress* 1990.

38 Public Law 102-486, 102 Stat. 2776, Oct. 24, 1992, section 143.

39 OTA, Building *Energy Efficiency*, supra note 9, pp. 122-123.

40 G.E. Peabody, U.S. Department of Energy, Energy Information Administration, *Weatherization Program Evaluation*, service report, SR-EEUD-84-1, Washington, DC, August 1984, pp. 1, 18.

has initiated a new evaluation and anticipates a final report at the end of 1993.[41]

In recent years, the WAP program has also shifted more of its emphasis to encourage leveraging of Federal funds to increase the number of clients it can serve. Agreements were made with two utilities to augment WAP funds with additional financial and in-kind services.[42]

The Institutional Conservation Program (ICP) was established by the National Energy Conservation Policy Act in 1978 as a matching grant program that provided funds for both detailed energy audits and the suggested energy-saving capital improvement in nonprofit institutions, such as schools and hospitals. Projects are funded on a 50 percent cost-share basis and are administered through State agencies. Since 1978, the program has awarded over $800 million in grants while saving over $2 billion in energy bills at participating institutions.[43]

New rules adopted as a result of Public Law 101-440 will streamline the program and encourage leveraging, and third-party financing options (such as utility demand-side management programs and energy savings contracts). The new rules will allow a State to use up to 100 percent of its funds for program and technical assistance activities and up to 50 percent of its Federal funds for marketing and other costs associated with leveraging nonfederal funds.[44]

The DOE Weatherization Assistance Program and the Institutional Conservation Program (ICP) are financed in large part from the petroleum overcharge fund. An additional beneficiary of these funds is the Low-Income Home Energy Assistance Program (LIHEAP) at the U.S. Department of Health and Human Services (HHS) that helps poor households in meeting their energy bills. LIHEAP is described in box 7-C.

Past Technical Assistance Efforts-Building Energy Audits

During the 1980s Congress discontinued two legislatively-mandated building energy audit programs that included utility participation. The Residential Conservation Service (RCS), which expired in 1989, and the Commercial and Apartment Conservation Service, repealed in 1986, were designed to provide building owners and occupants with building-specific information on energy use and savings.[45] The centerpiece of the program was the requirement that utilities perform an on-site energy audit that included actual measurements by an auditor and an individualized written report for its customers.

The enabling legislation for RCS estimated that the program would contribute to the insulation of 90 percent of the Nation's homes. However, at the conclusion of the program 7.3 million audits had been performed, achieving only 11 percent participation.[46]

As designed, the programs did not address either the availability and costs of financing conservation retrofits nor the regional availability of conservation supply and installation services. Additionally, under most State ratemaking formulas then in use, participating utilities lacked sufficient incentives to conduct the program as the costs of the program were merely passed through to customers without any added profit and resulting energy-savings potentially reduced utility revenues.

Despite these drawbacks, the programs, like other federally-mandated technical assistance and

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41 OTA, *Building Energy Efficiency*, supra note 9, pp. 97-99.

42 DOE, *Annual Report to Congress 1990*, p. 61.

43 OTA, *Building Energy Efficiency, supra note 9, pp. 99-100.*

44 DOE, *FY 1993 Congressional Budget Request*, vol. 4, p. 506.

45 For more on the history and effectiveness of these programs see OTA, *Building* Energy *Efficiency*, supra note 9, pp. 117-121.

46 Centaur Associates, *Update of the Evaluation of the Residential Conservation Service program*, vol. 1, report prepared for the U.S. Department of Energy, DOE/CS/10097, 1987, p. 2-19.

Box 7-C-Helping the Poor Pay Their Electricity Bills: The Low-Income Home Energy Assistance Program

LIHEAP, established in 1961 by the Imw-income Home Energy Assistance Act (Public Law 97-35), is a block-grant program administered by the Department of Health and Human Services. The program provides funds to States **to help eligible low-income households meet heating and cooling bills, such as utility bills. Up to 15** percent of **State LIHEAP grants (25 percent with a special waiver) can be used for home weatherization.**

In 1990, with funding of about $1.6 billion, LIHEAP reached about 6 million households; weatherization services were provided to only 146,000 homes. On average, States spend from 7 to 10 percent of their LIHEAP **funds on weatherization. The bulk of the funds are spent on energy assistance, averaging about $200 per household. In contrast, average weatherization expenditures under the program are about $l,600 per household. For the Federal Government and State agencies, helping poor families pay their energy bills allows thereto reach more households with available funds than weatherization efforts, even though weatherization could cut household energy bills.**

OTA's report, Building *Energy* Efficiency found that there was little assessment of the cost-effectiveness of LIHEAP weatherization efforts and no dear program policies encouraging cost-effective weatherization. Moreover, utilities benefit substantially from **Federal LIHEAP outlays by collecting payments that otherwise would have been lost or delayed. (Utility arrearages from delays in paying residential bills amount to hundreds** of millions of dollars annually; LIHEAP funds help offset these liabilities.) The report noted that new Federal **policies or requirements to leverage LIHEAP weatherization funds with State and utility resources could boost the number of low-income households that receive energy efficiency measures** under the program.

SOURCE: U.S. Congress, Office of Technology Assessmens, Building Energy *Efficiency,* **OTA-E-518 (Washington, DC: U.S. Government Printing Office, May 1992), pp. 99-100.**

reformation programs, helped to create the institutional infrastructure and expertise in State government, utilities, and energy conservation service providers that now help sustain active energy efficiency and technical assistance efforts.

The Federal Energy Management Program

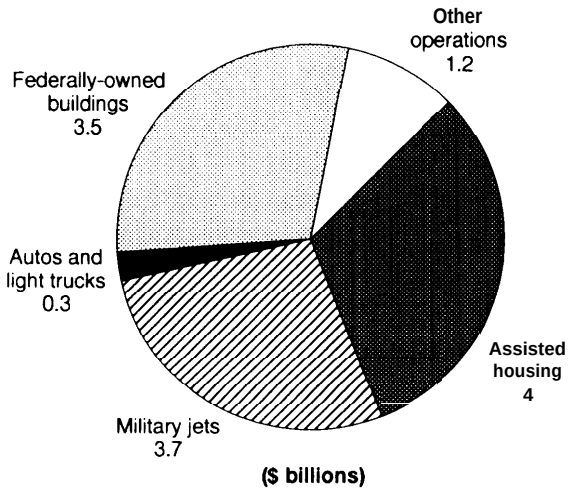
The Federal Energy Management Program (FEMP), located in The Office of Building Technologies, is an outreach program designed to assist Federal agencies in adopting energy efficiency measures in buildings, transportation and operations (see box 7-D). The program was established in the mid- 1970s in response to legislation and Executive Orders directing Federal agencies to reduce energy use. The program has a small staff (six people in 1991) and a modest budget ($4 million in FY 1992). FEMP has four areas of operations: 1) reporting on the energy management efforts of Federal agencies; 2) providing information training, and technical **support to** Federal agency personnel; 3) hosting interagency meetings to develop new Federal initiatives; and 4) awarding annual certificates of achievements to Federal facilities and personnel for demonstrating exemplary performance .47

As part of its efforts to assist Federal agencies in implementing energy-saving measures, FEMP has been evaluating agency participation in utility-sponsored DSM programs and is assisting in administrative reforms that would encourage greater use of shared energy savings contracts by Federal agencies as an alternative means of funding efficiency improvements. DOE estimates

47 *U.S.* Congress, Office of Technology Assessment, *Energy Efficiency in the Federal Government: Government by Good Example?*, OTA-E-492 (Washington DC: U.S. Government Printing Office, May 1991), pp. 24-25.

Box 7-D--Federal Energy Management Program

Federal Spending on Energy, FY 1989



SOURCE: Office of Technology Assessment, 1993, adapted from U.S. Department of Energy, Federal Energy Management Program, "Report on Federal Government Energy Management and Conservation Programs," October 1990.

The Federal Government is the Nation's largest single energy consumer. In FY 1989, the Federal Government spent over $8*7 billion on direct energy purchasesfor its own facilities and operations and another $4 billion subsidizing the energy expenses of low-income households (see figure). Not reflected in this direct energy expenditure are some $12.7 billion for energy costs for leased space for which the Federal Government does not directly pay utility bills. Payments to electric Utilities accounted for an estimated $2.4 billion of the FY 1989 energy bill for Federal buildings. Electricity accounts for around 70 percent of total energy costs.

OTA'S report Energy Efficiency in the FederalGovernmentby Good Example? concludes that much Federal energy is inefficiently used OTA estimated that the Federal Government could profitably conserve at least 25 percent of the energy used in Its buildings by adopting commercially cost-effeotive measures such as high-efficiency lighting and carefully operated heating, ventilation, and air conditioning equipment-with no sacrifice of comfort or productivity.

The constraints to Improved Federal energy efficiency are real and significant (see table.) Implementing efficiency improvements will require overcoming several hurdles, including finding sufficient funds to pay for retrofits in an era of tight budgets.

OTA's ease studies found a large potential for savings. However constraints, notably the lack of funding and staff, limited action at the facilities. For example, the General Services Administration's (GSA) Suitland Complex has about 2 million square feet of commercial building space. Electricity accounts for over 90 percent of the $5-million annual energy bill. The facility has increased effiencyof the heating, ventilation, and airconditioning system, improved lighting efficiency, and improved the building envelope. Most Improvements consisted of low first-cost measures because the funds for more capital-intensive measures were unavailable.

In spite of these efforts, energy use at the facility has risen since 1985. Changes in the building's use, such as greater use of computers and increased occupancy, offset the gains. Further measures have not been implemented for several reasons. The complexity of the procurement process creates significant lag time, and inhibits selection of innovative equipment and participation in local rebate programs. Current policy restricts replacement of functional equipment in spite of technological advances that would reduce energy use. Lastly, building personnel often lack training in energy conservation and some new technologies may be too sophisticated to run without it.

OTA found that there are mechanisms in place to promote greater energy efficiency in Federal buildings including sanctioned private-sector financing options available to assist funding of energy efficiency measures.

[1] U.S. C$_{ongr}$ess, Office of Technology Assessment, Energy Efficiency the Federal Government: Govemnent by Good Example?OTA-E-492 (Washington, DC: U.S. Government Printing Offioe, May 1991).

The first of these are shared energy savings (SES) contracts. Under the Comprehensive Omnibus Budget Reconciliation Act of 1985 (Public Law 99-272), all Federal agencies can seek private financing from energy service companies. These companies perform conduct energy audits and install efficiency measures using their own capital and personnel. Their costs and profits are paid for out of the monies that previously went to higher energy bills. However, this procurement practice is rarely used by Federal agendas. The complexity of the procurement process and uncertainty over who keeps the savings discourage interested agencies from initiating such contracts. Legislation was passed to assist the Department of Defense (DOD) overcome constraints in SES contracting. DOD is permitted to retain two-thirds of energy savings at the installation with the SES contract. One-half is to be used for further energy conservation measures, while the other half is available for other projects. Additionally, provisions in the act simplify the contracting procedures for DOD.

Utility rebates are another important source of funding. Large Federal installations offer significant energy savings for interested utilities.Therebates offered by utilities are likely to bring borderline efficiency measures within financial reach. For example, the GSA and Potomac Electric Power Company in the Washington, DC, metropolitan area have been working on a Federal Lighting Initiative. In 1991, GSA committed $10 million towardthis effort with PEPCO offering an additional $10 million in rebates. As of early 1991, only DOD and DOE had an explicit policy on receiving utility rebates. DOD is allowed to retain two-thirds of rebate, while the remaining third is returned to the general fund at the Treasury. DOE is allowed to retain the entire sum and credit the rebate to energy cost appropriation. Pacific Northwest Laboratory, a national laboratory, is working with FEMP to develop a generic Federal utility rebate program.

Efforts to improve the energy efficiency of Federal buildings received further stimulus under the Energy Policy Act of 1992. The act toughens energy efficiency standards for Federal buildings and sets anew deadline of 2005 for Federal agencies to install cost-effective technologies to save energy and water. Also enacted were a number of other measures to raise energy awareness among Federal managers and financial commitments to energy efficiency.

SOURCE: Office of Technology Assessment, 1993.

Constraints on Improved Federal Energy Efficiency

- **Resource constraints**
  - Priorities favor other agency needs
    - Energy efficiency is not central to most Agencies' missions
    - Energy is a small component of most agendas' expenditures
    - Little senior management interest
  - Many measures require initial capital spending
  - Many measures require personnel
    - Many facilities have no energy coordinator
- **Information constraints**
  - Opportunities have not been systematical!y assessed
  - Agencies are uncertain of technical and economic performance
    - Does this technology really work?
    - Would the facility be better off waiting for next year's model?
    - Lack of metered energy-use data
    - %0 little information sharing between agencies
  - Energy-use decisions are dispersed, made by thousands of individuals
    - Implementation requires coordinated effort from diverse parties
    - Too little training and education for diverse parties
- **Lack of incentives**
  - Dollar savings often do not acrue to energy savers
  - Energy costs are readily passed through budgets
  - Federal procurement policies often favor status quo
    - Procurement practices am complex often restrictive

SOURCE: U.S. Congress, Office of Technology Assessment, Energy *Efficiency in theFederal Government: Government*byGood Example? OTA-E-492 (Washington, DC: U.S. Government Printing Office, May 1991), p. 10.

that aggressive implementation of energy efficiency measures in Federal buildings, such as lighting retrofits, could cut Federal energy use by 10 percent from 1985 levels and yield savings of $400 million per year by 1995.[48]

ENERGY EFFICIENCY INFORMATION AND STANDARDS

The Federal Government has had almost 20 years of involvement in various programs involving building energy codes and standards, and appliance labeling and efficiency standards. In addition to DOE, the Federal Trade Commission (FTC) and the U.S. Department of Housing and Urban Development (HUD) have been involved in these efforts. The programs have required Federal agencies to work in cooperation with trade and professional organizations and manufacturers.

OTA'S report *Building Energy Efficiency* examined the history and efficacy of these programs for commercial and residential energy technologies.[49] OTA found that although there has been limited evaluation of the effectiveness and energy-savings attributable to these efforts, there is some consensus that they help reduce information-related constraints to energy efficiency improvements, and they provide accepted benchmarks used by electric utilities in determining and advertising energy-efficient products in their DSM programs.

Federal Building Energy Codes and Standards

While building energy codes generally are adopted and enforced locally, most localities rely on model codes published by national building organizations .50 The DOE and HUD have been active in developing model and mandatory building energy codes and standards. In cooperation with States and various national organizations, Federal agencies have issued voluntary guidelines for nonfederal buildings. DOE and HUD have promulgated energy efficiency standards for Federal buildings and manufactured homes (e.g., mobile homes). Although the number of new Federal buildings constructed annually is small, the Federal Government potentially has the ability to influence about 27 percent of new home construction through eligibility requirements for Federal mortgage insurance programs of the Federal Housing Administration, the Veterans Administration, and the Farmers Home Administration.[51] Table 7-6 shows the status of Federal efforts.

Appliance Efficiency Standards

The National Appliance Energy Conservation Act[52], as amended, establishes Federal minimum efficiency or maximum energy use standards for certain appliances, including refrigerators, air conditioners, and furnaces. DOE is required to update the standards to reflect technological changes every 3 to 10 years depending on the appliance. Federal efforts to promulgate efficiency standards for consumer appliances were initiated in the 1970s under the National Energy Conservation Policy Act. Implementation of that act's mandatory efficiency standards was slow because of opposition within the Executive Branch and from manufacturers, and litigation. Pressure for uniform national standards helped break the logjam after California and several other States adopted appliance efficiency stand-

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48 DOE, *FY 1993 Congressional Budget Request,* vol. 4, p. 327.

49 OTA, *Building Energy Efficiency*, supra note 9, pp. 107-116.

50 The major organimations are: the Building Officials & Code Administrators International the International Conference of Building Officials, the Southern Building Code Congress International, and the Council of American Building Officials, a federation of the first three organizations. The American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) promulgates standards for building HVAC systems tbat are often incorporated into building codes.

51 OTA, *Building Energy Efficiency*, supra note 9, pp. 107-109.

52 Public Law 100-137, Mar. 17, 1987, amended by Public Law 100-357,42 U.S.C. 6292.

Table 7-6-Federal Energy Standards for New Buildings 1992

Code	Applicability	Status
HUD Minimum Property Standards (1950s)	Residential buildings receiving Federal mortgages	To be replaced with Council of American Building Officials 'Model Energy Code'
National Manufactured Housing Construction and Safety Standards (1974)	All manufactured housing	Active
DOE Building Energy Performance Standards (1979)	All new construction	Never implemented; supplanted by performance standards listed below
DOE Mandatory Performance Standards for New Federal Residential Buildings (1989)	Federal residential construction (95 percent is military housing)	Active
DOE Energy Performance Standards for New Commercial Buildings (1990)	Mandatory for Federal commercial buildings. Voluntary for private-sector commercial buildings.	Active
DOE Voluntary Guidelines for Nonfederal Residential Buildings	Voluntary standards for nonfederal residential buildings	Underdevelopment; issuance pending

NOTE: New Federal Building Energy standards adopted in Energy Policy Act of 1992 (Public Law 102-488) are not included above.

SOURCE: Office of Technology Assessment, 1993, adapted from U.S. Congress, Office of Technology Assessment, *Building Energy* Efficiency, OTA-E-518 (Washington, DC: U.S. Government Printing Office, May 1992), p. 109.

ards of their own in the absence of Federal action. Table 7-7 shows selected appliance standards established before 1992, The Energy Policy Act of 1992 added additional energy and water-using devices to the list of products for which minimum Federal energy efficiency standards have been established .53

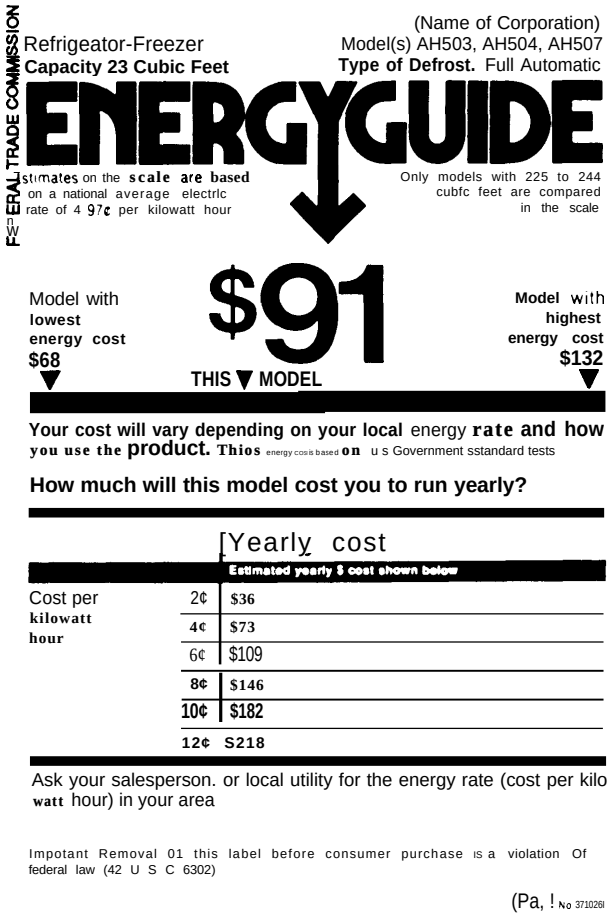
Appliance Labels

The Federal Government has also mandated labels showing energy use for the appliances covered by the standards under the Energy Policy and Conservation Act.[54] The requirement is based on the belief that consumers will purchase more efficient appliances if given information about operating costs and comparative product efficiencies. Labels now exist for refrigerators, freezers, dishwashers, water heaters, clothes washers, room air conditioners, and furnaces.[55] The labels include estimated operating costs for the product, as well as the range of operating costs for other available products in the same class. Appliance labeling requirements are the responsibility of the FTC.

53 Public Law 102-486, Subtitle C, 106 Stat. 2805, Oct. 25, 1992. The product categories added were @S, motors, commercial heating and cooling equipment, plumbing products, distribution transformers, windows, luminaries, and office equipment. The dates for promulgation of standards vary, but most must be published over the next 10 years.

54 The Energy Policy and Conservation Act (Public Law 95-163), as amended, requires the Federal Trade Commission to develop and issue appliance energy-use labels for: 1) refrigerators, 2) freezers, 3) dishwashers, 4) clothes dryers, 5) water heaters, 6) room air conditioners, 7) home heating equipment (other than furnaces), 8) television sets, 9) kitchen ranges and ovens, 10) clothes washers, 11) humidifiers and dehumidifiers, 13) furnaces, and 14) any other type of consumer product defined as covered by the Secretary of Energy. Swimming pool heaters and fluorescent lamp ballasts were added to the list by the National Appliance Energy Conservation Act.

55 The Federal Trade Commission determined that labeling the remaining classes of appliances (clothes dryers, home heating equipment other than furnaces, television sets, kitchen ranges and ovens, and humidifiers and dehumidifiers). was economically unfeasible and would not assist consumer purchasing decisions. 44 Fed. Reg. 66466 (Nov. 19, 1979).


FEDERAL TRADE COMMISSION

Refrigeator-Freezer
Capacity 23 Cubic Feet

(Name of Corporation)
Model(s) AH503, AH504, AH507
Type of Defrost. Full Automatic

ENERGYGUIDE

Estimates on the **scale are based** on a national average electric rate of 4 9**7¢** per kilowatt hour

Only models with 225 to 244 cubfc feet are compared in the scale

Model with **lowest energy cost** **$68**

$91

THIS ▼ MODEL

Model with highest energy cost **$132**

Your cost will vary depending on your local energy **rate and how you use the product. Thios** energy costs based **on** u s Government sstandard tests

How much will this model cost you to run yearly?

		Yearly cost Estimated yearly $ cost shown below
Cost per **kilowatt hour**	2¢	**$36**
	4¢	**$73**
	6¢	$109
	8¢	**$146**
	10¢	**$182**
	12¢	**S218**

Ask your salesperson. or local utility for the energy rate (cost per kilo **watt** hour) in your area

Impotant Removal 01 this label before consumer purchase is a violation Of federal law (42 U S C 6302)

(Pa, ! No 371026i

The Federal Trade Commission requires many new appliances to display labels that indicate the units' expected energy use of efficiency.

Other DOE Supply-side Research

The Office of Energy Efficiency and Renewable Energy administers a variety of programs with potential benefits for electric utility energy efficiency efforts. Three other DOE programs also sponsor R&D and demonstration projects dealing with energy efficiency in utility power generation and operations and cleaner generating technologies for new utility plants or repowering of existing plants. Energy efficiency is at present a minor consideration among the many objectives of these programs, which appear to be primarily directed at advancing particular fuels or technologies. DOE-funded activities could also provide cost and performance information on advanced power technologies that could aid consideration of these options in utility IRP programs. It is not clear, however, whether such information is effectively made available to the utility sector or to DOE's own 0ffice of Utility Technologies.

FOSSIL ENERGY R&D PROGRAMS

Fossil fuels contribute 60 percent of the fuel for the production of the Nation's electricity. The **Office of Fossil Energy (FE)** supports a wide range of basic R&D and demonstration projects involving coal, oil, and natural gas. One of the strategic goals identified for the fossil energy research program is to "provide environmentally, economically superior technology for the generation of electrical and thermal energy, and for the production of fossil-fuel-based chemicals and products for the electric utility market. . ."[56] Other goals include encouraging utilization of domestic resources, improving international competitiveness of U.S. technologies and technology-based products, and environmental protection. In recent years, consistent with these goals, greater emphasis has been given to cost-shared research and technologies for near- and mid-term commercialization by the private sector.

DOE-sponsored efforts with potential applications for electric utilities include R&D on coal combustion and control technologies, waste reduction, and fuel cells.

The coal program activities are focused on reducing emissions and boosting the energy efficiency of coal-fried powerplants. Low-cost coal cleaning methods will reduce costs for utilities' compliance with clean air regulations.

The fuel cell program, involving both coal and gas resources, is working to realize the potential of highly efficient, clean, and competitive generation of electricity and heat in the major sectors of the economy and is proposed to be shifted toward

56 DOE, *Congressional Budget Request, Fiscal Year 1992,* vol. 4, p. 15.

gas applications. By the year 2000, the program expects to demonstrate high-efficiency, natural gas fuel cell powerplants for on-site applications and low-megawatt electric utility powerplants that are economically competitive with conventional technologies.

The Clean Coal Technology program provides Federal funds to spur demonstration of advanced coal power generation technologies offering higher efficiencies, reduced emissions, and cost savings that can help coal compete with other resources (see box 7-E).

Cost and performance data from the Clean Coal Technology Program and other Fossil Energy R&D projects could aid utilities in resource planning for future power needs. Figure 7-3 shows the Fossil Energy R&D Budget.

NUCLEAR ENERGY R&D PROGRAMS

Nuclear power currently provides about 20 percent of the Nation's electricity. The Office of Nuclear Energy supports research projects in fission energy, including commercial nuclear reactor development. Preserving the viability and economic competitiveness of commercial nuclear power generation is a major priority of these efforts.

Much of the DOE nuclear R&D is targeted at the development of standardized designs for new nuclear plants. The $200-million program is shared equally between industry and the Federal Government. The goal of this partnership is to develop advanced light-water reactor designs for commercial application. Another focus is continued R&D in advanced nuclear power systems. DOE requested $50 million in FY 1993 for systems that show ''promise of potentially significant breakthroughs in economics, safety, licensing, and waste management. ' '[57] The early site permit program, a joint program started in 1992 between DOE and three electric utilities, will demonstrate the effectiveness of the early site permits procedure established by the Nuclear Regulatory Commission. The procedures are designed to approve sites for nuclear powerplants before both construction and substantial financial investment in an effort to improve industry standing.[58] Nuclear R&D funding requests were at $307 million in FY 1993, down from $332 million in FY 1992.

The energy efficiency related goals for nuclear power plants differ somewhat from those for

Table 7-7-Selected National Appliance Energy Conservation Act Standards 1992

Covered product	NAECA standard
Refrigerator-freezers'. ..	...960 kWh/yr (1990) 688 kWh/yr (1993)
Freezers[b].	.706 kWh/yr (1 990) 533 kWh/yr (1993)
Room air conditioners[c] ...	..9.0 EER (1990)
Heat pumps[d].	.10.0 SEER (1992) 6.8 HSPF (1992)
Water heaters[e]	
Electric.	.88.4% EF (1990)
Natural gas. . . . . ..,.	.52.5% EF (1990)
Furnaces.	.78.0°\0 AFUE (1992)
Fluoresoent lamp ballasts. , . .	.See 42 U.S.C. 6295(g)(5)-(6)

KEY: kWh/yr - kilowatt-hours per year; EER - energy efficiency ratio; SEER - seasonal energy efficiency ratio; HSPF - heating seasonal performance factor; EF = eff iciency factor; AFUE = annual fuel use (or utilization) efficiency.

a Automatic defrost units with top-mounted freezers, no through-the-door ice, and with adjusted volumes of 20.8 cubic feet.
b Uprighf, manual defrost units with an adjusted volume of 26.1 cubic feet.
c Room air conditioner units without reverse cycle, with louvered sides, and with capacities ranging from 8,000 to 13,999 Btu.
d Applicable to split (rather than single package) heat pump systems. SEER standard also applicable to central air conditioning systems.
e Standads shown here apply to 50 gallon units. NAECA water heater standards are less stringent for larger volume heaters.

SOURCE: Office of Technology Assessment, 1993, adapted from U.S. Congress, Office of Technology Assessment, Building Energy Efficiency, OTA-E-51 8 (Washington, DC: U.S. Government Printing Office, May 1992), p. 112.

[57] U.S. Department of Energy, ''National Energy Strategy: Powerful Ideas for America--One Year Later,' DOE/S—92008000, February 1992, p. 35.

[58] Ibid., pp. 33-36.

Box 7-E—The Clean Coal Technology Program

The Clean Coal Technology Program was established as an outgrowth of U.S.-Canadian agreements on add rain control (Public Law 99-190, Dec. 19, 1965). The program provides Federal funds for up to 50 percent of the cost of building and operating facilities demonstrating the future commercial feasibility of dean coat technologies that burn coal more efficiently, with lower emissions, and at a lowercostthan existlng technologies. The program was envisioned as a $5 billion effort with $2.5 billion in Federal funds to be matched with $2.5 billion in private funds. The Federal investment would be paid back over 20 years from sales of the technologies. Private-sector participation has exceeded expectations, and the overall investment in projects funded under the program is now anticipated to top $6 billion.

Clean Coal Program appropriations rose from $99.4 million in FY 1966 to $415 million in FY 1992. The program has encountered a number of difficulties and delays. Obligations have lagged behind the amounts appropriated. Awarding, negotiating, and obligating Federal funds for joint-venture arrangements proved to take longer than originally anticipated. A number of projects fell behind schedule and faced higher than expected costs.

The objectives of the Clean Coal Program have shifted over time. Originally, the program was envisioned as a means to spur practical technologies that would allow expanded coal use by reducing the adverse environmental impacts of burning coal and lowering costs for various industrial and commercial applications. As it has evolved, greater priority was given to technologies that can be used for retrofitting or repowering existing plants. (Repowering technologies c an also be used for new plants.) In later rounds, emphasis shifted to energy efficiency, environmental compliance, international competitiveness, and technologies with potentlal tocontribute to reducing global warming through lowered carbon dioxide emmisions. The fifth round targeted super-dean, high-efficiency power generation systems needed for coal to compete as an energy source under the more stringent post-2000 standards for sulfer dioxides and nitrogen oxides under the Clean Air Amendments acid rain controls. Information from dean coal demonstration projects will be collected by DOE for use by the industry, energy users, policy makers, regulators, and equipment vendors.

DOE has held five rounds of solicitations for clean coal Projects with the winners of the fifth round announced in May 1993. As of late 1992 there were 41 projects from the first four rounds of competition that were either underway (pre-construction or construction, or operational phases) or completed. Total value of these products is *nearry $4.6 billion* with 60 percent of the funding coming from nonfederal Sources.

Five projects were selected in the fifth round to share in sores $568 million available In cost-sharing. According to DOE, all five projects propose significant improvements in powerplant efficiencies, achieving conversion efficiencies of 45 percent of the energy content in the fuel, compared with the 33 to 35 percent efficiencies of conventional coal powerplants.

Among the technologies that have been funded under the demonstration program in early rounds are advanced coal cleaning, co-firing ofcoal with other fuels, advanced scrubbing technologies, underground coal gasification, atmospheric and fluidized bed combustion, slagging combustion, sorbent injection, integrated gasification combined-cycle, and advanced nitrogen oxide control and other flue gas cleanup technologies. Proposed projects selected in the fifth round include: a 480-MWadvanced integrated combined-cydepowerplant coupled with a 2.5 MW-molten carbonate fuel cell, a combined-cycle plant created by repowering an existing plant with an external gas turbine, a second-generation pressurized circulating fluidized bed powerplant, a small diesel power system fired by a coal-water slurry and equipped with a heat recovery boiler-steam turbine, and an advanced integrated steelmaking-power generation process.

The Energy Policy Act of 1992 calls for DOE to consider additional solicitations under the Clean Coal Technology Program

SOURCES: Office of Technology Assessment, 1993, bawd on information from U.S. Department of Energy, *"National Energy* Strategy: One Year Later," DOE/S--92008000, February 1992, pp. 27+32; and U.S. Department of Energy, Office of Fossil Energy, Clean Coal *Today, No.* 9, winter 1992.

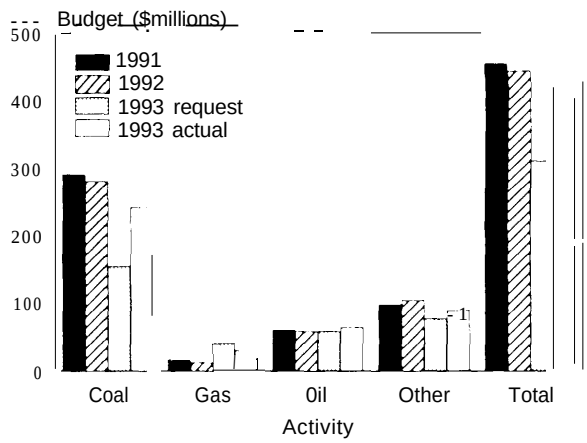
fossil-thermal plants. The industry is interested in reducing the downtime that nuclear plants have experienced, improving load-factor and capacity availability, and refining predictive maintenance methodologies, as well as improving the energy efficiency of individual plant components. Improvements in the energy efficiency of nuclear powerplants is not a driving force in DOE commercial nuclear programs. Efforts supporting standardized nuclear reactor designs and permitting procedures could enhance the viability of nuclear options in utility resource plans.

FEDERAL POWER SYSTEMS

There are 10 Federal "electric utilities"—Government-owned and, operated power systems that generate and sell electricity. They include the Tennessee Valley Authority (TVA), the five Power Marketing Administrations (PMAs), the U.S. Army Corps of Engineers, the Bureau of Indian Affairs and the Bureau of Reclamation in the Department of the Interior, and the International Water and Boundary Con-mission in the Department of State. Together, they operate over 150 powerplants and generate 8 percent of the Nation's electricity supply .59 Much of the power is generated at Federal darn projects initially designed to control flooding and improve irrigation.

These Federal utilities are primarily generators and wholesalers of electricity, although some also serve as retail power distributors to ultimate customers. Most of the power is sold for resale to municipalities, electric cooperatives, and other nonprofit customers under preferences required by authorizing statutes. In 1990, Federal power systems sold 197.9 million MWh to wholesale customers, while sales to ultimate or retail customers totaled 52.1 million MWh. Federal system

Figure 7-3-Fossil Energy Research and Development Budget, FY 1991-93



SOURCE: Office of Technology Assessment, 1993, based on data from U.S. Department of Energy, FY 1993 *Congressional Budget Request,* vol. 4, January 1992, pp. 1$17.

operating revenues totaled $8.2 billion and operating expenses were $5.4 billion for 1990 (see table 7-8). Pricing of Federal power is not intended to make a profit, but rather to recover operating costs and ultimately the capital costs of the facilities plus interest. Long-term debt and liabilities totaled some $31.9 billion in 1990.[60]

The major Federal power producers are TVA, the Army Corps of Engineers, and the Bureau of Reclamation. TVA markets its own power. Most of the electricity produced at Corps of Engineers and Bureau of Reclamation projects is marketed and transmitted by five power marketing administrations: the Bonneville Power Administration (BPA), the Western Area Power Administration (WAPA), the Southeastern Power Administration (SEPA), the Southwestern Power Administration SWPA), and the Alaska Power Administration (APA).[61] The PMAs also purchase power from other electric utilities in the United States and

59 U.S. Department of Energy, Energy Information Administration, *Financial Statistics of Selected Publicly Owned Electric Utilities 1990,* DOE/EIA-0437(90)/2 (Washington, *DC:* U.S. Government Printing Office, February 1992), p. 337.

60 Ibid.

61 The Bureau of Indian Affairs markets power for its Mission Valley Power and San Carlos dams. The Corps markets power from its North Central Division in Sault Ste. Marie, Michigan.

Table 7-8-Statement of Income of Federal Power Marketing Administrations and the Tennessee Valley Authority, 1990 ($ thousands)

Item	APA	BPA	SEPA	SWPA	WAPA	TVA	Total
Operating revenues.	9,602	2,070,265	136,569	95,326	517,259	5,338,721	8,167,742
Operating expenses.	3,867	1,554,260	26,500	84,845	514,954	3,216,460	5,400,886
Total income.	5,735	516,256	110,069	10,482	2,305	2,117,557	2,762,404
Income deductions.	2,983	201,950	110,081	830	44,918	2,845,175	3,205,937
Net income.	2,752	315,605	0	9,652	(44,598)	(387,588)	(104,177)

KEY: APA . Alaska Power Adminstration; BPA - Bonneville Power Administration; SEPA - Southeastern Power Administration; SWPA - Southwestern Power Administration; TVA - Tennessee Valley Authority; WAPA = Western Area Power Administration.

SOURCE: Office of Technology Assessment, 1993, from data in U.S. Department of Energy, Energy Information Agency, Financial Statistics of *Selected Publicly Owned Electric Utilities 1990, DOE/EIA-0437(90)/2* (Washington, DC: U.S. Government Printing Office February 1992), table 24, p. 338.

Canada to help meet customer demand, especially during periods of drought. ARA is an exception; it operates its own powerplants and distributes power to ultimate customers. Figure 7-4 shows a map of the areas served by the PMAs. With their broad customer base, PMAs are in a position to influence almost 30 percent of retail electricity sold.[62] Although all of the PMAs have authority to encourage their utility customers to invest in conservation, only Bonneville and Western have express legislative authority to link power sales to their customers with energy efficiency. Without this "conditioning authority," the other smaller PMAs have been limited in their ability to require their customers to participate in DSM activities.[63]

Individually, TVA and the PMAs have supported a number of energy conservation initiatives. Energy efficiency improvements offer several opportunities, including reduced agency costs and increased ability to satisfy varied uses of river systems.

Tennessee Valley Authority

TVA was created by Congress in 1933[64] as a government-owned corporation with the broad mission of resource and economic development for the Tennessee Valley region, an 80,000 square mile area extending to parts of seven States (figure 7-5).[65] TVA conducts a wide range of resource development programs including improvement of flood control, navigation, and recreation for the Tennessee River system, forestry and wildlife development, and electric power production. TVA also provides technical assistance in such areas as industrial development, regional waste management, and tourism promotion and has set up high-tech skill training centers to meet the needs of regional businesses and industries. TVA supports a fertilizer research facility and a bioenergy research program at Oak Ridge, Tennessee. TVA is governed by a three-member board of directors who are appointed by the President and approved by the Senate to serve 9-year terms.[66]

TVA is the largest Federal power producer. It serves some 110 municipal and 50 cooperative utilities that distribute power to some 3.3 million customers. TVA also provides power to about 50 retail customers. In 1990, TVA generated 116 million MWh, accounting for one-half of total net

62 General Accounting Office, "Utility Demand-Side Management Programs Can Reduce Electricity Use," GAO/RCED-92-13, October 1991, p. 33.

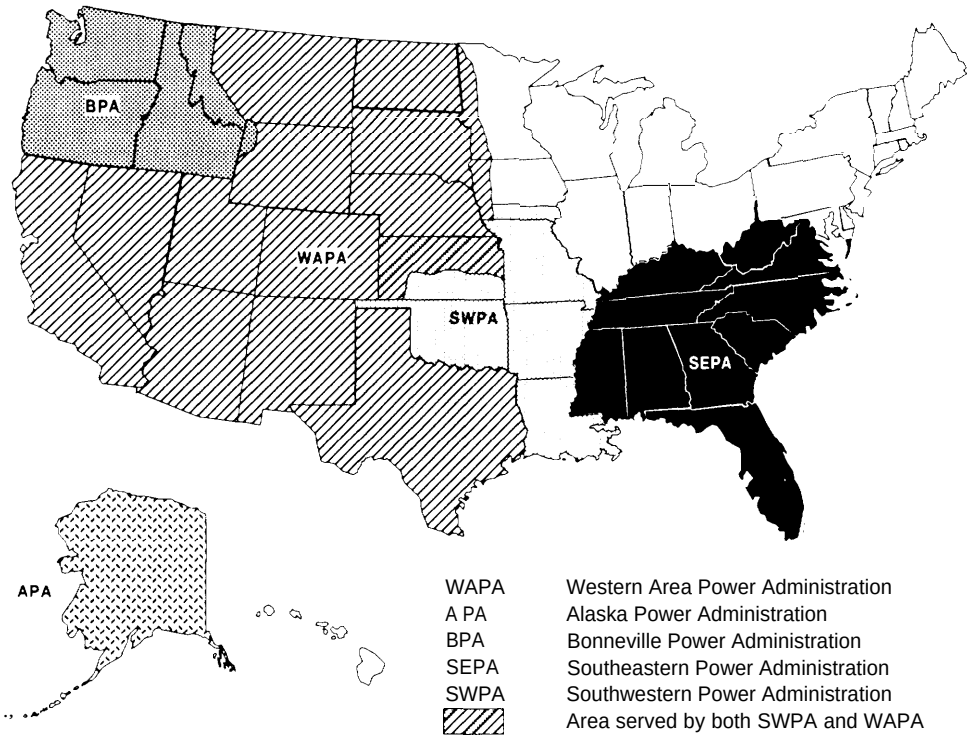
63 Ibid., pp. 37-38.

64 16 U.S.C. 831-831dd.

65 The Tennessee Valley region consists of Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia.

66 *U.S. Government Manual* 1991192, supra note 11, pp. 728-731.

Figure 74-Federal Power Marketing Administrations Service Areas



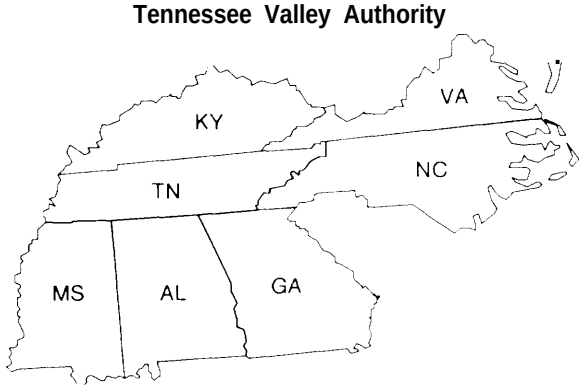
SOURCE: U.S. Department of Energy, The Secretary's Annual Report to Congress 1990, DOE/6-OO1OP (91), p. 160.

generation and over two-thirds of the electric operating revenues reported by the Federal electric utilities.[67]

While TVA's regional development programs are financed by congressional appropriations, the power program is required by law to be financially self-supporting through power sale revenues. Rates are to be set to cover capital and operational costs. Power system operations account for over 95 percent of the TVA budget.

In addition to hydroelectric plants, TVA maintains coal-fired powerplants, nuclear powerplants, combustion turbines and pumped storage systems in its capacity base.[68] Table 7-9 provides statistics

Figure 7-States in the Service Area of the Tennessee Valley Authority



SOURCE: Office of Technology Assessment, 1993, based on data from the Office of Federal Register, The *United* States Government *Manual 1991/92* (Washington, DC: U.S. Government Printing Office, 1991).

67 *Financial Statistics of Selected Publicly Owned Electric Utilities 1990*, supra note 59, p. 337.

68 Coal-fired steam plants now account for 55 percent of TVA's capacity and provide about 70 percent of the daily load. To comply with regulations required by the 1990 Clean Air Act Amendments, TVA estimates that it will invest more than $1 billion on new pollution control technologies by 2000, increasing annual operating costs by $300 million. William Malec, "TVA Re-Examines the Nuclear Option," *Forum for Applied Research and Public Policy*, winter 1991, p. 89.

Table 7-9-Tennessee Valley Authority Power System Statistics, 1990

Power system operators	Million kWh
System sales	
Municipalities and cooperatives	96,748
Federal agencies	2,336
Industrial customers	17,134
Total sales	116,483
Power delivered under cogeneration agreement	1,168
Losses, etc.	3,135
Total system output	120,768
System generation by source	
Hydro (includes pumped storage)	21,654
Coal-fired	78,504
Nuclear	15,275
Combustion turbine	203
Total net generation	115,636
Purchased power	959
Net Interchange and wheel ing	4,191
Total system Input	120,786

SOURCE: Office of Technology Assessment, 1993, based on data from *Tennessee Valley Authority 1990 Annual Report,* November 1990.

on the TVA power system. TVA also coordinates power output from Corps of Engineers dams in the Cumberland Valley and from Aluminum Company of America dams.

In the recent past TVA ran extensive energy conservation programs. However, in 1989 most of these efforts were terminated by TVA's board, citing the financial stresses facing the system. From 1985 to 1988, TVA rate hikes averaged 4.5 percent a year as the result of a combination of a problematic nuclear program, expensive repairs on coal-fired plants, and diminished hydroelectric production because of drought.[69] TVA's management felt its customer base was threatened as some of TVA's largest customers, including Memphis Light Gas & Water, which then accounted for 10 percent of kilowatt-hour sales, began to explore alternative power supply options.

To secure its base of distributors, TVA promised to freeze electricity rates for three years beginnin g in 1988. Among the various actions taken to reduce operating costs was elimination of most energy conservation programs. TVA officials gave two reasons for discontinuing conservation programs. First was the pledge not to raise rates for the 3-year period. TVA's managers reasoned that if sales declined because of successful conservation efforts, rates would likely have to increase as fixed costs were spread over fewer sales. TVA feared that increased rates would induce large customers to leave the system, leading to further decline in sales. Second, TVA cited an internal analysis that concluded that it had exhausted cost-effective conservation options.[70] In TVA management's view, finishing the partially complete nuclear plants offered more cost-effective options than continuing conservation programs to meet future electrical supply. In the summer of 1988, the TVA board of directors approved a transition program that began cutting the conservation staff. In 1989, then TVA Chairman Marvin Runyon stated: ''Conservation will add to our rates. ' '[71] In spring 1989, the board voted to terminate residential conservation programs, cut personnel from 600 to 280, and reduce the budget from $40 to $20 million.[72]

Prior to termination, TVA conservation programs were among the most extensive in the country, saving an estimated 913 MW in an 8-year period from home weatherization programs alone.[73] **Average annula electricity** use for

69 Roger L. Cole and Larry A. Pace, "The Power to Change: The Case of TVA, " *Training and Development*, August 1991, p. 59.

70 Tennessee Valley Authority, TVA Power Group, *Power Planning,* attachment in *Hearings on TVA Conservation Programs* before the Subcommittee on Energy and Power of the House Committee on Energy and Commerce, 101st Cong., 1st sess., June 29, 1989 (serial no. 101-60), pp. 190202.

71 Testimony of Marvin Runyon, Chairman, Tennessee Wiley Authority, ibid., p. 148,

72 Jim Cooper, U.S. Representative, ''What Is TVA's New Policy on Energy Conservation, " ibid, pp. 16-21.

73 Tennessee Valley Authority, ''Energy Services Report '87,' ' TVA/OP/CEM—88/17, 1988, p. 43.

Table 7-10-Tennessee Valley Authority Major Energy Conservation Programs, Fiscal Years 1977-87

Energy services	Number of Installations	Dollars loaned	Estimated annual savings (kWh)	Estimated cumulative savings (MW).
Residential				
Home weatherization.	601 ,282[b]	$375,001,000	1,802,300,000	913.0
Sunscreens.	2,626	490,000	2,100,000	1.0
Heat pumps. , ...	53,103	166,555,000	188,500,000	58.4'
Heat-pump water heaters.	1,504	1,108,000	4,100,000	0.8
Wood heaters.	16,246	4,484,000	79,100,000	55.4
"Cycle and Save"				
Air conditioner cycling.	53,287'	—		*54.0*
Water heater cycling.	57,037[d]	—	—	*79.4*
"Energy Saver" homes.	22,518	—	99,900,000	*30.8*
Commercial and Industrial				
Energy management surveys. .	26,500	4,947,000	*838,600,000*	*173*
Other programs, ...	n/a	n/a	*50,200,000*	*14*
Total.	834,103	$552,585,000	*3,064,800,000*	1,411

[a]Values shown are maximum seasonal reductions.
[b]Includes residences weatherized with TVA loans, without TVA loans, and residences weatherized in a joint effort with Community Action Agencies.
[c]Does not include switches installed on 12,324 heat pumps.
[d]Does not include 2,882 switches installed on solar water heaters Or 75 switches on heat pump water heaters.
'Refers to number of buildings surveyed.
Includes savings attributable to "Cycle and Save" switches.

SOURCE: Tennessee Valley Authority, "Energy Services Report, 1987," TVA/OP/CEM-88/17, p. 43.

TVA residential customers was 50 percent higher than the national average due to the large number of homes heated by electricity .74 Residential customers received services ranging from free audits to interest-free loans to financing for installation of conservation measures. In 1987, TVA celebrated the completion of 1 million home energy surveys. TVA had an extensive engineering staff assisting individual commercial and industrial customers with tailormade conservation programs. Additionally, industrial customers were eligible to receive information on relevant new technologies from TVA representatives. TVA also participated in a number of energy efficiency R&D efforts. TVA demonstration programs showcased innovative home designs, new water heaters, radiant barriers, and photovoltaics and helped confirm the cost, reliability, and availability of these emerging technologies.[75] Table 7-10 highlights the major conservation programs pursued by TVA.

After 1989, the programs remaining in TVA's conservation budget are primarily educational and information programs and strategic load management. The information programs include distributing energy sourcebooks and other teaching materials, and operating a TVA energy center for teachers and students. The consumer energy efficiency information program provides brochures to customers on appliances. The Energy Management Program provides technical assistance to Tennessee county governments in identi-

74 About 40 percent of TVA residential customers rely on electric heat compared with 20 percent of homes nationally. Ibid., p. 6.

75 Ibid., pp. 1-34.

fying opportunities for installation of energy-saving measures financed with State and Federal conservation funds.

The load management programs are designed to maintain and expand TVA's customer base load. In the industrial sector, TVA is encouraging the use of electrotechnologies. In the residential sector, the focus is on promoting construction of all-electric homes. TVA "energy conservation" programs have effectively shifted in focus from saving kilowatt-hours to strategic load marketing and demand growth.

The Industrial Energy Services program is a technical assistance program that works with the largest industrial customers to determine their energy requirements. TVA personnel then identify how to meet energy requirements cost-effectively and promote use of electrotechnologies. TVA estimates that 20 percent of activity in this program is concentrated on energy efficiency improvements.[76]

In 1989 TVA established the Residential Energy Service Program (RESP), which provides technical and financial assistance for installation of energy-efficient electric heat pumps, and information on electric hot water heating systems. RESP is currently budgeted at $10.5 million. TVA offers bounty payments to distributors who successfully encourage construction of new all-electric homes.[77] RESP was designed to "help TVA maintain a desirable balance between summer and winter peaks by helping maintain winter water heating and space heating loads. "[78] TVA provides the loans and support materials to its distributors which are responsible for the administrative costs. If a distributor does not participate, customers in its service area are not eligible for the loans.[79]

Under the stewardship of Marvin Runyon, TVA was poised to expand its generating capacity and "committed itself to nuclear power as an integral source for meeting the energy needs of its service area."[80] TVA demand is growing 1.5 to 4 percent a year according to TVA load forecasts. TVA plans have called for completing four nuclear powerplants currently in the construction or licensing stage by 2000.[81] With the five units already licensed, TVA anticipates that nuclear power will supply 40 percent of its annual generation by 2000. This additional power will be used to meet projected growth in demand.[82]

With passage of the Energy Policy Act of 1992, TVA's determination to eschew energy efficiency and build new nuclear generating capacity may be stalled and its future path redirected. Section 113 of the act requires TVA to establish a least-cost planning program to develop a resource plan with the lowest system cost.[83] The planning process must consider supply and demand resources, including renewable resources, energy conservation and efficiency, on a consistent and integrated basis. TVA must incorporate opportunities for its distributors to recommend cost-effective energy efficiency opportunities,

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76 Tennessee Valley Authority, attachment to testimony, in *Hearings on TVA Conservation programs,* supra note 70, at p. 160.

77 Report submitted by Representative Jim Cooper, *Hearings on TVA Conservation Programs,* supra note 70, pp. 17-21.

78 Ibid, p. 17.

79 Ibid, p. 16-25.

80 William Malec (Senior Vice President and Chief Financial Officer, Tennessee Valley Authority), " 'TVA Does Not Need To Be Privatized,'' *Public Utilities Fortnightly,* Feb. 15, 1991, p. 28.

81 In early 1993 TVA's board voted to proceed with construction of the mothballed unit of the Bellefonte nuclear plant, finish work on two units at Browns Ferry, and bring Watts Bar Unit 1 on line in 1994. Ed Lane, "In Debt and Off Line: Uncertain Future Faces Nuclear-Driven TVA," *Energy Daily, May 4,1993, pp. 3-4.*

82 William F. Malec, ''TVA Re-examines the Nuclear Option,'' *Forum for Applied Research and Public Policy,* winter 1991, pp. 87-90.

83 Public Law 102-486, Oct. 24, 1992, sec. 113, 102 Stat, 2798, 16 U.S.C. 831m-1. Section 113(b)(3) defines system cost as ''all direct and quantifiable net costs for an energy resource over its available life, including the cost of production transportation, utilization waste management, environmental compliance, and in the case of imported energy resources, maintaining access to foreign sources of supply."

rate structure incentives, and renewable energy proposals for inclusion in the program.

In planning and selecting new resources, TVA must evaluate the full range of existing and incremental resources (including new power supplies, energy conservation and efficiency, and renewable energy resources) in order to provide adequate and reliable services to its customers at the lowest system cost. The act further requires TVA to provide opportunity for public review and comment before selection of any major new energy resource and include a description of the action in its annual report to the President and the Congress

TVA was also directed to encourage and assist distributors in the planning and implementation of cost-effective energy efficiency options and authorized to provide a range of technical and financial services to advance these efforts.

The impact of these requirements on TVA's nuclear plans and its conservation programs remains to be seen. The act set no schedule for TVA's least-cost planning process and did not include any explicit mechanisms for enforcement or 'review. TVA is moving forward to develop expanded energy conservation programs and preparing comprehensive DSM analyses for the upcoming integrated resource planning process.[84]

Bonneville Power Administration

BPA, established in 1937, is the Federal electric power marketing agency in the Pacific Northwest.[85] BPA markets hydroelectric power from 21 multipurpose water resource projects of the U.S. Army Corps of Engineers, and 9 projects of the Bureau of Reclamation, plus power from nonfederal generating plants. These generating stations and BPA's 14,794 miles of transmission lines and 389 substations make up the Federal Columbia River Power System. In marketing its power, BPA must give preference to publicly-owned utilities and electric cooperatives.

BPA is the largest power wholesaler in the Northwest, supplying half of the electricity and operating almost 80 percent of the region's high-voltage power transmission capacity. BPA sells power at wholesale to local utilities and also provides power to a small number of large direct-service industrial customers[86] and to other Federal agencies. It participates in seasonal power exchanges and maintains power coordination and transfer agreements with utilities in other regions and in Canada.

Under its authorizing legislation, BPA may build and operate transmission facilities and market power, but it is not authorized to build or own power generation facilities. To meet its firm power contracts with its customers, BPA supplements its Federal hydropower supplies with purchases from other utilities. Under the Pacific Northwest Power Planning and Conservation Act of 1980, BPA's selection of nonfederal supply and demand resources to meet its customers energy needs is guided by a collaborative planning process.[87] The act also gave BPA responsibility for technical and financial assistance for energy conservation and renewable resource development, and for fish and wildlife protection in the Columbia River drainage basin.

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84 Meg McKnight, TVA Government Relations Office, Washington, DC, personal communication, Apr. 14! 1993.

135 Act of August 20, 1937 (The Bonneville Project Act), as amended, 16 USC 832 et seq. BPA serves Oregon and Washington and parts of Montana, Nevada, Utah and Wyoming.

86 There are currently fewer than 20 direct service customers, but when they are operating at capacity, they account for some 17 percent of BPAs power sales. They include a number of electricity-intensive industries: aluminum smelters, electroprocessing plants, pulp and paper mills, and chemical companies. Northwest Power Planning Council, *1991 Northwest Conservation and Electric Power Plan*, vol. 1,91-04 (Portland, OR: Northwest Power Planning Council, April 1991), p. 9.

87 Public Law 96-501, 94 Stat. 2697, Dec. 5, 1980, 16 U.S.C. 839-839h.

88 House Report No. 96-976, Part I, 96th Cong., 2d sess., May 15, 1980, pp. 23-30.

The House Report provides some of the background history that led to the legislation.[88] For over 40 years, the Columbia River system was able to provide the power requirements of BPA's preference customers, Federal agencies, investor-owned systems, and direct-service industrial customers. The region enjoyed some of the lowest electric rates in the country. In the 1970s, growing power demand was outstripping BPA's ability to meet customer needs from available hydroelectric resources. Extensive hydroelectric development also was blamed for declines in the region's fish and wildlife, and corrective measures to protect salmon and other species would reduce water flows for power generation. The BPA administrator warned that threatened power shortages could force it to curtail firm-power sales to investor-owned utilities and direct-service customers and to allocate available resources among the preference customers. To avoid this, BPA and the region's utilities then set forth on an effort to add nuclear and coal-fired generating plants owned by nonfederal entities to the Federal system. To help finance this capacity expansion, BPA entered into agreements with its preference customers that obligated BPA to purchase power generated from the new plants. In return, the selling utilities would receive credits on charges for power purchased from BPA.[89] However, this financing mechanism was foreclosed for additional resources by an adverse ruling by the Internal Revenue Service. Subsequent efforts also were derailed. The region's utilities and regulators scrambled to find some way to preserve their shares of BPA's low-cost hydro resources. At the same time, the cost of building new generating resources was climbing. By the late 1970s, BPA was selling wholesale electricity at 8 mills per kWh ($0.008/kWh) while power from new thermal powerplants would cost 10 times as much. The alternative of energy conservation, was being ignored, despite the existence of several successful programs demonstrating cost-effective electricity savings. Desperate for a solution, the actors turned to Congress.

The prescription was the Northwest Power Act of 1980. The House Committee report diagnosed the region's problems as follows:

> The opportunity for conservation of electric power in the region is great. Kilowatts saved cost a small fraction of the cost of producing an equivalent amount of kilowatts. All concede that a vast potential for energy conservation is being wasted in the region.
>
> As the costs of new generation have increased the potential for cost-effective conservation programs in the region have also increased. Unfortunately, the region appears to lack mechanisms to undertake an effective regional conservation effort. BPA has limited authority to carry out conservation programs, and no authority to borrow or underwrite funds to finance these programs. Individual utilities (particularly publicly owned systems) face many legal and practical problems which limit their conservation efforts. Further, under current conditions it could be several years before many customers of BPA preference customers will face the kind of price signals that would encourage them to invest money in cost-effective conservation measures.
>
> . . . In the absence of a coordinated regional power program, it is probable that conservation efforts in the region will be too slow, too scattered, and too modest to be effective; and the region would thus lose a good portion of conservation's potential economic benefit.[90]

The report concluded:

> The certain inability of the region to resolve its problems without legislation represents a serious economic, social, and environmental threat to the

88 House Report No. 96-976, Part I, 96th COW., 2d sess., May 15, 1980, pp. 23-30.

89 This mechanism was used to finance three nuclear units of the ill-fated Washington Public Power System with BPA effectively guaranteeing repayment of bonds issued to pay for construction.

90 House Report 96-976, supra note 88, p. 26.

region, and by implication to other regions of the country. The continued failure to use existing resources and conservation effectively and to plan efficiently for future needs raises the potential of severe regional electrical power shortages in this decade.[91]

The solution was to create a public planning process enabling States, localities, consumers, BPA customers, fish and wildlife agencies, Indian tribes, users of the Columbia River System, and the public to participate in the region's electric power decisionmaking process. The act authorized BPA to acquire additional resources on a long-term basis, consistent with the regional plan, and giving frost priority to conservation and renewable resources. It also clarified BPA's authority to enter firm power sale contracts with investor-owned utilities and direct service customers.

In form and practice, the regional planning process used by the Pacific Northwest Planning Council and BPA resembles utility IRP processes in wide use today. In 1980, however, the act marked a bold innovation in Federal and State collaboration. The act also required that conservation be treated as a resource, and that all resources be evaluated to determine the best and lowest-cost alternatives to meet the region's electricity needs. In planning and selecting resources, priority was to be given first to conservation; second, renewable resources; third, generating resources utilizing waste heat or generating resources with high fuel-conversion efficiency; and fourth, all other resources, including conventional thermal power-plants.[92] Box 7-F summarizes the planning process created by the act and the results of BPA's most recent resource plan.

BPA CONSERVATION ACTIVITIES

The Northwest Power Act of 1980 directed Bonneville to use conservation to the fullest extent possible in its resource mix and authorized a wide range of technical and financial assistance to encourage energy efficiency and renewable energy development.

BPA has had more than a decade of experience in developing, administering, and evaluating energy conservation programs. Its programs are extensive and serve customer utilities, residential, commercial, and industrial consumers, and State and local governments. Customer outreach provides technical and financial assistance for conservation measures. BPA pays part of the cost of residential weatherization. Hotlines inform commercial and industrial customers about emerging energy-efficient technologies. BPA has assisted State and local governments with the development and implementation of model energy conservation codes, and offered financial incentives to jurisdictions that adopt and enforce the codes. BPA also has underwritten extensive demonstration programs to test energy-efficient technologies and provide cost and performance information to their utility customers and others.

BPA's resource plans and energy conservation experience also contribute to the system's flexibility in responding to changing conditions. In April 1993 BPA outlined a number of emergency measures intended to head off or reduce a potential 25 percent rate hike on October 1, 1993. Among the circumstances that have contributed to the financial crisis were a drought that decreased sales and required BPA to purchase replacement power to meet its loads and the loss of one-quarter of its direct sales to aluminum companies. In an attempt to hold the price increase below 20 percent, BPA announced that

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91 Ibid, p. 27.

92 Northwest Power Planning and Conservation Act, Public Law 96-501, 1980, Sec. 4(e)(1). The definition of cost-effective in the act provides a 10 percent cost advantage to conservation resources. Section 3(4)(D) provides: "A conservation measure or resource shall not be treated as greater than that of any non-conservation measure or resource unless the incremental system cost of such conservation measure or resource is in excess of 110 per centum of the incremental cost of the non-conservation measure or resource." 16 U.S.C. 839a(4)(D).

Box 7-F--Regional Power Planning: The Bonneville Power Administration and the Pacific Northwest Power Planning Council

'Ten years ago, the Pacific Northwest embarked on a grand experiment It was a test initiated by the Northwest Power Act of 1960, to determine whether four states, sharing common needs and assets, could coordinate their efforts to ensure their people energy services at the lowest possible cost."[1]
Northwest Power Planning Council, April 1991

The Northwest Power Planning Council

The Pacific Northwest Electric Power Planning and Conservation Act of 1980[2] created the Northwest Power Planning Council to develop a long-term regional conservation and electric power plan to guide the Bonneville Power Administration's resource planning and selection. The act requires that BPA's resource acquisition be consistent with the council's recommendation and resource acquisition proposals must have council approval.[3] The plan is to be updated at least every 5 years. The Council is authorized to monitor and report on implementation of the resource plan and efforts at depbyment of conservaton and renewable energy resurces in the region. The act also gave the Council responsibility for developing a program to protect and enhance fish and wildlife and related spawning grounds and habitat on the Columbia River and its tributaries.[4]

Collaboration between State and Federal agencies and public review and involvement are key features of the Northwest planning process. The Council consists of two members each from Washington, Oregon, Idaho, and Montana Council members are appointed by the Governor of each State. The act provides for public hearings on the proposed plan and for an ongoing public information and outreach program to involve State and Federal agendas, Indian tribes, customers, and the public In the planning process.

The Planning Process

The act specifies that the regional conservation and electric power plan must contain:

1. an energy conservation program, including model energy Conservation standards;
2. recommendation for research and developmet,
3. a methodology for quantifying environmental costs and benefits in evaluating the cost-effectiveness of resource options;
4. a 20-year demand forecast covering the amount and types of resources needed to rneet BPA obligations impacts of fish and wildlife protection, and estimates of the resources to be acquired on a long- term basis;
5. an analysis of the resources required to assure adequate and reliable electric power at the lowest probable cost and the met-effective means of providing them;
6. the fish and wildlife protection, mitigation, and enhancement program; and
7. recommendations, if any, for surcharges to be imposed on customers not implementing energy conservation standards.[5]

Energy conservation and renewable energy resources are given the highest priority for new resources. The act provides that conservation resources are to be given a 10 percent advantage in cost-effectiveness determinations. The Council has developed three regional power plans. The most recent one was released in April 1991.

The 1991 Northwest Conservation and Electric Power Plan sets forth the planning council's estimates of power needs and recommendations for resource acquisition.[6] The early plans weredeveloped during a timewhen

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[1] Northwest Power Planning Council, *1991 Northwest Conservation and Electric Power Plan*, vol. 1, 91-04 (Portland, OR: Nortwest Power Planning Council, April 1991), p. 3.

[2] Public Law 96-501, 94 Stat. 2697, Dec. 5, 1980, 16 U.S.C. 839-839h.

[3] Any resources that Bonneville wants to acquire that aren't consistent with the plan must be approved through an Act of Congress.

[4] Public Law 96-501, sec. 4, 94 Stat. 2705-2706, 16 U.S.C 839b.

[5] 16 U.S.C. 839b(e).

[6] Northwest Power Planning Council, *1991 Northwest Conservation and Electric Power Plan*, vol. 1, 91-04 (Portland, OR: Northwest Power Planning Council, April 1991).

the region faced an energy surplus from the overbuilding in the 1970s. The 1991 plan addresses a tightening power supply. The plan forecasts a potential for a capacity deficit by the turn of the century unless new resources are acquired.

The plan analyzed a number of electricity demand growth scenarios ranging from one where average demand declines at a rate of-0.4 percent per year to one with a high growth rate of 2.5 percent per year, however more emphasis was placed on mid-range growth levels of 0.6 to 1.7 percent per year.[7] The council developed several alternative resource portfolios containing various mixes of supply and demand resources capable of meeting the full range of energy demand reflected in the scenarios. Potential supply and demand resources were evaluated by examining total costs including direct costs and enviromnental impacts, and reliability. Other evaluation criteria included lead times, size, and capital cost. Based on its analysis and public comment, the council plan adopted four objectives for a regional energy strategy.

1. *Acquiring all low-cost resources-The* plan recommends that BPA and regional utilities acquire 1,500 average megawatt (aMW)[8] of conservation and energy efficiency improvements at a total cost to utilities and customers of $7 billion (see figure on next page). This would entail aggressive efforts to install efficiency measures in the residential, commercial, industrial and agricultural sectors at a level many times greater than current DSM and conservation programs. Efficiency improvements in powerplants, transmission, and distribution facilities would contribute 360 aMW of conservation savings. In addition, the plan callsfor 150 aMWof new, low-cost hydropower and 650 aMWof low cost industrial cogeneration by the year 2000.[9]
2. *2. Shortening lead times needed to bring new resources into operation to enable quick and flexible responses to rapid load growth. The* plan would reduce lead times by beginning inexpensive pre-construction preparations such as siting, permitting, licensing, design, contracts, and other approvals to enable addition of 100 aMWof new hydropower and up to 750 aMW of cogeneration to resource plans if demand growth is higher than anticipated. These pre-construction activities often are among the most time-consuming in developing new power resources. The council also recommends that BPA and utilities investigate cost- effective backup power supplies for 1,500 aMW of the region's non-firm hydropower to accommodate potential impacts of fish and wildlife protection programs. Good candidates for "hydrofirming" include interregional energy transactions, increased interruptible loads and gas fired combustion turbine plants.[10]"
3. *Confirming* the cost and *availability of additional resourocs that could be incorporated into future* plans--The plan callsforsupport of research, development, and demonstration efforts for resources that are not yet ready for utility-scale deployment including new energy conservation and renewable energy technologies (such as geothermal, wind, and solar generating technologies). Additionally, the council requests that BPA determine whether the continued preservation of its two uncompleted nuclear power plants remains a prudent insurance policy.[11] The council also suggests that BPA investigate

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7 Ibid., p. 17.

8 An average megawatt (aMW) is 8,760 megawatt-hours of_ or the amount of energy produced by continuous operation of 1 megawatt of generating capacity over a year. It Is distinct from a megawatt or MW used to refer to capacity, the maximum output of an electrical generator. Because most generators do not run continuously, securing 1 aMW of resources may require acquisition of more than IMW of capacity.

9 Ibid., pp. 31-36

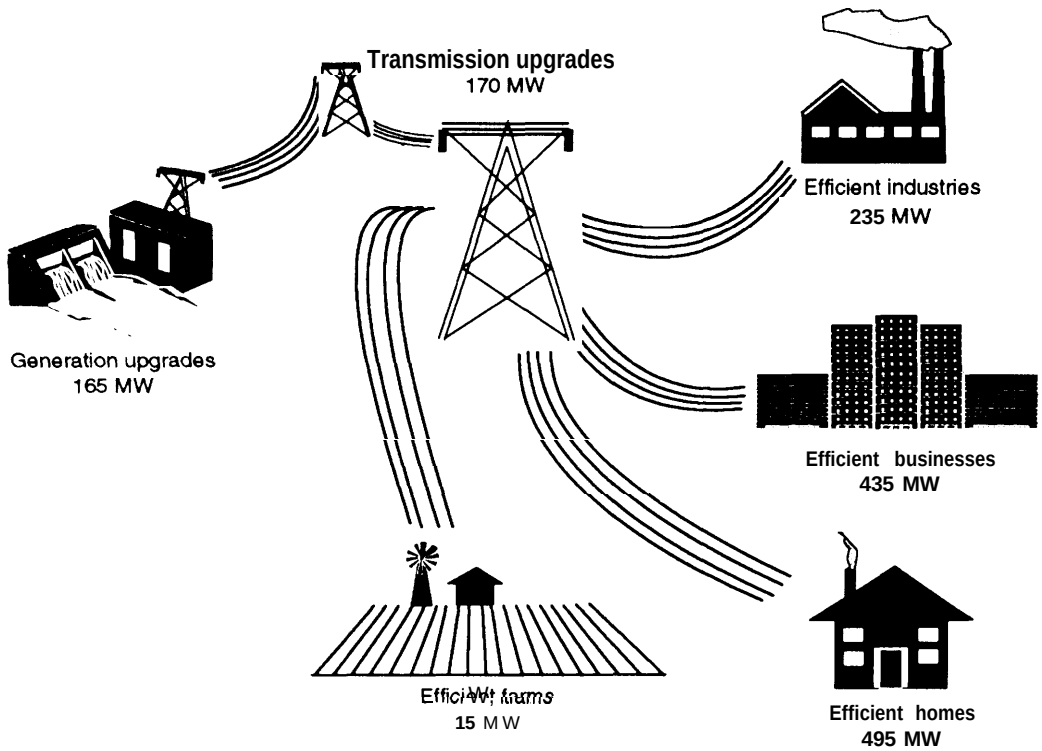
10 Ibid., pp. 36-38.

11 ibid., pp. 38-43. inApril 1993, the Washington Public Power Supply System began proceedings to formally terminate *partially completed nuclear power plant that had been preserved in an unfinished condition since 1983. BPA is guaranteeing repayment of some $4.6billion In revenue bonds sold to finance construction, It Is estimated that more than $3billion would be necessary to complete the plants. BPA and regional planners have concluded that more than 5,000 MW from other sources at prices of$0.03/kWh making electricity from the two nuclear plants at an estimated $0.04/kWh uneconomic.

(Continued on next page)

Box 7-F–Regional Power Planning: The Bonneville Power Administration and the Pacific Northwest Power Planning Council--Continued)

Recommended Resource Acquisitions of the 1991 Northwest Conservation and Electric Power Plan



SOURCE: Office of Technology Assessment, 1993, from Northwest Power Planning Council, 1991 Northwest *Conservation and Electric Power Plan, vol.* 1,91-04 **(Portfand, OR: Northwest Power Planning Council, April 1991), figure 17, p. 33.**

rapid-response resources replace 500 to 1,000 aMW of existing generating capacity should the need arise. Rapid-response resources include acquisitions through bidding, and alterations to existing combustion turbine resources. The council states that "if sufficient rapid-response resources cannot be identified, it may be necessary to seek interruptible loads and develop curtailment strategies until resources with longer lead times can be added."[12]

4. *Encouraging regulatory* ***and other Institutional changes*** *to help implement theplan--The plan* details recommendations for a variety of actions by BPA State regulators, utilities and local governments to ease the implemental'bn of the council **plan. Among the suggestions are that regulators consider changes to decouple profits from the energy sold and relink profits to energy saved and review policies to ease the siting and acquisition of generating resources. Regulators were encouraged to consider appropriate rate treatment for investing in activities that reduce resource lead times, and for participation in research activities to confirm/deny potential resources. Lastly, the council urged cooperation between regulatory**

[12] **Ibid., pp. 31-43.**

agencies and Bonneville **in the** issue of transmission access for non-utility generators.[13]

Responsibility for implementing the plan is shared by BPA and region's regulators and utilities backed by support of environmental, consumer groups and the public. The Council notes that it will monitor progress in addressing these recommendations.

BPA's 1992 Resource Program

Every two years BPA issues a 10-year resource program outlining its proposals for meeting electricity loads. The November 1992 resource program was the first adopted after the 1991 **Northwest Power Plan and identifies conservation as its preferred resource.** BPA assumed a 1 percent annual growth rate and proposed acquiring 1,530 **aMW.** In doing its part to meet regional electric needs, BPA proposes to:

- acquire all cost-effective conservation-targeting 880 aMW of conservation and 120 aMW of power system efficiency improvements through 2003 in its public utilities service areas (estimated cost $2.8 billion);
- acquire an additional 400 aMW of new generating resources to meet the most likely range of need through 1998; and
- purchase 250 aMW of options (rights to buy firm power at a specific time) to cover the outer range of need.[14]

BPA also plans to secure 1,050 aMW in options and contingent resources to provided needed capacity if demand growth is higher than forecast. BPA will reserve the right to cancel selected projects on option in exchange for reimbursing the sponsor's pre-development costs.

To accomplish its goal of accelerated acquisition of conservation resources, BPA is making major changes in the operation of its conservation programs and how it pays for energy savings. Program development and decisionmaking will shift from headquarters to BPA area offices which will collaborate with utilities and local communities in designing and implementing **local** conservation plans. Under the Northwest Power Act BPA can pay utilities and others for conservation resources that reduce BPA's loads. BPA anticipates securing conservation resources through:

- **utility adoption of BPA-sponsored programs;**
- **utility reimbursement** for costs of program administration and conservation measures installed; and
- utility or energy service company compensation for installation of conservation measures based on kwh saved.[15]

Instead of paying up-front, BPA plans to shift to pay-for-performance contracts that purchase measurable savings over time. Verification of energy savings will be required in the performance contracts. BPA expects utilities to provide a substantial portion of the necessary capital for installing conservation measures rather than relying on BPA to provide financing. BPA also will continue to require utilities that own generation to pay **a percentage** of the cost of conservation in their service area, based on the percentage of the utility's load supplied by BPA. This cost-sharing is required so that nongenerating utilities do not **pay** a disproportionate share of conservation program costs. For some utilities, current cost-sharing percentages have, however, created a financial impediment to meeting accelerated conservation targets and BPA is investigating alternative mechanisms for an equitable sharing.

The accelerated conservation path and will face several challenges. There will have to be unprecedented cooperation among all groups in the region to identify and install all commercially available cost-effective conservation measures. Utilities and governments will need greater staff, technical, and financial support from BPA to develop and carry out local conservation programs. Regulators will have to review policies and rate structures for possible conflicts with conservation goals.[16]

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13 **Ibid., pp.** *43-44.*

14 **Bonneville power Administration, 1992 Reset.mx Program--10 Year Plan,** *Draft II DOE/BP-1874* **(Portland, OR: Bonneville Power Administration, May 1992), p. i, Draft II insubstantially identical to the final resource program released in November 1992.**

15 Ibid., p. 48.

16 Ibid., pp. 26-33.

(Continued on next page)

Box 7-F–Regional Power Planning: The Bonneville Power Administration and the Pacific Northwest Power Planning Council--(Continued)

Savings to Date

In the view of the Northwest Power Planning Council, the act's grand experiment has been a clear success for the people of the Pacific Northwest:

> 'This region is convinced! Every Northwest utility is promoting efficiency through marketing programs and incentives. They have already saved more than 350 megawatts at a cost less than half of the power from a new generating plant Aluminum companies also have cut their consumption. And state energy office programs brought us another 200 megawatts.
>
> New energy-efficient building codes and appliance standards already adopted by Federal, State and local governments can save the region more than 1,300 average megawatts by the year 2010.
>
> In addition, if the region captures all the energy savings described in thisplan over the next 20 years, it could add another 4,600 megawatts of conservation."[17]

[17] 1991 Northwest Conservation *and Electric* Power *Plan* p. *20.*

SOURCE: Office of Technology Assessment, 1993.

it is cutting all programs by 25 percent, including conservation and fish and wildlife activities, and administrative programs by 50 percent. The cuts are not expected to change BPA's resource program goals, but likely will result in deferrals and slowdowns in prgram growth.

Western Area Power Administration

WAPA was established in 1977 under section 302 of the Department of Energy Organization Act to market power in a 15-State area generated from federally-owned powerplants operated by the Bureau of Reclamation, Corps of Engineers, and the International Boundary and Water Commission.[93] It also markets Federal entitlement power from the coal-fried Navaho Generating Station. WAPA operates and maintains 16,500 miles of transmission lines, plus associated substations to deliver power to its customers. Like BPA, Western's transmission resources are an important link in regional power systems. Westem serves some 532 wholesale customers, mostly public power systems and electric cooperatives supplying over 10 percent of the region's needs.[%] Other purchasers include investor-owned utilities and Federal and State agencies. Western supplies an average of 35 percent of its customers' power needs.[95]

In 1981 WAPA established its own conservation and renewable energy program with three objectives:

1. reducing wasteful uses of electricity through energy conservation;
2. enhancing the place of electricity in the energy market by making uses of electric power more efficient; and
3. ensuring that conservation and renewable energy technologies are fairly compared

[93] 42 U.S.C. 7152.

[94] States include Arizona, California, Colorado, Indiana, Kansas, Minnesota, Montana, Nebraska, Nevada, New Mexico, North Dakota, South Dakota, Texas, Utah, and Wyoming.

[95] Bill Clagett, Administrator, Western Area Power Administration, letter to O'IX, Sept. 18, 1992.

with conventional resources when additional power is required.[96]

Title II of the Hoover Power Plant Act of 1984 essentially confined Western's conservation and renewable energy program and its pre-existing authority to condition contracts for Federal hydropower on customer adoption of conservation programs.[97] Indeed, the act explicitly requires new firm power contracts with WAPA to contain provisions obligating the purchaser to implement energy conservation programs. Unlike BPA, Western is not required to meet wholesale customer load growth, however, it must purchase power to make up for short-term power shortages in drought periods in order to meet its firm power contractual commitments. Western can withhold power from a customer that has not implemented conservation programs or that do not submit a plan within a year of signing a power contract.

Following the 1984 legislation, WAPA published amended guidelines and criteria for evaluating the adequacy of customer utilities' conservation programs.[98] Long-term firm power customers must submit a plan describing qualifying program activities, the implementation schedule, targeted goals, and energy savings estimates where feasible. Qualifying customer programs, include: energy consumption efficiency improvements; production efficiency improvements, load management, cogeneration, rate design improvements, and renewable energy resources (wind, solar, biomass, small-scale hydro, and geothermal technologies). Western allows considerable flexibility in program design. The acceptability of customer conservation and renewable energy plans is determined based on utility type and total system sales. For example, most customers with over 100 gigawatt-hours (GWh) per year in sales have been required to implement five individual programs. Customers with sales of less than 50 GWh per year need only submit three programs for acceptance.

Western provides additional support to customer utilities through a variety of information and technology transfer activities: workshops, information services, publications, direct technical assistance, onsite visits, equipment loans, and IRP computer software. Under a "peer matching' effort, Western has matched small customer utilities to others with first-hand experience and expertise in conservation and renewable energy technologies. This has been particularly helpful to small rural communities with limited staff and resources.

Estimates of energy or capacity savings resulting from the Western's requirements are not available at present. Western measures program accomplishments by the number of approved ongoing annual customer conservation and renewable energy activities. For FY 1992, Western reports almost 100 percent participation by the nearly 800 customers, with a total of 3,200 separate approved activities.[99] In any event, Western believes that because Federal hydropower is a low-cost resource, customer conservation activities would likely not be used to reduce their power purchases from WAPA, but rather to offset their own higher-cost thermal power supplies from utilities' own generation or from others. In 1990 electricity savings from operating conservation programs were insufficient to offset the power loss caused by drought conditions. Western spent an additional $267 million for power purchased during the drought.[100] Because

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96 Ibid.

97 Public Law 98.381, Aug. 17, 1984, 98 Stat. 1333-1342, 42 U.S.C. 7275. Pre-existing conditioning authority was derived from the Department of Energy Organization Act, 42 U.S.C. 7101, et seq., and the Reclamation Act of 1902, as amended.

98 50 Fed. Reg. 33,892-33,899, Aug. 21,1985.

99 Bill Clagett, Administrator, Western Area Power Administration, letter to OTA, Sept. 18, 1992.

100 General Accounting Office, ''Utility Demand-Side Management Programs Can Reduce Electricity Use,' GAO/RCED-92-13, October 1991, p. 33.

of Western's statutory responsibility to market available Federal hydropower and contractual obligations to supply power to its customers (including replacement power supplies in times of drought), customer DSM programs will not reduce the amount of power that Western markets. They may, however, allow that low-cost resource to serve a higher portion of customer requirements and to be shared more equitably.

Proposed revisions to WAPA'S conservation program begun in 1990 and now under review would add requirements for adoption of IRP programs and also would require customers to quantify energy and capacity savings from their programs. Changes would also directly link allocation of hydro resources to long-term planning and efficient use of resources and impose surcharges on customers that did not comply.[101]

Many elements of WAPA'S proposed Energy Plannin g and Management Program were adopted by section 114 of the Energy Policy Act of 1992, which amends the Hoover Power Plant Act of 1984 to add a new title on IRP. WAPA must promulgate rules within 1 year amending renewable resource and conservation plan requirements for its long-term firm power customers to include provisions calling for customer utilities to implement IRP within 3 years. WAPA is to provide technical assistance to customer utilities in developing IRP programs and review the plans prepared. Definitions of IRP, system costs, and least-cost resource options in the act require evaluation of supply and demand resources in a consistent, integrated manner to select options that minimize life-cycle costs including adverse environmental effects, and give priority to energy efficiency and renewable energy to the extent practicable. Failure to submit a plan or to comply with an approved plan will trigger surcharges of from 10 to 30 percent on purchases from WAPA. Alternatively, the Administrator can curtail power allocations by 10 percent until a customer complies. No penalties will be imposed if the Administrator determines that the utility has made a good faith effort to comply. Several provisions were added in recognition of the diversity of Western's customer utilities and to avoid duplication of requirements by State regulators or others. For example, two or more utilities can collaborate to submit joint IRP plans, and plans prepared under State or other IRP programs can also be accepted by WAPA.

Southwestern Power Administration

SWPA operates as the marketing agent for Federal hydroelectric power in a six-State area.[102] It was created in 1943 by the Secretary of the Interior for the transmission and sale of electric power from certain Corps of Engineers reservoir projects and assumed responsibilities under the Flood Control Act in 1944. SWPA has been under the direction of DOE since 1977.[103] Under various authorizing legislation, SWPA'S mandate is to market Federal hydropower to encourage the most widespread and economical use at the lowest possible cost, consistent with sound business principles.[104] SWPA supplements its power supplies with power purchased from public and private utilities to meet its contractual obligations. By law, publicly-owned utilities and cooperatives receive preference in power allocations. SWPA operates and maintains some 1,380 miles of transmission lines, 24 substations and switching stations, and 39 radio and microwave stations.[105] With these facilities, SWPA sells power wholesale to public utilities and cooperatives. SWPA is also responsible for scheduling and

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101 *Western Area Power Administration Update*, June 1992, pp. 1-2.

102 The States are Arkansas, Kansas, Louisiana, Missouri, Oklahoma, and Texas.

103 Department of Energy Organization Act, 91 Stat. 578, 42 U.S.C. 7152.

104 16 U.S.C. 825s.

105 U.S. *Government Manual* 1991/92, supra note 11, p. 283.

dispatching power, negotiating power sales contracts and constructing facilities, and participating in comprehensive planning of water resource development. Rates to its customers are adjusted to ensure full recovery of Federal investment.

According to a GAO report, SWPA sought to clarify its authority to require its customers to adopt DSM programs. DOE's Office of Conservation and Renewable Energy responded that ''SWPA has implicit authority under Section 5 of the Flood Control Act of 1944 to encourage conservation programs among customer utilities, and could propose in the absence of more explicit legislative authority, conservation programs through rule-making actions, subject to departmental approval. ' [106] DOE noted, however, that any attempts to implement programs could be subject to challenge in the courts.

SWPA supports various activities to encourage DSM and IRP. It maintains a program to loan energy-efficient equipment for its customers and provides technical assistance through workshops. Together with WAPA and others, it is jointly funding a project to prepare detailed IRP manuals to assist utilities in developing and implanting IRP programs.

Southeastern Power Administration

SEPA was created in 1950 by the Secretary of the Interior to carry out the functions of the Flood Control Act.[107] SEPA operates under the general mandate to encourage widespread use of electricity from Federal hydro projects at the lowest possible rates consistent with sound business principles and to give preference to publicly-owned utilities. Responsibilities include providing for the transmission and sale of surplus electric power generated at Corps of Engineers reservoir projects in a 10-State area of the Southeast.[108] SEPA does not own or operate any transmission facilities of its own; transmission lines owned by other utilities deliver the power. SEPA markets power from a total of 22 Federal multipurpose water projects, giving preference to public bodies and cooperatives. Using the region's large private utilities, SEPA negotiates wheeling and pooling arrangements to provide firm power to its customers. Rates charged to customers are adjusted to ensure that the Federal Government recovers its investment plus interest. Oversight of SEPA programs was transferred to the newly created DOE in 1977.[109]

SEPA does not have any explicit statutory mandate to promote DSM, IRP, or regional cooperation in power planning. However, like SWPA its authorizing legislation has been interpreted to support initiatives to promote energy conservation.[110] Southeastern is offering energy-efficient training programs for cooperatives and municipalities.

Alaska Power Administration

APA is responsible for the operation and maintenance of the Snettisham and Eklutna hydroelectric generating projects in Alaska and markets the power produced. APA also operates associated transmission systems serving Anchorage and Juneau.

For the past several years, DOE has been negotiating with the State of Alaska to sell the assets. The Alaska Power Administration Sale Authorization Act submitted to Congress by DOE

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106 General Accounting Office, "Utility Demand-side Management Programs Can Reduce Electricity Use," GAO/RCED-92-13, October 1991, p. 37.

10753 Stat. 890.

108 The States include Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia.

109 Department of Energy Organization Act of 1977, Public Law 9s-91, as amended, sec.302, 42 U.S.C.7152.

110 General Accounting Office, ''Utility Demand-Side Management Programs Can Reduce Electricity Use," GAO/RCED-92-13, October 1991, p. 37,

in June 1992 would sell the 78-MW Snettisham project to the Alaska Energy Authority and the 30-MW Eklutna project to three electric power utilities serving the Anchorage area. Over 90 percent of the State's electricity is now provided by nonfederal generating sources leading DOE to conclude that there is no longer a need for APA.[111]

APA has been assisting a customer utility with evaluating and testing demand as well as supply--side energy efficiency measures.

RURAL ELECTRIFICATION ADMINISTRATION

REA is a credit agency within the U.S. Department of Agriculture (USDA) that makes loans and loan guarantees to finance the construction and improvement of electric power systems to serve the needs of rural areas. The agency was established during the New Deal to extend electric service to remote areas not served by private utilities.[112] REA loans enabled borrowers to form electric cooperatives to build power lines for transmission and distribution of wholesale power purchased from private utilities or from Federal hydroelectric facilities. REA also guarantees loans made by others, and approves security arrangements that permit borrowers to obtain financing from other lenders without a guarantee.[113] Since the 1960S, REA has made loans for the construction of generating and transmission facilities "to protect the security and effectiveness of REA-financed systems. ' '[114] REA is also authorized to provide technical assistance to its borrowers to aid system development and to protect loan security. In 1990, there were 897 cooperative borrowers; 838 were distribution borrowers and the remaining 56 were generation and transmission cooperatives. (See table 7-12.)

Loans are made through the Rural Electrification and Telephone Revolving Fund created in 1973. By law, REA loans are made at a 5 percent interest rate and as low as 2 percent for extreme hardship, and for years REA rates were below the prevailing market rates for direct borrowing.[115] REA requires most borrowers to obtain 30 percent of their financial needs from outside sources to comply with a statutory requirement added in 1973 directing REA to encourage rural electric systems to enhance their ability to obtain financing from their own financial organizations or other sources.[116] Many cooperatives obtain this financing from the National Rural Utilities Cooperative Finance Corporation and the Bank for Cooperatives.

REA loan guarantees have been made primarily to large-scale facilities and are subject to the same requirements as direct loans. Interest rates on guaranteed loans are established at rates set by the borrower and the lender with REA concurrence. Since 1974, the Federal Financing Bank (FFB) has purchased obligations guaranteed by the REA, although all borrower dealings were with REA. A 1981 amendment to the Rural Electrification Act required the FFB to make loans under an agency guarantee if requested to

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111 "Federal Power Projects in Alaska Will Be Sold to Private Owners," *Inside Energy with Federal Lands*, June 29, 1992, p. 7. Proposals for privatizing the PMAs have been circulating for more than a decade through both the Reagan and Bush Administrations and have met stiff resistance from members of Congress and the PMAs customers. Of all the proposals, the one to sell APA has been the least controversial.

112 Rural Electrification Act of 1936, 7 U.S.C. 901-950b.

113 *U.S. Government Manual 1991192*, supra note 11, p. 114.

114 *Financial Statistics of Selected Publicly Owned Electric Utilities 1990*, supra note 59, p. 347.

115 *U.S. Government Manual 1991/92*, supra note 11, p. 114. Interest rates on the direct borrowing have historically been several points higher than the 5 percent maximum charged on loans. More REA funds have been lent out than repaid since 1973 and the deficit is made up by direct borrowing and sale of Certificates of Beneficial Ownership to the Federal Financing Bank in the U.S. Treasury.

116 "...that rural electric and telephone systems should be encouraged and assisted in developing their resources and ability to achieve the financial strength needed to enable them to satisfy credit needs from their own financial organizations and other sources at reasonable rates and terms consistent with the loan's applicant's ability to pay. ' Ibid.

do so by a utility who held a guarantee. Now, most REA-guaranteed loans are made by the FFB.[117]

In January 1992, REA issued a final rule revising the requirements for general and preloan procedures for insured and guaranteed electric loans.[118] These regulations were in large part a recodification of many of REA's existing policies and rules. REA loan requirements contain several provisions that encourage IRP and utility energy efficiency programs. All borrowers are encouraged to promote energy efficiency and load management to improve system load factors, reduce losses, and reduce the need for new generating capacity.[119] Most REA borrowers must prepare and maintain power requirements studies (PRS) and construction work plans (CWP) for review and approval by REA. Together the PRS and CWP require a borrower to establish a comprehensive and integrated planning system to guide operations and resource acquisition, effectively an IRP process.[120] To qualify for new loans, a borrower must demonstrate to REA that it has explored all practical and feasible alternatives to adding new capacity, including improved load management, energy conservation, and power purchases from other suppliers, including independent power producers. REA believes that the rule changes are expected to lead to a more effective power planning process.

Table 7-1 l—Rural Electrification Administration Cooperative Distributor Borrowers: Consumers, Sales, and Operating Revenue 1990

Number of consumers on December 31	
Residential	9,732,694
Commercial and industrial	915,363
Other sales to ultimate consumers	153,324
Total ultimate consumers	10,801,381
Sales for resale	203
Total consumers	10,801,584
Sales for the year (mWh)	
Residential	111,776,522
Commercial and industrial	65,794,723
Other sales to ultimate consumers	5,814,007
Total sales to ultimate consumers	183,385,252
Sales for resale	3,095,647
Total Sales	186,480,899
Operating revenues for the year ($000)	
Residential	8,403,275
Commercial and industrial	3,806,505
Other sales to ultimate consumers	374,504
Total sales to ultimate consumers	12,684,284
Sales for resale	121,008
Total revenue from sales of electricity	12,805,290
Other operating revenues	196,248
Total operating revenues	13,001,538

NOTES: Totals may not equal sum of components because of independent rounding. This table does not included in 1990 the 56 Power Supply Borrowers. Data for 1990 represents 838 Distribution Borrowers.

SOURCE: Office of Technology Assessment, 1993, based on **data from U.S. Department of Energy, Energy Information Administration, *Fhancia/Stat/sties of Selected Publicly Owned Electric Utilities 1990, DOE/EIA-0437(90)/2* (Washington, DC: U.S. Government Printing Office, February 1992), table A4, p. 349.**

FEDERAL ENERGY REGULATORY COMMISSION

FERC regulates prices, terms, and conditions of wholesale power sales and rates involving privately-owned power companies and of transmission of electricity at wholesale.[121] With the growth of wholesale transactions in the utility sector, FERC now regulates about one-third of electricity sold. FERC also approves rates for power sold and transported by the five power marketing administrations.

There have been suggestions that FERC could as a matter of policy under its existing broad authority over wholesale transactions require utilities selling power at wholesale to engage in IRP and offer DSM programs and require sellers to demonstrate that a proposed sale is consistent

117 Ibid.

118 57 Fed. Reg. 1,0441,068, Jan. 9, 1992.

119 7 CFR 1710.118, 57 Fed. Reg. 1061, Jan. 9, 1992.

120 7 CFR 17 10.200-1710.206 and 7 CFR 1710.2501710.254, 57 Fed. Reg. 1062-1066, Jan. 9, 1992.

121 16 U.S.C. 791a, 824a, and 824d. FERC authority is discussed in ch. 3 of this report.

with the buyer's approved IRP program. For example, President Bush's National Energy Strategy suggests FERC promote utilities' use of IRP through its rulemaking authority and its regulatory powers.[122] To open discussions, from 1991 to 1992 FERC held several workshops with State regulators to explore IRP, transmission, and market-based pricing issues. However, FERC has not yet defined any potential role in promoting IRP or DSM, nor has it been actively pursuing issues related to energy efficiency or least-cost planning for utilities engaged in wholesale power sales and transmission.

ENCOURAGING VOLUNTARY EFFORTS

In recent years, there has been growing interest in mechanisms that the Federal Government can use to provide various incentives to utilities and others to implement energy efficiency programs voluntarily. These efforts are in addition to, and not a replacement for, the variety of programs that establish more or less mandatory requirements for utilities or that offer technical and financial assistance to aid utility energy efficiency and planning. Examples of this approach include the "green programs" in EPA's office of climate change, the conservation and renewable energy emissions allowances reserve under the Clean Air Act Amendments, and energy efficiency awards programs for Federal facility managers.

EPA's Green Programs

The EPA Office of Atmospheric Programs has embarked on several initiatives designed to encourage the voluntary adoption of energy-efficient and pollution-reducing technologies as part of EPA's global climate change activities. EPA's green programs marshall the agency's stores of good will, credibility, and visibility in combination with market forces to attract commercial, industrial, utility, and government participants to cooperative efforts to overcome some of the barriers that have hampered investment in energy-efficient and environmentally-friendly technologies. Among the goals most of these programs share are:

- Changing corporate and consumer purchasing patterns to favor efficient products through information availability and exhortation;[123]
- Creating a market pull and lower prices for efficient products through aggregated purchases (group buys) and changes in long-term procurement patterns;
- Encouraging utility rate reforms to reward investments in energy efficiency;
- Expanding international markets for high-productivity and energy-efficient products; and
- Changing industrial practices and processes to reduce emissions of greenhouse gases.[124]

The **Green Lights Program** is the largest and most prominent of EPA's green programs. It was established in 1991 as a voluntary program designed to encourage U.S. corporations to retrofit their buildings with cost-effective lighting measures. According to EPA estimates, commercial and industrial lighting amounts to some 20 percent of total electricity consumption. By reducing energy use from lighting, EPA anticipates a lower amount of pollutants associated with fuels from electricity generation. In particular, EPA estimates that more efficient lighting could lower greenhouse gas emissions by 22 to 55 million metric tonnes of carbon. EPA is relying on the lure of cost-savings, and higher profits, and the promise of technical assistance to attract participants.

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122 *National Energy Strategy: Powerful Ideas for America*, supra note 3, p. 7.

123 Eileen Claussen, Director, Office of Atmospheric and Indoor Air Programs, Office of Air and Radiation, U.S. Environmental Protection Agency, testimony before the Joint Economic Committee, 102d Cong., 2d sess., April 28, 1992, p. 5.

124 John Hoffman, Office of Atmospheric Programs, Environmental Protection Agency, briefing for congressional staff sponsored by the Environmental and Energy Study Institute, Aug. 7, 1992.

As of May 1993, more than 900 corporations, and organizations have joined the program.

The over 450 "partners" have each signed a "memorandum of understanding' '(MOU) with EPA committing to survey their U.S. facilities and install all profitable lighting retrofits in 90 percent of total square footage within 5 years. In return, EPA offers encouragement, information, product testing, technical assistance, and public recognition to organizations. Green Lights helps partners overcome barriers to energy efficiency by providing technical assistance as well as information on products and financing. EPA-provided software and training help businesses identify the retrofit options that maximize savings. The National Lighting Product Information Program provides reliable information about lighting technologies and options to corporations concerned about product claims or potential employee response to lighting changes. EPA also supports participants through a registry of utility rebates, energy service companies, banks and leasing companies providing financing.

The over 350 Green Lights "allies" include lighting manufacturers and energy management companies, and electric utilities that agree to educate customers about energy efficient lighting. EPA's utility ally program promotes cooperation in publicizing the many benefits of energy efficient lighting, EPA invites utilities to sign a MOU under which the utility agrees to:

- complete profitable lighting retrofits in 90 percent of the square footage of its own facilities;
- assist EPA in marketing Green Lights and energy-efficient technologies to its industrial and commercial customers;
- participate in the ongoing **lighting product** and employee information programs; and
- assist EPA in documenting savings from lighting upgrades in their service area.

In return EPA agrees to:

U.S. ENVIRONMENTAL PROTECTION AGENCY

- provide tools and methodologies for pollution prevention calculations, energy savings, dollar savings, and lighting upgrade designs;
- provide materials to help the utility's efforts to promote high quality energy-efficient lighting; and
- enhance the energy-efficient lighting market by working with the lighting industry to improve consumer confidence in product availability, quality, and value.

EPA also promises utilities that participation in Green Lights will enhance their corporate image by showing their concern and involvement in environmental protection. Green Lights also offers utilities support for their own DSM objectives and access to a national network providing a timely exchange of information on program effectiveness, experience, and decision-support tools.[125]

EPA has also enrolled the assistance of various trade, conservation, and professional associations as Green Lights endorsers.

Green Lights builds on the realization that protecting the environment has become an attractive product marketing angle. As an additional incentive, EPA authorizes participating compa-

125 "U.S. EPA Green Lights, Utility Ally Program, " flyer, April 1992.

nies and allies to use the EPA Green Lights logo in advertising and promotional materials. EPA also displays corporate logos of participants in its own publicity and recruitment materials and advertising.

As of May 1993, some 2300 Green Lights projects encompassing over 220,000 square feet were in the process of being surveyed and retrofitted. Approximately, 40,000 square feet of retrofits were complete. EPA estimates that if all participants enrolled as of May 1993 complete the upgrading of their facilities, more than 3.3 billion square feet will have been retrofitted.[126] Annual savings on participants' electric bills will total over $1 billion annually, according to EPA, and more than $6 billion in new powerplant investments will be avoided. Lighting upgrades will prevent emission of some 21,378 million pounds of carbon dioxide annually-the equivalent of removing over 2.1 million cars from the roads. Additionally, EPA estimates that program investments in lighting upgrades will create some 66,000 job years.

Because the agreements are voluntary, there are no enforcement mechanisms under which EPA can compel participants to fulfill their promises. EPA, however, is monitoring the pace of installations and has indicated that if participants fail to follow through, EPA will bring added pressure on them to do so.

Green Lights advances several objectives. First, it helps overcome informational barriers to installing more efficient lighting through advertising and technical assistance provided by EPA. Second, by expanding the pool of customers for energy-efficient lighting services, EPA is helping to create a market pull for efficient products and services. Third, this market expansion could eventually help lower prices of these products through improved economies of scale in manufacturing and distribution. Lastly, the program can help lower first-cost barriers to participation by collaborating with various utility and government programs that provide loans and rebates for installing efficient lighting.

EPA is also creating a partner lighting program for the Federal Government, entitled Federal Green Lights. A similar program dubbed Green Buildings, which will launch a cooperative effort to incorporate energy-saving construction and building, ventilation, and air conditioning technologies in commercial buildings, is under development.

Building on the success of Green Lights, EPA has launched an energy efficiency labeling program designed to sell consumers and manufacturers on the advantages of energy efficient products. The first application, the EPA Energy Star Computers program is a voluntary partnership with EPA and the computer equipment manufacturers to manufacture and market computer equipment incorporating energy-saving technologies. In return the participants gain the right to use the EPA pollution preventer logo in marketing and advertising. For more on this program see chapter 4. Other cooperative efforts under consideration are showerheads, residential room air conditioners, and cooking equipment.

Another innovative initiative is the "Golden Carrot" program-a consortium of 25 utilities that is sponsoring a contest for the development and production of a super-efficient regrigerator that is free of ozone-depleting CFCS. The winning manufacturer will receive a bonus of $28 million and orders to deliver up to 300,000 units to participating utilities for use in their DSM programs. The award will be announced in summer 1993. For more on the Super Efficient Refrigerator Program (SERP), see chapter 4.

Conservation and Renewable Energy Reserve

The Clean Air Act Amendments of 1990 acid rain title provides for allocation of up to 300,000

126 John S. Hoffman, Director, Global Change Division, Office of Air and Radiation Programs, U.S. Environmental Protection Agency, presentation to congressional staff, June 3, 1993.

sulfur dioxide (SO^2) emissions allowances to a conservation and renewable energy reserve.[127] The EPA Administrator can make allowances from the reserve available to eligible utilities that have reduced SO^2 emissions by installing qualified cost-effective conservation measures or renewable energy generation after January 1, 1992. These allowances will be made available beginning January 1, 1995, and can be used for complying with the acid rain emissions limitations. The amendments set a number of requirements for eligibility. The utility must adopt a least-cost planning process that evaluates a full range of resources including conservation and renewable energy sources to meet future demand at the lowest system cost. The plan must be approved by the utility's State regulatory authority and the qualifying measures must be consistent with the plan. For conservation measures, State-regulated utilities must obtain DOE certification that State regulators have adopted rate provisions that assure that the utility's net income after installing the qualified conservation measures is at least as high as it would have been without the energy efficiency measures.[128]

DOE certification of this "net income neutrality status' for DSM investments involves review of the regulatory treatment of conservation program expenditures, such as decoupling adjustments, lost revenues, and performance incentives.[129] DOE certification must be obtained before the utility implements the qualified conservation measure. DOE is processing certifications on a "first-come, first-served" basis, and must also certify that the utility is actually implementing the conservation measures it developed in qualifying for the emission allowances.[130]

Federal Energy Efficiency Awards

Two awards programs administered by the Federal Government recognize Federal employees and/or facilities for energy efficiency achievements. The first is the Federal Energy Efficiency Awards at FEMP, and the other is the awards program at the U.S. Department of Army.

Each year the FEMP awards 15 certificates of achievement to individuals and facilities for exemplary performance in promoting conservation in Federal facilities.[131] The award does not include any financial compensation, but it does provide recognition and favorable publicity for the winning individuals and organizations.

The U.S. Army in Europe (USAREUR) has an award component in its energy program. The awards recognize both small and large facilities for saving energy in a variety of ways. The strenuous review of the nominees includes scoring on elements like efficiency measures, short-term measures, long term plans, numeric performance, mobility fuel savings, special considerations, and a day-long inspection of finalists. The value of the program is multifold. In addition to showing the interest and commitment of USAREUR, it creates publicity for energy programs, recognizes deserving communities, and reduces energy use. Prior to FY 1991, the award included a monetary component: $500,000 for first place, and a total $1.2 million in cash awards to be used on a ''welfare, morale, and recreation' item for the winning communities.[132]

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127 Clean Air Act Amendments of 1990, Public Law 101-549, title IV, sec. 404, 104 Stat. 2592-2605, Nov. 15, 1990, 42 U.S.C. 7651b.

121742 U.S.C. 404(f)(2) @)(iii).

129 Diane B. Pirkey, Manager, DSM Programs, Office of Utility Technologies, Energy Efficiency and Renewable Energy, U.S. Department of Energy, "Demand-Side Management Activities of the U.S. Department of Energy-A National Perspective," Mar. 25, 1993, p. 6.

130 Ibid.

131 U.S. Congress, Office of Technology Assessment, Energy *Efficiency* in *the Federal Government: Government by Good Example?*, *OTA-E-492,* (Washington DC, U.S. Government Printing Office, May 1991) p. 27.

132 Ibid, p. 97.

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