

# **DOE's Federal Industrial Facilities Initiative: A Collaborative Partnership Between the Federal Energy Management and Industrial Technologies Programs**

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## **ABSTRACT**

The Industrial Facilities Initiative (IFI) is a new effort by the U.S. Department of Energy's (DOE's) Federal Energy Management Program (FEMP) to support federal agencies' efforts to meet their energy goals. To comply with Executive Order 13123, federal industrial facilities must achieve reductions in their energy intensity of 20% by 2005 and 25% by 2010 (relative to 1990). Instead of developing a new program to address the needs of the government's energy-intensive industrial facilities, FEMP established a partnership with DOE's Industrial Technologies Program (ITP). ITP's BestPractices and Industrial Assessment Center (IAC) programs have been widely recognized for their expertise and effectiveness in transferring energy- and cost-saving techniques and practices to the private sector. The BestPractices Program is home to Allied Partnerships and DOE's popular software tools including MotorMaster and the Pump System Assessment Tool (PSAT). The IAC Program has been providing energy assessments to the private sector since the late 1970s and has conducted more than 11,000 assessments. FEMP is now bringing the technical resources of ITP's programs to federal industrial facilities to help them identify opportunities to improve their operations and meet their energy goals. Through FEMP's initiative, IAC teams provide generalized industrial energy assessments; BestPractices experts provide system-specific assessments focused on compressed air, steam, or pumping systems; and experts from both programs provide energy management training tailored to federal industrial facilities. Since the initiative was announced in FY 2001, its services have been in high demand. A team at Oak Ridge National Laboratory, where FEMP's Industrial Facilities Initiative is based, coordinates screening of assistance requests, gathers and assigns IAC and BestPractices teams to perform assessments, coordinates the DOE Regional Offices' interaction with customers, and follows up on results. The IFI has provided assessments at Department of Defense, Department of the Treasury, U.S. Postal Service, National Aeronautics and Space Administration, and DOE sites; IFI teams also supported FEMP activities in California during the energy crisis of 2001. Reductions of more than \$1 million in energy costs have been identified at two Treasury sites and are currently being implemented.

## **Introduction**

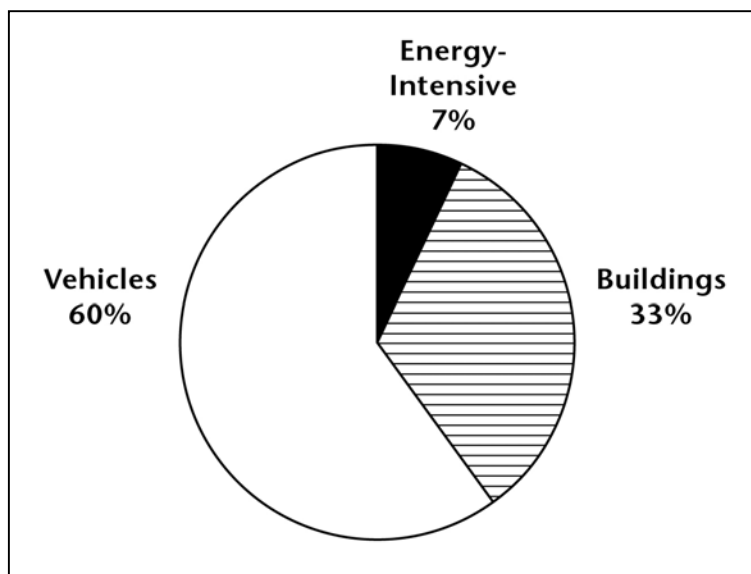
The Industrial Facilities Initiative (IFI) is a new effort by the Federal Energy Management Program (FEMP) to support federal agencies' efforts to meet mandated goals to reduce energy consumption in federal industrial facilities. Instead of developing a new program to address the needs of the federal government's energy-intensive industrial facilities, FEMP established a partnership with the Department of Energy's (DOE's)

Industrial Technologies Program (ITP). ITP's BestPractices and Industrial Assessment Center (IAC) programs have been widely recognized for their expertise and effectiveness in transferring energy- and cost-saving techniques and practices to the private sector. Congressional appropriations to ITP limit these programs to serving industrial customers based solely in the private sector. The partnership between FEMP and ITP allows FEMP to purchase ITP services for its own federal customers and eliminates the need to establish a redundant program for the federal sector. This paper discusses the format and function of this unusual partnership between ITP and FEMP, as well as some of the clients that have benefited from the initiative.

## Background

DOE established the Federal Energy Management Program (FEMP) to work with federal agencies to identify and implement measures to reduce the cost and environmental impact of the largest energy consumer in the United States—the federal government. In 1999, federal energy consumption topped 1.01 quads (or  $1.0 \times 10^{16}$  Btu, site) at a cost of \$7.96 billion (DOE 2001). Nearly 7% of federal energy consumed occurs in energy-intensive operations, which include laboratories and industrial facilities, at a cost of \$640 million per year. Figure 1 provides a functional breakdown of energy consumption by federal sector.

**Fig. 1. Functional Breakdown of Federal Energy Consumption, FY 1999**



Source: DOE 2001

Since the late 1980s, under a series of policy and legislative mandates, federal agencies have been required to meet designated reductions in energy intensity. In the earlier years, most energy-intensive facilities (including industrial facilities with process-related energy consumption) were exempt from efficiency mandates. Executive Orders 12092 and 13123 closed the loophole for exemption of industrial facilities and established efficiency goals for agencies operating these facilities. Under Executive Order 13123 and per 10 CFR requirements and definition of life cycle cost effectiveness, federal agencies must implement

life-cycle cost-effective measures to reduce the energy intensity in their facilities by 20% (relative to 1990) by 2005 and 25% by 2010. Only the following facilities are now exempt:

- facilities where the implementation of efficiency measures is either technically infeasible or savings would be outweighed by an overwhelming proportion of process-dedicated energy,
- parking garages,
- buildings either entering or leaving the inventory during the reporting year, and
- federal vehicles (ships, airplanes) that consume utility-provided energy while docked or parked.

In response to these efficiency goals, FEMP established the IFI to provide technical assistance to agencies with industrial operations.<sup>1</sup> Faced with a modest level of funding and uncertainty about the demand for technical assistance for industrial sites, FEMP sought a partnership with DOE's Industrial Technologies Program (ITP, formerly known as the Office of Industrial Technologies). This partnership provides FEMP's federal customers access to ITP's technical resources including tools, assessments, experts, training, and publications from the BestPractices and Industrial Assessment Center programs. The result of this partnership has been a successful initiative that crosses program borders, avoids programmatic overlap, and delivers high-quality technical assistance to federal industrial clients at a modest cost to FEMP and at no cost to ITP.

## **Federal Industrial Customers**

In the early stages of the Industrial Facilities Initiative, FEMP performed a characterization study of federal industrial sites using energy data provided annually by agencies (as mandated by Executive Order and by Congress under the National Energy Conservation Policy Act as amended by the Energy Policy Act of 1992), and information from its institutional knowledge of federal customers. Figure 2 illustrates annual energy consumption in energy-intensive facilities in 1999 (DOE 2001). In the year that this information was collected, agency reports did not distinguish industrial facilities from other energy-intensive facilities; however, the report indicates that most of the energy consumed was by process operations in industrial facilities.

While Figure 2 indicates that industrial energy consumption by the Department of Defense far outweighs that by other agencies, FEMP believes that the processes and operations at many agency industrial sites could benefit from the technical expertise available from the Industrial Technologies Program. More common industrial activities, by agency, are:

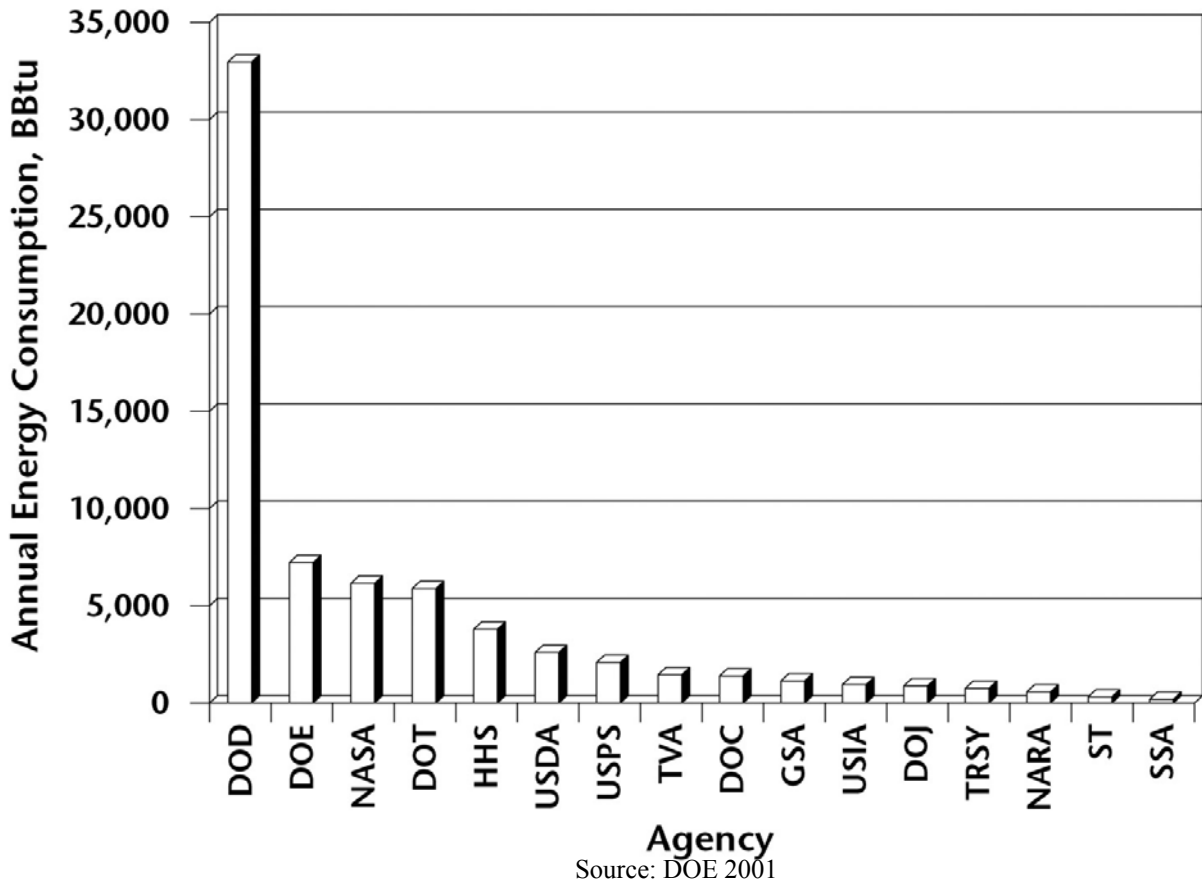
- *Department of Defense (DoD)*: maintenance, explosive production, metal processing and loading, assembly and packing

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<sup>1</sup> Industrial facilities are defined in Executive Order 13123 as "any fixed equipment, building, or complex for production, manufacturing, or other processes that uses large amounts of capital equipment in connection with, or as part of, any process or system, and within which the majority of energy use is not devoted to the heating, cooling, lighting, ventilation, or to service the water heating energy load requirements of the facility."

- *DOE*: weapons production, R&D facilities (reactors and accelerators)
- *National Aeronautics and Space Administration (NASA)*: assembly, repair, and upgrade facilities
- *U.S. Postal Service (USPS)*: processing and distribution, bulk mail handling

**Fig. 2. Annual Energy Consumption in Energy-Intensive Operations (1999 data)**



- *Department of Treasury*: printing of currency, production of coins

### **Collaboration and Coordination**

Technical assistance, outreach, and alternative financing assistance comprise the primary services FEMP offers its federal customers. Through Technical Assistance Program efforts like the IFI, FEMP helps federal energy managers identify, design, and implement new construction and facility improvement projects. Energy and water assessments, training, design reviews, publications, software, and consulting services are all available to federal customers through FEMP's Technical Assistance Program. However, most of FEMP's technical resources have typically focused on standard buildings and equipment or

laboratories with little expertise offered in the industrial arena. For this reason, FEMP turned to the Industrial Technologies Program for help.

In similar format to FEMP's Technical Assistance Program, ITP offers technical assistance to industrial customers in the *private* sector. Through ITP's BestPractices and IAC programs, the private sector has access to generalized industrial energy, waste, and productivity assessments, targeted system (compressed air, steam, pumping) assessments, and technical software and publications.

The IAC Program has been providing energy assessments to the private sector since the late 1970s and has conducted more than 11,000 assessments. IACs are located at engineering colleges across the United States, and generalized industrial assessments are provided by teams of seasoned engineering students led by qualified engineering faculty. The program supports a database of assessments and assessment recommendations that documents energy savings actually implemented by IAC clients. Currently, average implemented cost savings per assessment conducted in the private sector are nearly \$70,000 per year, with simple paybacks of less than 1 to 2 years.

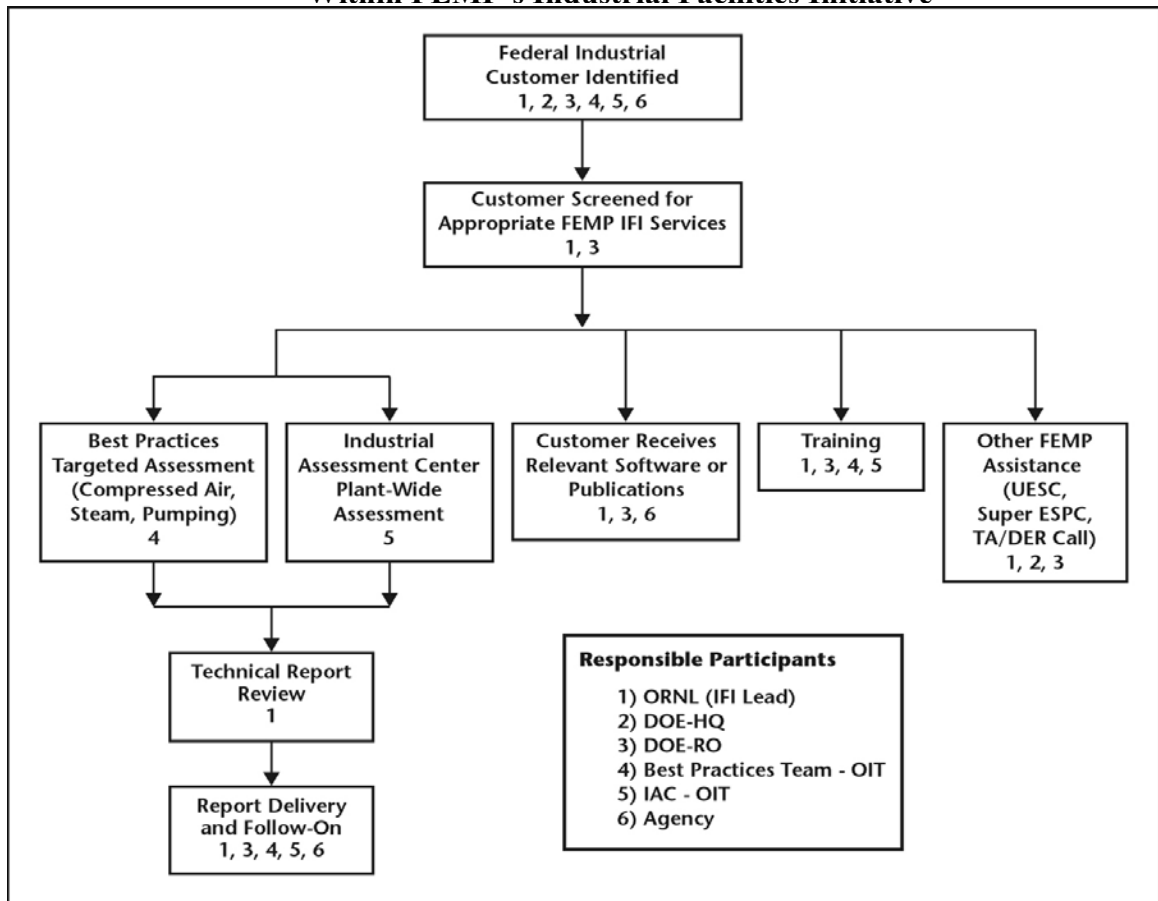
The BestPractices program is the originator of popular software tools and training. BestPractices tools operate at two levels. The first level is the system opportunity assessment level. Here, the intent is to perform a screening analysis to identify where in the system significant opportunities exist for energy-efficiency improvements to estimate the potential magnitude of the savings. These tools include the Pump System Assessment Tool, the Steam System Assessment Tool, the Process Heating Assessment and Survey Tool, and AirMaster. (The Fan System Assessment Tool is currently under development and will be available in late 2003.) Component-level tools include MotorMaster and 3E+. These tools are designed to help select energy-efficient components. BestPractices offers training based on these tools to assist companies that wish to incorporate the BestPractices tools and techniques in their energy management activities. The one-day end-user training sessions review optimization principles for the system of interest and introduce the BestPractices tool(s) that can aid in system opportunity analysis. The multi-day specialist training is designed for in-depth exploration of the uses and application of the tool in an industrial environment.

Bringing ITP's technical resources to FEMP's federal customers on a limited budget requires careful coordination. Oak Ridge National Laboratory (ORNL) was selected to lead this effort because of its history of experience with FEMP and with ITP's BestPractices and IAC programs. The ORNL FEMP team works with DOE Headquarters, DOE Regional Offices, federal agencies, and IACs to market and identify training and assessment opportunities for federal industrial customers. ORNL works with potential customers to identify their needs for assistance and match those needs with the technical resources available from the BestPractices or IAC programs. Following careful evaluation of federal customer's needs and potential for actual implementation, the ORNL FEMP team works with ORNL's BestPractices team and IAC Field Management (located at Rutgers University) to procure appropriate consultants, assessment teams, or trainers. In general, services provided include targeted system assessments, generalized industrial assessments, and training. Table 1 is a complete listing of the services available to IFI's federal industrial customers. Note the FEMP covers all costs of all services provided to federal industrial customers, and ITP incurs no new costs. Figure 3 illustrates this process.

**Table 1. Services Available to FEMP’s Industrial Facilities Customers**

Service	Technical Resource	Funding Source
Generalized industrial energy, waste, productivity assessments	Industrial Assessment Centers	FEMP
Energy assessments of steam, compressed air, pumping systems	BestPractices	FEMP
Technical publications	FEMP/BestPractices/IAC	FEMP/ITP <sup>a</sup>
Software (BLCC, FRESA, MotorMaster, PSAT, SSAT, AirMaster, Steam System Scoping Tool, etc.)	FEMP/BestPractices	FEMP/ITP <sup>a</sup>
Follow-up and financing assistance	DOE Regional Offices	FEMP

**Fig. 3. Flowchart of Services and Responsibilities Within FEMP’s Industrial Facilities Initiative**



<sup>a</sup>ITP funds publications and software, which are available to the public at large. Federal use of these tools comes without additional expense to ITP.

ORNL’s coordination of assessment activities occurs from project/customer identification, through report review, to customer follow-up and interaction with the DOE Regional Office. In the case of assessments, ORNL works with BestPractices and IAC teams to address differences between the private sector and the federal agency’s approach to energy projects, and any specific circumstances that the agency is experiencing that should be known by assessment teams when identifying energy and water savings opportunities. The assessment teams must be mindful of these differences (listed in Table 2). In addition to a

technical review of assessment reports, ORNL provides feedback to the BestPractices and IAC teams on potential opportunities for follow-on assistance (i.e., additional technical assistance, alternative financing assistance) that should be incorporated into the assessment reports. Assessment teams deliver final reports to the customers, often returning to the site for a presentation of results. ORNL sends final reports to the FEMP representatives in the DOE Regional Offices for follow-up support. Often the Regional Office representatives accompany assessment teams to the site for report presentations.

**Table 2. Typical Differences Between Private Sector and Federal Industrial Customers**

	<b>Private-Sector Industrial Customers</b>	<b>Federal Industrial Customers</b>
Facility size	100,000 – 1,000,000 ft <sup>2</sup>	100,000 – 3,000,000 ft <sup>2</sup> often spread out over several buildings on a base or site
Predominant factors driving implementation decisions	2-year simple payback, annual cost savings	Up to 12-year simple paybacks, life-cycle cost-effective, annual cost savings, federal mandates to reduce consumption, environmental stewardship
Project cost ceilings	< \$ 1 million	> \$1 million
Level of customer’s energy advocacy	Low to medium	Medium to high
Availability of energy expert on customer staff	Unlikely to moderately likely	Very likely
Financing/funding opportunities for projects	Corporate funds, third-party financing (utility, financial institution, ESCO)	Area-wide GSA agreements, UESC, ESPC, Super ESPC, appropriations, operating budgets

ESCO=energy service company

GSA=General Services Administration

ESPC=energy savings performance contract

UESC=utility energy service contract

### **IFI Activities, FYs 2001 and 2002**

FEMP’s IFI began in mid-FY 2001. During this time, the program has touched 5 agencies with 14 assessments and 2 training sessions. Participating agencies include the Departments of Treasury, Energy, and Defense; the USPS; and NASA. Four of the five agencies are return customers.

Treasury clients include the Bureau of Engraving and Printing (BEP), and the U.S. Mint. The Bureau of Engraving and Printing is responsible for the production of all U.S. currency with sites located in Fort Worth, Texas, and Washington, D.C. The D.C. BEP facility received an IFI assessment in March 2001. IAC teams from West Virginia University and University of Dayton were accompanied by a team of BestPractices steam experts. Annual energy costs for the 1.75 million-ft<sup>2</sup> facility were \$4.9 million, and annual site energy consumption was 341,902 MMBtu. Although the team spent only 2 days onsite, they identified a reduction in energy cost of more than \$700,000 (15% reduction) and 46,000 MMBtu in site energy savings (13% reduction), with implementation costs topping \$500,000. Follow-up with the BEP indicated that in one year following the assessment, the BEP had implemented lighting, steam, and compressed air recommendations with a savings of 24,000 MMBtu/year and \$286,000 per year, and plans were in place to continue implementation of most remaining assessment recommendations.

The U.S. Mint is another example of a satisfied customer—management requested and received three IAC assessments and has participated in IAC energy manager training.

Assessments were conducted in the San Francisco, Denver, and most recently, the Philadelphia facilities. These assessments were conducted by IACs from San Francisco State, Colorado State, and the University of Massachusetts, respectively. A small group of U.S. Mint energy managers participated in a one-and-a-half day IAC workshop conducted by Rutgers University IAC. The U.S. Mint is currently implementing projects recommended during its assessments and has identified an opportunity for a graduate student from the Colorado State IAC to conduct monitoring and verification on a project analyzed in the IAC assessment report.

In the summer of 2001, the energy crisis in California prompted the Secretary of Energy to deploy FEMP assessment teams to 25 federal sites. These sites were selected based on their high level of energy consumption and willingness to take immediate action to relieve the demand on the California utility system. Through FEMP's IFI, two California-based IACs (San Francisco State University and San Diego State University) were dispatched to four federal industrial sites: the U.S. Mint, San Francisco; the USPS, San Bernardino Processing and Distribution Center; NASA Goldstone Tracking Station; and USPS, Richmond Bulk Mail Center. Within *weeks* these IAC "energy SWAT teams" conducted multi-day site visits at the industrial sites, analyzed electrical energy and demand savings opportunities, and generated detailed assessment reports. This is an excellent example of how collaboration between two DOE programs can result in efficient, streamlined delivery of services to DOE customers.

Most recently, BestPractices experts conducted compressed air and water/wastewater assessments at DOE's Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico. The facility is the world's first underground repository licensed to safely and permanently dispose of transuranic radioactive waste left from the research and production of nuclear weapons. WIPP's energy manager had tried unsuccessfully for several years to acquire funding for site audits of the compressed air system and water and wastewater facilities, but potential savings appeared small at first glance, and low-payback conservation projects rarely rate a high funding priority. The oversized and oversized compressed air and water treatment systems at WIPP were actually ripe for savings. BestPractices experts identified opportunities to reduce compressed air consumption by 60% (annual savings of \$40,000 and 3,000 MMBtu site energy) and water consumption by 54% (2.9 million gallons per year). Armed with the roadmaps provided by the assessments, the site now plans to make the recommended changes.

## **Conclusions**

In the two years since its inception, FEMP's IFI has demonstrated a successful partnership between DOE's Federal Energy Management and Industrial Technologies programs. This collaboration has allowed FEMP to help federal industrial customers meet mandated efficiency goals, at minimum cost to FEMP, using existing materials and expertise available through IFP BestPractices teams and IACs. Through this initiative, publications, software, training, and assessments widely used in the private sector by IFP customers are now available to federal industrial customers. Oak Ridge National Laboratory is assigned to coordinate all levels of IFI activities because of its experience with FEMP and ITP. The successful partnership between FEMP and ITP should be considered a model for collaborative activities and motivation for similar programs.



## References

- U.S. Department of Energy (DOE). 2001. *Annual Report to Congress on Federal Government Energy Management and Conservation Programs Fiscal Year 1999*, Federal Energy Management Program, Office of Energy Efficiency and Renewable Energy, Washington, D.C., DOE/EE-0252.