

UNITED STATES MARKUP

1. GOALS FOR EFFICIENCY IMPROVEMENT

1.1 Overall Energy Efficiency Improvement Goals

The United States has adopted the aspirational goal expressed by APEC leaders in 2007 of reducing the energy intensity of GDP 25% by 2030 (relative to 2005).

1.2 Sectoral Energy Efficiency Improvement Goals

The United States Department of Energy (DOE) has goals for the research, development and deployment (RD&D) of energy efficient technologies and practices.

1.2.1 Buildings

The energy used in residential and commercial buildings represents 40% of total US energy consumption. The Building Technologies Program (BTP) developed by the United States Department of Energy (DOE) aims to construct partnerships among industry, end users and other stakeholders to prioritize research, development and the deployment of energy efficient technologies. Innovations in energy efficiency for residential and commercial buildings, energy efficient appliances and lighting, alongside advances in renewable energy technologies could stabilize the total primary energy consumption by the buildings sector at levels well below current levels by 2025. BTP programs that are helping to reduce US energy demand include Building America, Better Buildings, Commercial Building Initiative, Commercial Building Energy Alliance, Energy Smart Schools and Hospitals, Energy Star and Home Energy Score, Energy Codes, and Appliance and Equipment Standards.

a) Residential

Building America, which is an industry-driven program, supports research to reduce energy consumption of new and existing homes. BTP will invest in whole-building strategies to reduce the energy consumption of new homes by 50% before 2020.

b) Commercial Buildings

DOE is developing integrated whole-building strategies to enable new commercial buildings to be designed, constructed, and operated to use up to 50% less energy before 2020, relative to the commercial building energy standard, ASHRAE Standard 90.1-2004. In November of 2010, U.S. Energy Secretary Steven Chu announced that \$21 million will be awarded to help reduce energy consumption in commercial buildings. The goal is to achieve 30% energy savings in existing buildings and 50% savings in new projects.

1.2.2 Other Sectoral Goals

The industry sector currently accounts for more than 30% of the energy used nationwide. To substantially reduce energy use in this sector, the DOE now focuses on the development of new manufacturing processes and materials that use half the energy currently required. DOE also establishes voluntary agreements with industrial partners to reduce energy intensity (annual energy consumption per unit of physical output) 2.5% per year over 10 years.

According to the Energy Independence and Security Act of 2007, federal government buildings are required to reduce energy intensity (energy consumption per unit area of floor space) 30% by 2015 (relative to 2005).

1.3 Action Plans for Promoting Energy Efficiency

1.3.1 The United States Strategic Approach for Promoting Energy Efficiency

a) Objectives

Invest in the RD&D of energy efficient technologies. Support programs and development of best practices relating to energy efficiency implementation.

b) Applicable sectors

Industry, buildings, vehicles, and government

c) Outline

The US government has, over decades, supported the promotion of energy efficiency through legislation, regulation and dedicated funding. Earlier emphasis, in keeping with economy-wide economic practices, has been on leveraging the market system and the self-interest of decision makers, with occasional explicit efficiency requirements in selected sectors. More recently, with greater recognition of the economic, environmental and security benefits offered by energy efficiency, there has been a series of increasingly stringent energy efficiency targets and mandates, most often expressed by sector or technology. Financial incentives and funding levels have also grown.

d) Financial resources and budget allocation

For FY2012, the EERE budget for energy efficiency R&D programs totalled \$821 million:

- Advanced Manufacturing: \$115 million
- Building Technologies: 219 million
- Federal Energy Management Program: 30 million
- Vehicle Technologies: 329 million
- Weatherization and Intergovernmental Activities: 128 million

The numbers below represent the additional funding made available for EERE's energy efficiency programs from FY2009 to FY2013 through the American Recovery and Reinvestment Act:

- USD 46.2 million for high-efficiency solid-state lighting development and manufacturing
- USD 74.64 million for advanced energy-efficiency building technologies and commercial building training programs
- USD 21.73 million for the federal energy management program
- USD 160.1 million for industrial energy efficiency projects
- USD 47.01 million for information and communication technologies
- USD 2.8 billion for energy efficiency and conservation block grants
- USD 3.1 billion for state energy program
- USD 452.04 million for better buildings
- USD 4.98 billion for weatherization assistant program
- USD 106.06 million for heavy-duty truck and passenger vehicle efficiency
- USD 298.5 million for alternative fuelled vehicles pilot grant programs
- USD 1.99 billion for advanced battery and electric drive component manufacturing grants
- USD 386.23 million for transportation electrification projects
- USD 20.3 million for small business clean energy innovation projects

1.3.2 The National Action Plan for Energy Efficiency

a) Objectives

Boost energy efficiency through actions by participating organisations to overcome barriers to energy efficiency investment

b) Applicable sectors

Utilities, industry, NGOs, private and public sectors

c) Outline

The National Action Plan for Energy Efficiency was issued by the electric and gas utility industry and State regulators who see the need to increase energy efficiency and have the ability to do so. This Action Plan, facilitated by technical assistance from the US Department of Energy and US Environmental Protection Agency, aims to create a sustainable, aggressive commitment to energy efficiency through gas and electric utilities, utility regulators, and partner organisations. Over 120 organisations, including leading electric and gas utilities, all three of their trade associations, many state regulators and governors, and the National Association of Regulatory Utility Commissioners have endorsed the Action Plan's five main recommendations and have pledged to take individual actions to carry them out.

The five main recommendations are:

- 1) Recognise energy efficiency (EE) as a high priority resource
- 2) Make a long-term commitment to implement cost-effective EE
- 3) Communicate benefits of EE
- 4) Fund programs to deliver EE
- 5) Align utility incentives with delivery of cost-effective EE.

d) Financial resources and budget allocation

Commitments by participating organisations are expressed as advocacy for priority and funding, communication/education, support for legislation, commitments to efficiency and procurement goals, and funding, among other commitments. Many of the participating organisations fund/operate energy efficiency programs within their spheres of influence.

e) Method for monitoring and measuring effects of action plans

Self-reporting by stakeholders

f) Expected results

Not quantified

g) Outputs of monitoring

Annual update describing accomplishments

h) Outcomes

The wide range of outcomes includes legislation, deployed efficiency, education, and increased funding

1.3.3 State and Local Energy Efficiency Action Network (SEE Action)**a) Objective**

To help the states to achieve cost-effective energy efficiency improvements by 2020

b) Applicable Sectors

Buildings and industry

c) Outline

The goals of the program are as follows:

- Establish real-time metering systems that enable the user to access current usage and costs of their electricity
- Assist state and local governments in the development of energy efficiency policies and programs

- Removing barriers to energy savings
- Increase the investments in energy efficiency technologies
- Expansion of residential and commercial retrofits for existing buildings
- Reduction of industrial energy intensity and increased use of combined heat and power
- Innovative financing solutions
- Strengthened building codes and compliance plans
- Innovative methods of evaluation, measurement and verification

During 2011, SEE Action established eight working groups that focus on specific energy efficiency program and policy issues. Each group represents stakeholders from across the country, including state and local governments, associations, business leaders, and non-government organizations. Each group has collaborated to produce a blueprint to guide near- and long-term goals to capture cost effective energy efficiency. These blueprints will guide implementation efforts that focus on leveraging existing measures and targeting new activities to help state and local governments achieve energy efficiency on a broad scale.

- Customer Information and Behavior Working Group will assist regulators and policymakers with considering data issues associated with energy efficiency and using customer feedback programs to help customers save energy.
- Evaluation, Measurement and Verification Working Group will provide tools and training to improve energy efficiency management by increasing the accuracy, credibility, and timeliness of evaluation, measurement, and verification results.
- Existing Commercial Buildings Working Group will engage state and local governments on model programs and policies, such as on benchmarking/disclosure.
- Industrial Energy Efficiency and Combined Heat and Power Working Group will provide guidance on model state programs and policies for industry and combined heat and power.
- Building Energy Codes Working Group will work to increase adoption of and compliance with building codes for new buildings and renovations to existing buildings.
- Financing Solutions Working Group will work to remove financing barriers to energy efficiency in the United States through improved financing tools and mechanisms such as loans, leases, and service agreements.
- Residential Building Retrofits Working Group will establish a robust, sustainable, private sector industry that provides home energy upgrade services.
- Utility Motivation and Energy Efficiency Working Group will work to implement policies that motivate utilities to support energy efficiency initiatives that target all cost-effective energy efficiency.

d) Financial resources and budget allocation

The U.S. DOE provides funding to states and local governments that promote energy efficiency savings through the development of policies and programs.

1.3.4 Advanced Manufacturing Office

a) Objectives

Reduce energy consumption per unit of output of an industrial partner by 25% over 10 years and reduce carbon emissions by 70% by 2030. This goal derives from the Energy Policy Act (EPAAct) of 2005.

b) Applicable sectors

Industry

c) Outline

The DOE supports the US energy goals for industry through two critical pathways: technology delivery and energy efficiency R&D. These pathways support immediate and long-term efforts to reduce industrial energy consumption.

Through technology delivery, DOE helps plants save energy immediately by assessing opportunities and facilitating adoption of best energy management practices and efficient new technologies. Technology delivery activities include: energy assessments, best practices, training and qualification, energy management certification, software tools, technical publications, and deployment/demonstration. In August 2011, DOE released an update to the State Incentives and Resource Database which provides access to more than 3,900 programs offered by federal and state governments, regional and nonprofit organizations, and utilities to help manufacturers identify and implement energy-saving projects. Users can quickly search for information about energy assessments, grants, rebates, loans, training and other tools by location (state, city, zip code), program sponsor, resource, industrial system, or energy type.

Energy efficiency R&D develops technologies addressing top energy saving opportunities in the industrial sector. R&D activities are divided between industry specific R&D and crosscutting R&D. Industries supported in the industry-specific R&D include aluminium, cement, chemicals, food processing, forest products, glass, metal casting, mining, refining, and steel. Crosscutting areas cover energy-intensive processes, nanomanufacturing, fuel and feedstock flexibility, sensors and automation, clean distributed energy and materials R&D. The EISA of 2007 provides grants for R&D for universities, research centers and other institutions to support eight Regional Clean Energy Application Centers.

More broadly, the United States is supporting improved industrial energy efficiency through international efforts to implement ISO energy management standard 50001 which was issued in final form in June 2011. The Global Superior Energy Performance (GSEP) initiative that was launched under the Clean Energy Ministerial supports efforts in economies to encourage widespread adoption of ISO 50001 by major energy-using industries and commercial firms. Domestically, the Superior Energy Performance initiative is supporting implementation of the ISO 50001 standard by U.S. industry and commercial building owners.

d) Financial resources and budget allocation

The Recovery Act of 2009 provided USD 256 million for industrial energy efficiency R&D projects: USD 156 million for combined heat and power, district energy systems, waste energy recovery systems and efficient industrial equipment; USD 50 million for improved energy efficiency for information and communication technology; and USD 50 million for advanced materials in support of advanced clean energy technologies and energy-intensive processes. In January of 2010, DOE announced USD 47 million to improve efficiency in the information technology and communication technology sectors. The budget for the Advanced Manufacturing Office is USD 116 million in 2012; USD 290 million is requested for 2013..

e) Method for monitoring and measuring effects of action plans

The DOE maintains databases of activities and results for a majority of industrial activities. Impacts are reported annually in a publication of results. Effects of the plan are analysed annually as required by the Government Performance and Results Act of 1993 (GPRA). This analysis includes a GPRA data call and DOE programmatic evaluations.

f) Expected results

Working with industry, DOE's Industrial Technologies Program seeks to reduce industrial energy intensity by 25% over 10 years.

g) Responsibility for monitoring

The Industrial Technologies Program

h) Outputs of monitoring

The Industrial Technologies Program releases an annual Impacts Report

i) Outcomes

Energy savings, reduction in industrial energy intensity, and newly commercialised technologies¹

1.3.5 Federal Fleet Petroleum Reduction and Alternative Fuel Use Increase

a) Objectives

Reduce petroleum consumed by Federal transport fleets in favour of alternative fuels and hybrid-electric vehicles

b) Applicable sectors

Federal transport

c) Outline

United States Federal agencies have requirements to decrease vehicle fleet petroleum consumption 2% annually and increase vehicle fleet alternative fuel use 10% annually through the year 2015, relative to a year 2005 baseline. Assisting in achieving these goals are mandates requiring Federal agencies to acquire alternative fuel vehicles and hybrid electric vehicles, and requirements to use alternative fuel in Federal alternative fuel vehicles when alternative fuel is available and reasonably priced.

d) Financial resources and budget allocation

No information available

e) Method for monitoring and measuring effects of action plans

Federal agency self-reporting

f) Expected results

20% reduction in fleet petroleum consumption, more than double the amount of alternative fuel use, and increased inventory of hybrid electric vehicles

g) Responsibility for monitoring

Agencies report on their own progress and the DOE monitors results

h) Outputs of monitoring

Annual report on Federal Fleet Compliance with EPACT and E.O. 13423

i) Outcomes

Targets were met, or nearly met, in 2007. Twenty-one covered Federal agencies reported progress toward petroleum reduction and alternative fuel goals.

1.4 Institutional Structure

1.4.1 Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy

a) Status of organisation

Implementer

b) Roles and responsibilities

The Office of Energy Efficiency and Renewable Energy (EERE) develops cost-effective

¹ OMB (2009).

energy efficiency and renewable energy technologies that provide a diverse supply of reliable, affordable, and environmentally sound energy for the economy. EERE achieves this goal through a strong and balanced program of research, development and market deployment. EERE is organised around the three main energy users in the renewable and energy efficiency resource and demand markets— industry, transportation, and buildings.

The *Advanced Manufacturing Office* leads the drive to increase energy productivity and foster innovations that will bolster U.S. technology leadership and global competitiveness. The office sponsors cost-shared R&D and provides support for the widespread use of energy management systems and best practices across the supply chain.

The *Vehicle Technologies Program* supports R&D in vehicle systems, hybrid electric systems, hybrid and electric propulsion, advanced combustion engines, advanced materials technologies, and fuels technology. Focus areas for technology deployment include: alternative fuel vehicles, alternative fuel infrastructure development, idling reduction for commercial trucks and buses, expanded use of non-petroleum and renewable fuel blends, hybrid vehicles, driving practices for improved efficiency, and engine/vehicle technologies that maximise fuel economy.

The *Building Technologies Program* develops technologies, techniques and tools for making residential and commercial buildings more energy efficient, productive, and affordable. The portfolio of activities includes efforts to improve the energy efficiency of building components and equipment and their effective integration using whole building system design techniques, the development of building codes and equipment standards, the integration of renewable energy systems into building design and operation, and the accelerated adoption of these technologies and practices.

The *Federal Energy Management Program* works with Federal agencies and private sector partners to help agencies realise energy, environmental and cost savings potentials, including Federal energy intensity goals, as set by Presidential Executive Orders or Congressional legislation.

c) Covered sectors

Residential, commercial, industry, manufacturing, transport, power, and public sectors

d) Established date

Department of Energy Organization Act (1974)

e) Number of staff members

Approximately 800 (in Washington D.C. and Golden, Colorado)

1.4.2 Environmental Protection Agency

a) Status of organisation

Regulator, implementer

b) Roles and responsibilities

The EPA mission is to protect human health and the environment by developing and enforcing regulation, giving grants, studying environmental issues, sponsoring partnerships, and informing people about the environment. Efforts in support of energy efficiency include Clean Energy programs, Energy Star (with DOE), the Responsible Appliance Disposal program, the Electronic Product Environmental Assessment tool, and activities to improve energy efficiency at water utilities.

c) Covered sectors

Residential, commercial, industry, transport, and public sectors

d) Established date

1970

e) Number of staff members

Estimated dozens of people spread across clean energy and other EPA programs

1.4.3 Regional Organisations

State and local governments and utility regulators have introduced energy efficiency policy measures that address all sectors. These measures include minimum performance standards (that is, building codes) and a variety of financial incentives.

1.5 Information Dissemination, Awareness-Raising and Capacity-Building

a) Information collection and dissemination

Energy Information Administration: The Energy Information Administration collects and interprets data on energy production, trade, transformation, and consumption. This includes collection of energy use data for many industrial sectors and for residential and commercial buildings.²

Database of State Incentives for Renewables & Efficiency (DSIRE): DSIRE is a comprehensive source of information on state, local, utility, and Federal incentives that promote renewable energy and energy efficiency. The DSIRE website (www.dsireusa.org) provides Federal, state, local governments, and the public with a fast and convenient method for accessing information about renewable energy and energy efficiency incentives and regulatory policies administered by Federal and state agencies, utilities, and local organisations across the economy.

www.EnergySavingTips.gov: In December 2004, DOE launched a new website (www.EnergySavingTips.gov) as a consumer-friendly portal to detailed energy saving information from various Federal agencies.

b) Awareness-raising

Powerful Savings Campaign: In May 2004, DOE and the Alliance to Save Energy teamed up on a Powerful Savings campaign to help consumers reduce their energy bills and the economy reduce its energy use through smart energy practices and energy-efficiency. Powerful Savings focuses on increasing public awareness of the importance of energy efficiency and on smart energy practices both at home and on the road through an extensive media outreach campaign.

“Easy Ways to Save Energy”: This campaign promotes energy savings through an “Energy Savers Guide.” The Guide is being distributed to consumers across the economy. Aggressive radio and print advertisements to promote more efficient energy use are also under way.

Public Energy Education Program: The EFACT 2005 states that DOE is required to convene a conference with representatives from industry, education, professional societies, trade associations, and government agencies to design and establish an ongoing economy-wide public education program focused on energy efficiency and other topics. The Office of Science held this conference in January 2007.

Energy Efficiency Public Information Initiative: DOE is required to conduct an advertising and public outreach program about the need to reduce energy use, the consumer benefits of reduced use, the relationship to jobs and economic growth, and cost-effective consumer measures to reduce energy use. Funding at US D90 million per year is authorised for FY2006 to FY2010. DOE is implementing this provision within the limits of annual Congressional appropriations.

Many more information programs are operated by state and local governments and utilities.

OMB (2009).

c) Capacity-building

Advanced Technology Transfer Centers: The Energy Policy Act of 2005 directs DOE to provide grants to non-profit institutions, state and local governments, or universities to establish a geographically dispersed network of Advanced Energy Technology Transfer Centers. DOE has so far funded pilot projects at the Florida Solar Energy Center and Washington State University. The centres are to encourage the demonstration and commercial application of advanced energy methods and technology through education and outreach to building and industry professionals. The Recovery Act of 2009 has allocated USD 500 million for energy efficiency and renewable energy workforce investment programs.

Industrial Energy Management: Industrial energy management is encouraged through information and training offered by many Federal, state and utility voluntary programs. The Department of Energy's Industrial Technologies Program and the Environmental Protection Agency's Energy Star Program are two key Federal resources for information and training on industrial energy management.³

Small Businesses: The US Environmental Protection Agency's Energy Star program provides education and technical resources to help small businesses improve energy efficiency. In addition, many state and local programs provide technical assistance as well as access to funding for implementing energy efficiency measures.⁴

1.6 Research and Development in Energy Efficiency and Conservation

1.6.1 Research and Development on Building Technologies

The Building Technologies Program supports innovation, emerging technologies, systems integration, and reducing market barriers of advanced technologies to improve energy efficiency in America's buildings. The 2012 budget allocation for the Building Program was USD 219 million and the 2013 request is USD 310 million. The primary barriers to improved building efficiency are technological (greater energy efficiency) and market-based (acceptable cost to purchase) in nature. The principal strategy of BTP is to support research, development, demonstration and deployment (RDD&D) of technologies that have the potential to achieve significant improvements in building efficiency. The Program also supports market-priming measures to ensure that these technologies overcome the barriers to widespread adoption, such as first cost, the various building trades' acceptance of new technology, and insufficient availability of consumer information.

Widespread adoption of building efficiency technologies is critical to the success in meeting the Program's goals and includes both voluntary efforts such as Energy Star and the Better Buildings Program (Residential and Commercial) as well as regulatory activities, such as, the Appliance Standards Program.

The Program strategy is divided into three interwoven pathways, each of which can result in lowering building energy use:

- Improve building components (solid state lighting, windows, heating ventilation and cooling, building envelope, sensors and controls), both performance and cost to manufacture/install, through ground breaking research and development; and develop whole building energy simulation programs such as Energy Plus that engineers, architects, and researchers can use to model energy and water use in buildings;
- Increase market pull from private industry through cooperation with stakeholders, improvement of building design and audit tools, and the creation of reliable efficiency benchmarks and databases to facilitate energy efficiency financing and to define

³DOE (2009) and EPA and DOE (n.d. - a).

⁴DOE and EPA (n.d. - b).

efficiency value-add to consumers (Better Buildings Residential and Commercial, HUB, Energy Star); and

- Raise the standards for new energy consuming equipment and new buildings with continually updated equipment and model building codes based on cost effective, higher performing technology that has been successfully commercialized.

The program applies all three interwoven pathways to pursue market opportunities to achieve five main mid-term goals:

- **Appliance and Equipment:** Provide cost-effective energy savings through national appliance and equipment standards; issue 23 final rules by the end of FY2015; deliver 1,350 trillion BTUs annual savings by 2030;
- **New Construction:** Reduce the energy required to operate new residential and commercial buildings by 50 percent, at less than the cost of the energy saved. Prove existing technologies and practices and accelerate deployment through model building codes to deliver:
 - 350 trillion BTUs in annual savings by 2020;
 - 1,600 trillion BTUs in annual savings by 2030;
- **Existing Commercial Buildings:** Reduce the energy required to operate existing commercial buildings by 40 percent, at less than the cost of the energy saved. Bring needed technologies and practices to market delivering:
 - 1,600 trillion BTUs in annual savings by 2020;
 - 6,000 trillion BTUs in annual savings by 2030;
- **Existing Residential Buildings:** Reduce the energy required to operate existing residential buildings by 50 percent at less than the cost of the energy saved. Bring needed technologies and practices to market delivering:
 - 1,250 trillion BTUs in annual savings by 2020;
 - 4,500 trillion BTUs in annual savings by 2030;
 and
- **Technology Development:** Bring to market technologies that save 70 percent of lighting, 60 percent of water heating, 40 percent of HVAC, and 20 percent of other appliances energy use at less than the cost of the energy saved.

1.6.2 Advanced Manufacturing Research and Development

Formerly the Industrial Technologies Program, EERE's Advanced Manufacturing Office is the lead government program to develop and deploy new, energy-efficient technologies for manufacturing. The FY2012 budget of USD 116 million is being invested in:

R&D for Next Generation Manufacturing Processes: New manufacturing processes, simulation tools, and technologies are pursued in four key areas to lower the energy intensity of manufacturing:

- Reactions and Separations
- High-Temperature Processing
- Waste Heat Minimization and Recovery
- Sustainable Manufacturing

R&D Next Generation Materials: Novel materials can open new design spaces for high-performance and renewable energy technology manufacturing. Projects focus on three areas with clear energy, carbon, and economic benefits:

- Thermal and Degradation Resistant Materials
- Highly Functional, High-Performance Materials
- Lower-Cost Materials for Energy Systems

Technology Deployment Activities: The Energy Resource Center helps manufacturers across the supply chain reduce energy costs and learn how to improve energy efficiency by selecting state-of-the-art technology and adopting energy management best practices.

The FY13 budget request is USD 290 million, representing a 150% increase in funding.

1.6.3 Research and Development in Transport Sector Energy Efficiency

The mission of the Vehicle Technologies Program (VTP) is to accelerate the development and deployment of cost-effective, energy-efficient, and environmentally-friendly technologies for on-highway passenger and commercial vehicles that meet or exceed performance expectations and other requirements, enabling the United States to use significantly less petroleum and reduce greenhouse gas emissions. The program's 2012 budget allocation was USD \$329 million. The FY2013 budget request is approximately \$420 million, with the largest increase supporting additional work in batteries and electric drive technology.

The program focuses primarily on research and development, with approximately 10% of its total budget supporting technology deployment. Research covers a broad portfolio of technologies including batteries; power electronics and electric machines; advanced combustion technologies; materials technologies, including lightweighting; and advanced fuels and lubricants. The program also supports a comprehensive testing and evaluation effort, a robust analysis and modelling capability, and related codes and standards and education activities. Precompetitive research is coordinated with industry through two partnerships – U.S. DRIVE (Driving Research and Innovation for Vehicle efficiency and Energy sustainability) for light-duty vehicle technologies, and the 21st Century Truck Partnership for heavy-duty vehicle technologies. These partnership efforts provide a valuable means for leveraging technical expertise, ensuring government-funded activities remain focused on critical barriers to technology commercialization, and preventing duplication of effort between government and industry.

The program has established the following specific targets that drive its activities:

- Reduce battery pack cost to \$300/kWh by 2015 and \$125/kWh by 2020;
- By 2020, reduce traction drive system cost to \$8/kW, power electronics to \$3.3/kW, and electric motor cost to \$4.7/kW;
- By 2015, demonstrate an engine-/powertrain-only approach that achieves fuel economy improvements of 25% for light-duty gasoline vehicles and 40% for light-duty diesel vehicles (compared to a 2009 gasoline vehicle);
- By 2015, demonstrate an optimized heavy-duty diesel engine that achieves a 20% fuel economy improvement;
- By 2020, achieve estimated weight reductions in the following vehicle systems: 35% for the body structure, 25% for the chassis and suspension, 10% for the powertrain, and 5% for the interior;
- By 2015, identify fuel formulations using non-petroleum-based blending components that are optimized for use in high-efficiency heavy truck engines, while meeting

prevailing emissions standards, with the potential to achieve at least a 15% replacement of petroleum fuels by 2030;

- By 2015, demonstrate cost-effective lubricant with a 2% fuel economy improvement;
- By 2020, to achieve a petroleum reduction of over 2.5 billion gallons per year through voluntary adoption of alternative fuel vehicles and infrastructure.

1.6.3 Electric Power Sector Energy Efficiency Technology Research and Development

The Office of Electric Delivery & Energy Reliability supports the development of technologies to modernise the electric grid. Some of these technologies will have important benefits for energy efficiency. The total 2010 budget allocation for this office was approximately USD 172 million. The budget request for 2011 is approximately USD 186 million. The Recovery Act provided USD 4.5 billion to the Office of Electric Delivery & Energy Reliability.

Research on *high-temperature superconductivity* (HTS) is focused on improving the current carrying capability of long-distance cables; its manufacturability; and cost-effective ways to use the cable in equipment such as motors, transformers, and compensators. Research goals include HTS wires with 100 times the capacity of conventional copper/aluminium wires. The program aims to develop and demonstrate a diverse portfolio of electric equipment based on HTS, with half the energy losses and half the size of conventional equipment with the same rating.

Research on *transmission and distribution technologies* is focused on real-time information and control technologies; and systems that increase transmission capability, allow economic and efficient electricity markets, and improve grid reliability. Examples include high-strength composite overhead conductors, grid-status measurement systems that improve reliability by giving early warning of unstable conditions over major geographic regions, and technologies and regulations that enable the customer to participate more in electric markets through a demand response. Research program goals in this area include, by 2010, demonstrated reliability of energy-storage systems; reduced cost of advanced conductors systems by 30%; and operation of a prototype smart, switchable grid in a region within the United States transmission grid.

Research on *energy storage* is focused in two general areas. One goal is storage technologies that reduce power-quality disturbances and peak electricity demand, and improve system flexibility to reduce adverse effects to industrial and other users. A second goal is to improve electrical energy storage for stationary (utility, customer-side, and renewable) applications. Research focuses on storage technologies with high reliability and affordable cost.

2. MEASURES FOR ENERGY EFFICIENCY IMPROVEMENTS

2.1. Government Laws, Decrees, Acts

a) Name

There have been many laws, decrees and acts including provisions intended to achieve energy efficiency improvements enacted at Federal, state and local levels. Some of the most important examples at the Federal level include US Code Title 42, Chapter 77; Code of Federal Regulations (CFR) Title 10, Chapter II; Energy Policy Act of 2005 (EPAAct 2005); Executive Order 13423; and the Energy Independence and Security Act of 2007 (EISA). The American Recovery and Reinvestment Act of 2009 has also directed substantial energy efficiency investments.

b) Purpose

Promote energy efficiency in all sectors of the economy

c) Applicable sectors

Residential, commercial, industry, agriculture, power, and public sectors

2.2. Regulatory Measures**2.2.1. Minimum Energy Performance Standards (MEPS) and Labelling****a) Name**

- Appliances and Commercial Equipment Standards (many standards were added or revised by the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007)
- Energy Star Labels.

b) Purpose

Improve the energy efficiency of appliances and equipment

c) Applicable sectors

Residential, commercial, industry, and public sectors

d) Outline

The DOE *Appliance Standards* program develops, promulgates, and enforces test procedures and energy conservation standards for about 50 categories of appliances and equipment. DOE has energy efficiency standards in place for most major types of energy-using appliances and equipment, including air conditioners, clothes washers and dryers, space and water heaters, kitchen ranges and ovens, refrigerators and freezers, lighting, electric motors and distribution transformers.

Section 135 of EAct 2005 establishes new or revised energy conservation standards for a number of products as follows:

- *Residential*: ceiling fans, compact fluorescent lighting fixtures (medium base), dehumidifiers, torchiere lighting fixtures
- *Commercial*: commercial refrigerators and freezers, commercial package air conditioning and heating equipment, fan-type unit heaters, coin-operated clothes washers, low-voltage dry-type distribution transformers, illuminated exit signs, traffic signal indicator light modules, pedestrian signals, automatic ice makers, commercial ice cream freezers, mercury vapour light ballasts, tubular fluorescent lamp ballasts (34, 60, 95 watts), pre-rinse spray valves, air flow through duct work, refrigerated beverage vending machines, determination of standards for battery chargers and external power supplies.

The Energy Independence and Security Act of 2007 (EISA) set standards for certain consumer and industrial products and requires new or revised standards for others. EISA sets incandescent lighting standards that will cut energy consumption 30% by 2014 and substantially more by 2020. These standards will encourage but not require the use of compact fluorescent bulbs and advanced solid state lighting technologies. Other related provisions of EISA include:

- Statutory efficiency standards for external power supplies (0.5 watts for units up to 250 watts), residential boilers, dehumidifiers, electric motors, and walk-in coolers
- Requirement for electric motors to meet efficiency levels specified by the National Electrical Manufacturers Association (these were previously voluntary)
- Water use standards for clothes washers and dishwashers
- Authority to set regional standards for home heating and cooling equipment
- Mandates to develop standards for furnace fans, refrigerators, and standby power

- Requirements for periodic updating of all standards and test procedures labelling of electronic products.

In 2011, the Department of Energy updated minimum energy efficiency standards for furnaces, central air conditioners, clothes dryers, room air conditioners, residential refrigerators, fluorescent lamp ballasts, refrigerators and freezers, and direct heating equipment. DOE has also proposed a significant update to standards for utility distribution transformers and anticipates updating standards on clothes washers and dishwashers in 2012. Further, DOE is exploring the potential costs and benefits of establishing minimum standards for commercial and industrial pumps and for industrial fans, blowers and fume hoods.

DOE issued a policy statement in 2011 that commits to adopting full fuel cycle analysis as part of its standards development process and to improving the information available to product buyers and users on product emissions and energy impacts over the full fuel cycle. In addition, DOE has issued a number of public notices or rules affecting its appliance and equipment test procedures, as well as its efficiency certification and enforcement efforts. In December 2011, DOE launched a web-based data base of all product certification data.

EISA outlines a rigorous lighting efficiency program, which mandates increases in the energy efficiency of light bulbs by 25%-30% starting in 2012. This will effectively phase out most common types of incandescent light bulbs by 2014. EISA mandates revised lighting efficiency standards effective in 2020 which could be met by compact fluorescents, LED or other energy efficient bulbs. EISA sets efficiency standards for metal halide lamps and requires amended standards in 2012 and 2019. DOE is progressing on rule-making to update and expand the scope of energy efficiency standards for fluorescent lamps and ballasts, and incandescent reflector lamps.

EISA requires that test procedures for covered consumer products be amended to include standby mode and off mode energy consumption, taking into consideration the most current versions of Standards 62301 and 62087 of the International Electrotechnical Commission. EISA mandates that any final rule establishing or revising a standard for a covered consumer product, adopted after 1 July 2010, incorporate standby mode and off mode energy use. DOE is revising test procedures for battery chargers and external power supplies and developing an efficiency standard to address standby energy use. With accurate measurement of standby power needs included in testing to meet appliance standards, as well as with standards for external power supplies, typical appliances will use less standby power. The Federal government is required to buy devices that use less than 1 watt of standby power. Some states have implemented standby limits on certain consumer electronics products.

DOE is implementing a round-robin test program to assess the repeatability and reproducibility of test procedures for various appliances. The National Institute of Standards and Technology (NIST), the Appliance Technology Evaluation Center (ATEC) at the National Energy Technology Laboratory (NETL), and many third parties and manufacturers perform these tests. The round robin testing will document the variability of test results, both within a test lab (repeatability) and among test labs (reproducibility), and seek to identify the potential contributing causes of variability. The results will form the basis of recommended corrective actions for facilities and highlight needed modifications to test procedures.

The *Energy Star® labelling* program is designed to clearly signal high efficiency in buildings and products to consumers and businesses. Over 50 types of products can now earn the label. The US Environmental Protection Agency (EPA) manages the labelling of buildings, new homes, office equipment, home electronics, and residential heating, ventilation and air conditioning (HVAC). DOE manages the labelling for a variety of residential products, including appliances, compact fluorescent lamps (CFL), solid state lighting, windows, and residential water heaters. In July 2011, EPA and DOE announced the first products recognized as the most energy-efficient in their categories among those that have earned the Energy Star label. "EnergyStar Most Efficient 2012" product identification is available for clothes washers, refrigerators, televisions, central air conditioners, furnaces, and heat pumps.

The EISA of 2007 states that as of December 19, 2010, federal agencies are generally required to lease space in buildings that have earned an Energy Star label in the previous year. There are exemptions to this rule; agencies are allowed to remain the previously occupied buildings, even if not Energy Star labelled.

2.2.2. Building Energy Codes

a) Name

Energy Efficiency Standards for Buildings

b) Purpose

Reduce energy used in the heating, cooling and ventilation of buildings

c) Applicable sectors

Residential and commercial

d) Outline

The United States has developed energy efficiency standards for new buildings since 1975, with the first codification of those standards taking place in 1977. Adoption and enforcement of these codes and standards is the responsibility of the states, with the US DOE playing a major support role in the development of new economy-wide model codes. According to the Database of State Incentives for Renewables & Efficiency, all 50 states and the District of Columbia have building energy codes. The goal expressed by the 2009 Recovery Act is for 90% compliance with energy code requirements for each state.

In 2007, DOE undertook to support a 30% improvement in ASHRAE/IESNA Standard 90.1 for the year 2010 (relative to Standard 90.1-2004). Standard 90.1 is the primary reference for economy-wide model commercial codes. In 2008, DOE provided support to a 30% improvement in the economy-wide model residential code.

The Building Energy Codes Program estimates an energy cost savings of more than USD 2.5 billion per year. The program supports the development, adoption and compliance of energy efficiency standards in buildings.

e) Financial resources and budget allocation

At the Federal level, about USD 4 million was allocated in 2008. Additional budget is allocated at the state level.

f) Expected results

Many new residential and commercial buildings will use 30% less energy in 2010 than in 2007 due to widespread state compliance with model buildings codes developed.

2.2.3. Vehicle Fuel Efficiency Standards

a) Name

Corporate Average Fuel Economy (CAFE) Standards for Light Vehicles and Greenhouse Gas and Fuel Efficiency Standards for Trucks and Buses

b) Purpose

Improve the fuel economy of light vehicles, trucks and buses

c) Applicable sectors

Transport

d) Outline

The Energy Independence and Security Act of 2007 (EISA) mandates a corporate average fuel economy standard of 35 miles per gallon for new light vehicles (cars and light trucks

(vans, SUVs, and pickups)) throughout the United States by 2020. On 19 May 2009, President Obama greatly accelerated the vehicle efficiency improvement by introducing a policy aimed at both increasing fuel economy and reducing greenhouse gas pollution. The new standards, covering model years 2012-16, require an average fuel economy standard of 35.5 miles per gallon in 2016 (6.6 liters/100 km; 250 g CO₂/mile). On April 1, 2010, the U.S. Environmental Protection Agency and the National Highway Traffic Safety Administration issued regulations to implement this standard. It is estimated that the new requirements will save 1.8 billion barrels of oil and cut carbon emissions by about 960 million metric tons.

On July 29, 2011, President Obama announced more new standards to increase fuel efficiency and reduce greenhouse gas pollution for new cars and light trucks sold in the United States. These new standards will cover cars and light trucks for Model Years 2017-2025, requiring performance equivalent to 54.5 mpg in 2025 while reducing greenhouse gas emissions to 163 grams per mile. The standards will save an estimated 12 billion barrels of oil in total ó 2.2 million barrels per day by 2025 and over 4 million barrels per day by 2045 when new vehicles meeting the 2025 fuel economy requirement replace nearly the entire vehicle fleet. They will also reduce carbon dioxide emissions by a total of over 6 billion metric tons.

On August 9, 2011, The Environmental Protection Agency and National Highway Traffic Safety Administration established the first-ever U.S. fuel economy standard for heavy trucks which should reduce vehicle fuel consumption by 10ó20% between 2014 and 2018 with net cost savings of \$42 billion to commercial truck owners. Based on projected fuel savings, vehicle owners are expected to recover the additional upfront costs of the more efficient vehicles in one to five years.⁵ The standards are projected to reduce oil consumption by 530 million barrels and carbon dioxide emissions by 270 million tons over the life of these trucks.

The United States has also greatly expanded support for development and manufacture of more fuel-efficient vehicles. Loan guarantee authority funded in 2008 and the economic stimulus program enacted in 2009 have expanded support for the retooling of auto manufacturing plants to increase fuel efficiency, the manufacture of advanced batteries, and purchase of plug-in hybrid vehicles. This support is in the form of expanded R&D, loan guarantees, direct financial assistance, and tax incentives.

e) Financial resources and budget allocation

Information not available

f) Expected results

Average fuel economy for new cars and light trucks will gradually increase to 35.5 miles per gallon by 2016 and then further to 54.5 miles per gallon by 2025. The new CAFE standards are expected to result in savings of 12 billion barrels of oil over the lifetime of the vehicles. Average fuel economy for heavy trucks will also increase, saving another half billion barrels.

2.3. Voluntary Measures

2.3.1. Climate VISION-Voluntary Innovative Sector Initiatives

a) Purpose

Reduce energy intensity and greenhouse gas intensity of industrial output

b) Applicable sectors

Industry

c) Outline

⁵ NHTSA (2010)

Climate VISION works with its partners to standardise measuring and monitoring, find cost-effective solutions to reduce energy use and GHG emissions, accelerate R&D, and explore cross-sector efficiency gains to reduce emissions. Partners represent a broad range of industrial sectors: oil and gas production, transportation, and refining; electricity generation; coal and mineral production and mining; manufacturing; railroads; and forestry products.

2.3.2. Commercial Lighting Initiative

a) Purpose

Reduce energy use for commercial lighting

b) Applicable sectors

Commercial

c) Outline

This initiative works to reduce energy use for lighting in stores, offices, hospitals, and other commercial buildings to 30% below the prevailing US commercial buildings energy standard, the ASHRAE/IESNA Standard 90.1-2004, using voluntary market pull strategies.

2.3.3. Better Buildings Program

a) Purpose

Reduce energy use in commercial buildings

b) Applicable sectors

Commercial

c) Outline

The program, launched by DOE in February 2011, catalyzes private sector investment in upgrades to make commercial buildings 20 percent more energy efficient over the next decade. On June 30, 2011, 14 partners announced commitments to the Better Buildings Challenge, including private companies, financial institutions and local governments. Companies will provide data on energy savings and efficiency strategies which can serve as models to others. Financial institutions have agreed to help finance efficiency projects.

2.4. Financial Measures Taken by the Government

2.4.1. Tax Schemes

Federal Tax Credits for Energy Efficiency: Home Improvements

a) Level

Federal

b) Purpose

Promote energy efficiency in existing residential buildings

c) Applicable sectors

Residential

d) Outline

Individuals can get an income tax credit for 30% of the cost of energy efficiency measures.

e) Financial resources and budget allocation

Given there are about 100 000 000 households in the United States, this credit represents a potential investment in the order of USD 150 billion dollars for as much as USD 450 billion in efficiency improvements. Clearly the actual uptake will be some fraction of this potential.

f) Expected results

Improved residential uptake of energy efficiency measures

g) Description

Home improvement tax credits were available for home improvements placed in service from 1 January 2009 through 31 December 2010. The maximum that a taxpayer could claim was USD 1500. It had to be an existing home and principal residence to receive this tax credit. New construction and rentals did not qualify. Geothermal heat pumps, solar energy systems, wind energy systems and fuel cells qualify for a 30% tax credit through 2016.

In January of 2011, the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 was passed in Congress and extended the tax incentives for home improvements through 2011. The new tax incentives are for home improvements made in 2011. The ones made in 2010 were still subject to the previous tax credit requirements. The new tax credit amounts for 10% of the cost of building envelope improvements, excluding labor costs; and limited to USD 200 for windows, and specific dollar limits for heating and cooling equipment. The total credit cannot exceed USD 500 and applies to cumulative claims dating back to 2006. To be eligible a home must be the taxpayer's principal residence.

*Tax Credit for Manufacturers of Energy-Efficient Appliances***a) Level**

Federal

b) Purpose

Promote the production of energy-efficient appliances

c) Applicable sectors

Commercial

d) Outline

Tax credits for manufacturers of high-efficiency residential clothes washers, refrigerators, and dishwashers

e) Financial resources and budget allocation

Information not available

f) Expected results

Increased domestic manufacturing of energy efficiency appliances

g) Description

The credits are in the form of a tax credit for increases in unit production of efficient appliances over a two-year baseline. The amount of the credit is tied to specified efficiency ratings, and varies according to appliance and the level of achieved efficiency. The appliances must be produced in the United States.

The appliance tax credit was extended until the end of 2011 and follows the criteria:

- Dishwashers
 - USD 25 - models using no more than 307 kilowatt hours/year and 5.0 gallons of water/cycle (this is the ENERGY STAR level effective July 1, 2011)
 - USD 50 - models using no more than 295 kilowatt hours/year and 4.25 gallons of water/cycle
 - USD 75 - models using no more than 280 kWh kilowatt hours/year and 4 gallons of water/cycle

- Clothes Washers ó
 - USD 175 ó top-loading models that meet/exceed 2.2 MEF, and does not exceed 4.5 WCF
 - USD 225 ó top-loading models that meet/exceed 2.4 MEF, and does not exceed 4.2 WCF, or front-loading models that meet/exceed 2.8 MEF and do not exceed a 3.5 WCF
- Refrigerators ó
 - USD 150 ó models that use 30% less energy relative to federal standard
 - USD 200 ó models that use 35% less energy relative to federal standard

Federal Tax Credits for Energy Efficiency: Vehicle Fuel Efficiency

a) Level

Federal

b) Purpose

Encourage market penetration of fuel-efficient hybrid electric vehicles

c) Applicable sectors

Residential and commercial transport

d) Outline

A federal income tax credit of up to USD 3,400 was available for hybrid vehicles placed in service after 31 December 2005 and purchased by December 31, 2010. Plug-in hybrid-electric vehicles and all electric vehicles purchased in or after 2010 were eligible for a federal tax credit of up to USD 7,500, depending on the capacity of the battery used. Some diesel vehicles purchased or placed into service after December 31, 2005 were eligible for a federal income tax credit of up to USD 3,400. The credit amount began to phase out for a given manufacturer once it sold over 60,000 eligible hybrid and diesel vehicles.

e) Financial resources and budget allocation

The net US investment depends on consumer uptake of the certified vehicles.

f) Expected results

Increased consumer uptake of the certified vehicles, reducing fuel consumption and associated emissions

g) Description

Private or commercial purchasers of certified vehicles received a USD 250-USD 3400 tax credit for certified vehicles. For the case of hybrid-electric vehicles, the tax credit for a given manufacturer was phased out after the first 60 000 certified vehicles were sold. For plug-in hybrid-electric vehicles, the tax credits were: PHEV10 (vehicles with a range of 10 miles): USD 2500, PHEV20 (20 miles): USD 4000, PHEV30: USD 5000, PHEV40: USD 5000. For plug-in vehicles, the tax credit for a given manufacturer was phased out after 200 000 vehicles were sold.

Federal Tax Credits for Energy Efficiency: Fuel Cells

a) Level

Federal

b) Purpose

Promote the use of energy-efficient fuel cells for stationary applications

c) Applicable sectors

Residential

d) Outline

Credits are available for residential fuel cells and micro turbine systems.

e) Financial resources and budget allocation

Information not available

f) Expected results

Increased installation of fuel cell/microturbine systems

g) Description

There is a residential consumer tax credit of up to 30% of the cost (up to USD 1500 per 0.5 kW of capacity maximum) for installing a qualified fuel cell and microturbine system. The system must have an efficiency of at least 30% and a capacity of at least 0.5 kW. The credits are available for systems placed in service from 1 January 2006 through 31 December 2016. This credit is not limited to the USD 1500 home improvement cap.

2.4.2. Low-Interest Loans*Qualified Energy Conservation Bonds***a) Level**

Federal

b) Purpose

Accelerate the deployment of energy efficiency improvements

c) Applicable sectors

State, local, and tribal governments

d) Outline

For qualified projects, which include certain energy efficiency improvements, the borrower pays back the principal of the bond, and the bondholder receives Federal tax credits instead of bond interest.

e) Financial resources and budget allocation

The tax credit bond limit in the original October 2008 legislation was USD 800 million but was increased in the ARRA 2009 to USD 3.2 billion. Recent legislation provides that tax credit bonds may also be issued as Build America Bonds in which the bonds bear taxable interest and the obligor receives a subsidy directly from the federal government equal to 70% of the taxable interest cost.

f) Expected results

Larger-scale adoption of energy efficiency measures

*Energy Efficient Mortgages***a) Level**

Federal

b) Purpose

Help homebuyers or homeowners save money on energy bills by enabling them to finance the cost of adding energy-efficiency features to new or existing housing as part of their home purchase or refinancing mortgage.

c) Applicable sectors

Residential

d) Outline

Cost-effective energy saving measures may be financed as part of the mortgage. A buyer's debt-to-income ratio on the loan for an energy efficient home could be stretched, so that a larger percentage of the borrower's monthly income can be applied to the monthly mortgage payment. All homes built to the Council of American Building Officials Model Energy Code (MEC) can qualify for an Energy Efficient Mortgage.

e) Financial resources and budget allocation

Maximum loan amounts vary by originator, but may be expressed in terms of a maximum dollar amount or as a percentage of the home's appraised value.

f) Expected results

Larger-scale adoption of energy efficient technologies

*State and Utility Based Loan Programs***a) Level**

State and local government, utilities

b) Purpose

Promote adoption of energy efficient technologies

c) Applicable sectors

Residential, commercial, non-profit, state/local government

d) Outline

More than 200 state and utility programs are identified at the DSIRE website www.dsireusa.org/summarytables/FinEE.cfm?&CurrentPageID=7&EE=1&RE=1.

e) Financial resources and budget allocation

Varies

f) Expected results

Wider adoption of qualifying energy efficiency measures

2.4.3. Subsidies and Budgetary Measures*Weatherization Assistance Program (WAP)***a) Level**

Federal

b) Purpose

Improve the energy efficiency of homes inhabited by low-income families

c) Applicable sectors

Residential

d) Outline

The program provides cost-effective energy efficiency improvements to low-income households through the weatherisation of homes. It thereby helps low-income families to permanently reduce their energy bills. DOE's weatherisation program performs energy audits to identify the most cost-effective measures for each home, which typically includes adding insulation, reducing air infiltration, servicing heating and cooling systems, and providing health and safety diagnostic services. Priority is given to the elderly, persons with disabilities, families with children, and households that spend a disproportionate amount of their income on energy bills (utility bills make up 15% to 20 % of household expenses for low income families, compared to 5% or less for all other Americans).

e) Financial resources and budget allocation

The Recovery Act made available approximately USD 5 billion for weatherization efforts from 2009 - 2013. The annual WAP program budget for FY2012 is USD 128 million and the request for 2013 is USD 195 million.

f) Expected results

Over 36 years, as of February 2012, WAP has provided weatherization services to more than 7.3 million low-income households, with 707,000 funded through the Recovery Act.

Numerous economy-wide, state and local energy efficiency subsidies

a) Level

Federal, state and local governments, local utilities

b) Purpose

Improve the energy efficiency of residences and commercial buildings

c) Applicable sectors

Residential, commercial, industry, and agriculture

d) Outline

Numerous subsidies are available to assist private citizens and business owners in obtaining energy efficiency audits and perform efficiency improvements. See the summary information at www.dsireusa.org.

e) Financial resources and budget allocation

Varies

f) Expected results

Improved energy efficiency in applicable sectors

Energy Savings Performance Contracts

a) Level

Federal

b) Purpose

Facilitate financing of energy efficiency improvements by Federal government agencies

c) Applicable sectors

Public sector

d) Outline

Energy Savings Performance Contracts (ESPCs) are a contracting vehicle that allows agencies to accomplish energy efficiency projects for their facilities without up-front capital

costs and without Congressional appropriations. An ESPC project is a partnership between the customer and an energy services company (ESCO). The ESCO conducts a comprehensive energy audit and identifies improvements that will save energy at the facility. In consultation with the agency customer, the ESCO designs and constructs a project that meets the agency's needs and arranges financing to pay for it. The ESCO guarantees that the improvements will generate savings sufficient to pay for the project over the term of the contract. After the contract ends, all additional cost savings accrue to the agency. Contract terms up to 25 years are allowed. Federal agencies structure ESPCs so that financial savings cover costs of their investments.

e) Financial resources and budget allocation

More than 570 projects worth USD 3.9 billion have been awarded by 25 different Federal agencies and organizations as of May 2011. These projects saved an estimated USD 13 billion in energy costs, from which USD 10 billion goes to fund energy efficiency projects and the remaining USD 3 billion in savings reduces government spending.

f) Expected results

The current ESPC contract permits 16 energy service companies to receive contractor payment of up to USD 5 billion for projects. This has the potential to result in up to USD80 billion of energy efficiency, water conservation, greenhouse gas emissions reduction and renewable energy projects at federally owned buildings and facilities

Utility Energy Service Contracts

a) Level

Federal

b) Purpose

Facilitate financing of energy efficiency improvements by Federal government agencies

c) Applicable sectors

Public sector

d) Outline

Utility arranges financing to cover the capital costs of an efficiency project; the costs are paid back by efficiency savings achieved by the installed measures.

e) Financial resources and budget allocation

Since 1991 more than 1,600 projects attracted USD 2.3 billion in capital investment for energy and water efficiency upgrades at Federal facilities.

f) Expected results

It is estimated these projects are providing more than 19 million MMBTU in annual energy savings and USD 350 million in annual cost savings.

2.5. Energy Pricing

The pricing mechanism is generally market based. However, particularly in the electric power sector, there is a significant regulated element in the price for many customers. Most of the wholesale electricity business is based on competitive supply to various utilities. But only about half the states offer retail choice of suppliers to small customers. The transmission and distribution component of price is generally regulated by states on a cost-of-service model. There are also a variety of taxes and fees which are levied, for example highway tolls and

gasoline taxes on automobiles, which affect market prices and vary considerably from state to state within the United States.

Demand for energy fluctuates with price but is rather inelastic, particularly in transport and residential buildings. As a result, policies to improve automotive fuel efficiency have focused on regulating the fuel economy of new vehicles, and policies to reduce energy use in buildings have focused on efficiency standards and labels.

2.6. Other efforts for energy efficiency improvements

2.6.1. Cooperation with non-government organisations

Many NGOs are prominent in promoting energy efficiency in the United States. Examples include Alliance to Save Energy; American Council for an Energy Efficient Economy; American Society for Heating, Refrigeration and Air Conditioning Engineering; Northwest Energy Efficiency Alliance; Precourt Institute for Energy Efficiency; Resources for the Future; Rocky Mountain Institute; and various trade associations.

2.6.2. Cooperation through bilateral, regional and multilateral schemes

The United States cooperates extensively with other economies to develop energy efficiency standards, and on developing and deploying energy efficient technologies and processes. US agencies including DOE, EPA, and AID maintain relevant cooperative efforts with numerous economies and organisations involving work on all continents. For example, the United States participates in IEA Implementing Agreements on Buildings and Community Systems, Demand Side Management, District Heating and Cooling, Energy Storage, Heat Pumps, Combustion, Superconductivity, Fuel Cells, Hybrid and Electric Vehicles, and Advanced Motor Fuels. The United States participates in APEC, United Nations programs, and the Asia Pacific Partnership on Clean Development and Climate (APP). The United States is also actively engaged in efforts to launch the International Partnership for Energy Efficiency Cooperation (IPEEC) which will help economies to share best practices in implementing energy efficiency technologies and monitoring progress toward their energy efficiency goals.

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