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Nuclear Energy Policy

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Nuclear Energy Policy

Summary

Nuclear energy policy issues facing Congress include the implementation of federal incentives for new commercial reactors, radioactive waste management policy, research and development priorities, power plant safety and regulation, and security against terrorist attacks.

The Bush Administration has called for an expansion of nuclear power. For Department of Energy (DOE) nuclear energy research and development, the Administration requested $632.7 million for FY2007, an 18.1% increase from the FY2006 appropriation. The request would boost funding for the Advanced Fuel Cycle Initiative (AFCI) from $79.2 million in FY2006 to $243.0 million in FY2007. The higher AFCI funding would allow DOE to begin developing a demonstration plant for separating plutonium and uranium in spent nuclear fuel, as part of the Administration's Global Nuclear Energy Partnership (GNEP). The House-passed version of the FY2007 Energy and Water Development Appropriations Bill (H.R. 5427, H.Rept. 109-474) would have cut the GNEP request in half and reduced the overall nuclear energy request to $572.8 million, whereas the Senate Appropriations Committee approved $36 million above the request for GNEP. However, the FY2007 appropriations measure was not enacted, and DOE programs are currently funded by a continuing resolution.

Significant incentives for new commercial reactors are included in the Energy Policy Act of 2005 (P.L. 109-58), signed by the President on August 8, 2005. These include production tax credits, loan guarantees, insurance against regulatory delays, and extension of the Price-Anderson Act nuclear liability system.

The September 11, 2001, terrorist attacks on the United States raised concern about nuclear power plant security. The Energy Policy Act of 2005 includes several reactor security provisions, including requirements to revise the security threats that nuclear plant guard forces must be able to defeat, regular force-on-force security exercises at nuclear power plants, and the fingerprinting of nuclear facility workers.

Disposal of highly radioactive waste has been one of the most controversial aspects of nuclear power. The Nuclear Waste Policy Act of 1982 (P.L. 97-425), as amended in 1987, requires DOE to conduct a detailed physical characterization of Yucca Mountain in Nevada as a permanent underground repository for high-level waste. The opening of the Yucca Mountain repository is now scheduled for 2017.

Whether progress on nuclear waste disposal and federal incentives will revive the U.S. nuclear power industry's growth will depend primarily on economic considerations. Several utilities have announced that they will seek licenses for up to 30 new reactors. Although no commitments have been made to build the reactors, nuclear industry officials have predicted that the incentives in the Energy Policy Act of 2005 will lead to the first new U.S. reactor orders since 1978.

This report replaces CRS Issue Brief IB88090, *Nuclear Energy Policy*, by Mark Holt. It will be updated as events warrant.

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Most Recent Developments

The House on May 24 passed the FY2007 Energy and Water Development Appropriations Bill (H.R. 5427, H.Rept. 109-474) with $572.8 million for nuclear energy research and development — $59.9 million below the Bush Administration's February 6, 2006, budget request but $20.8 million above the FY2006 funding level. In contrast, the Senate Appropriations Committee voted June 29 to increase nuclear energy funding by $151.5 million over the request, to $784.2 million.[1] However, the FY2007 appropriations measure was not enacted, and all Department of Energy (DOE) programs are currently funded by a continuing resolution (H.J.Res. 102).

The Administration's FY2007 request would boost funding for the Advanced Fuel Cycle Initiative (AFCI) from $79.2 million in FY2006 to $243.0 million. The higher AFCI funding would allow DOE to begin developing an engineering-scale facility to demonstrate new technology for separating plutonium and uranium in spent nuclear fuel, as part of the Administration's Global Nuclear Energy Partnership (GNEP). The House-passed funding bill would have cut the AFCI funding request to $120 million, which would still be 50% above the FY2006 level. The Senate Appropriations Committee, calling GNEP "imperative" for reducing nuclear waste and increasing energy supplies, boosted AFCI funding by $36 million over the request.

The Administration requested $544.5 million for the civilian nuclear waste program in FY2007, $50 million above the FY2006 level. The program is developing a national nuclear waste repository at Yucca Mountain, Nevada. The House-passed funding bill would have provided the full request, plus $30.0 million for interim nuclear waste storage if authorizing legislation were enacted. The Senate Appropriations Committee voted to cut the request to $494.5, about the same as the FY2006 funding level. Because of continued delays in the Yucca Mountain project, the Senate panel added an extensive provision to the Energy and Water bill (section 313) to authorize the Secretary of Energy to designate storage sites for spent nuclear fuel.

DOE announced on July 19 that it would submit a Yucca Mountain license application to the Nuclear Regulatory Commission (NRC) by June 30, 2008. If Congress passes proposed changes in the repository licensing process, according to DOE, nuclear waste shipments to Yucca Mountain could begin by 2017.

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[1] The nuclear energy funding levels in the Administration budget request and the amounts approved by the House and the Senate Appropriations Committee all include $72.9 million in funding under the "other defense activities" appropriations account.

The Treasury Department on May 1 published interim guidance for a nuclear power tax credit provided by the Energy Policy Act of 2005 (P.L. 109-58), which provides a strong incentive for the construction of new nuclear power plants. The tax credit is available for up to 6,000 megawatts of new nuclear capacity for the first eight years of operation, up to $125 million annually per 1,000 megawatts. Under the Treasury Department guidance, the 6,000 megawatts of eligible capacity will be allocated proportionally among reactors that file license applications by the end of 2008 or, after that date, until enough applications are filed to use the capacity.

Because the nuclear industry has often blamed past nuclear reactor construction cost overruns on licensing delays, the energy act authorizes the Secretary of Energy to pay for up to $500 million in costs resulting from NRC delays for each of the first two new reactors and up to $250 million for the next four. DOE published a final rule for this "standby support" program on August 11.

Overview of Nuclear Power in the United States

The U.S. nuclear power industry, while currently generating about 20% of the nation's electricity, faces an unclear long-term future. No nuclear plants have been ordered in the United States since 1978, and more than 100 reactors have been canceled, including all ordered after 1973. No new units are currently under active construction; the Tennessee Valley Authority's (TVA's) Watts Bar 1 reactor, ordered in 1970 and licensed to operate in 1996, was the most recent U.S. nuclear unit to be completed. The nuclear power industry's troubles include high nuclear power plant construction costs, public concern about nuclear safety and waste disposal, and regulatory compliance costs.

High construction costs are perhaps the most serious obstacle to nuclear power expansion. Construction costs for reactors completed since the mid-1980s ranged from $2 to $6 billion, averaging more than $3,000 per kilowatt of electric generating capacity (in 1997 dollars). The nuclear industry predicts that new plant designs could be built for less than half that amount if many identical plants were built in a series, but such economies of scale have yet to be demonstrated.

Nevertheless, the outlook recently has been improving for the U.S. nuclear power industry, which currently comprises 103 licensed reactors at 65 plant sites in 31 states. (That number excludes TVA's Browns Ferry 1, which has not operated since 1985; TVA is spending about $1.8 billion to restart the reactor in 2007.) Electricity production from U.S. nuclear power plants is greater than that from oil, natural gas, and hydropower, and behind only coal, which accounts for more than half of U.S. electricity generation. Nuclear plants generate more than half the electricity in six states. The near-record 818 billion kilowatt-hours of nuclear electricity generated in the United States during 2005[2] was more than the nation's entire electrical output in the early 1960s, when the first large-scale commercial reactors were being ordered.

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[2] "World's Nuclear Performance in 2005 Close to 2004's," *Nucleonics Week*, Feb. 9, 2006, p. 1.

Average operating costs of U.S. nuclear plants dropped substantially during the past decade, and costly downtime has been steadily reduced. Licensed commercial reactors generated electricity at an average of 89.4% of their total capacity in 2005, according to industry statistics.[3]

Forty-seven commercial reactors have received 20-year license extensions from the Nuclear Regulatory Commission (NRC), giving them up to 60 years of operation. License extensions for eight more reactors are currently under review, and many others are anticipated, according to NRC.[4]

Industry consolidation could also help existing nuclear power plants, as larger nuclear operators purchase plants from utilities that run only one or two reactors. Several such sales have occurred, including the March 2001 sale of the Millstone plant in Connecticut to Dominion Energy for a record $1.28 billion. The merger of two of the nation's largest nuclear utilities, PECO Energy and Unicom, completed in October 2000, consolidated the operation of 17 reactors under a single corporate entity, Exelon Corporation, headquartered in Chicago.

Existing nuclear power plants appear to hold a strong position in the ongoing restructuring of the electricity industry. In most cases, nuclear utilities have received favorable regulatory treatment of past construction costs, and average nuclear operating costs are currently estimated to be competitive with those of fossil fuel technologies.[5] Although eight U.S. nuclear reactors were permanently shut down during the 1990s, none has been closed since 1998. Despite the shutdowns, annual U.S. nuclear electrical output increased by more than one-third from 1990 to 2005, according to the Energy Information Administration and industry statistics. The increase resulted primarily from reduced downtime at the remaining plants, the startup of five new units, and reactor modifications to boost capacity.

The good performance of existing reactors and the relatively high cost of natural gas — the favored fuel for new power plants for the past 15 years — have prompted renewed utility consideration of the feasibility of building new reactors. During the past two years, electric utilities announced plans to apply for combined construction permits and operating licenses (COLs) for up to 30 reactors (see **Table 1**). However, no commitments have been made to build them if the COLs are issued. The Department of Energy (DOE) is assisting with some of the COL applications and site-selection efforts as part of a program to encourage new commercial reactor orders by 2010.

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[3] Ibid.

[4] [http://www.nrc.gov/reactors/operating/licensing/renewal/applications.html]

[5] Energy Information Administration, *Nuclear Power: 12 percent of America's Generating Capacity, 20 percent of the Electricity*, July 17, 2003, at [http://www.eia.doe.gov/cneaf/nuclear/page/analysis/nuclearpower.html].

Table 1. Announced Nuclear Plant License Applications

Announced Applicant	Site	Planned Application Date	Reactor Type	Units
Amarillo Power	Not specified	2007	GE ABWR	2
Constellation Energy (Unistar)	Calvert Cliffs (MD)	4Q 2007	Areva EPR	1
	Nine Mile Point (NY)	1st half 2008	Areva EPR	1
	Not specified	4Q 2008	Areva EPR	3
Dominion	North Anna (VA)	Nov. 2007	GE ESBWR	1
Duke Power	Cherokee (SC)	2007-2008	West. AP1000	2
Entergy	River Bend (LA)	May 2008	GE ESBWR	1
Exelon	Texas	Nov. 2008	Not specified	2
Florida Power and Light	Not specified	2009	Not specified	1
NRG Energy	South Texas Project	2007	GE ABWR	2
NuStart	Grand Gulf (MS)	Nov. 2007	GE ESBWR	1
	Bellefonte (AL)	Oct. 2007	West. AP1000	2
Progress Energy	Harris (NC)	Oct. 2007	West. AP1000	2
	Levy County, FL	July 2008	West. AP1000	2
SCE&G/Santee Cooper	Summer (SC)	3Q 2007	West. AP1000	2
Southern	Vogtle (GA)	March 2008	West. AP1000	2
TXU	Comanche Peak (TX)	4Q 2008	Not specified	2
	Texas	4Q 2008	Not specified	2
	Texas	4Q 2008	Not specified	2
Total units				**33**

Sources: NRC, *Nucleonics Week*, *Nuclear News*, Nuclear Energy Institute, company news releases.

Strong incentives for building new nuclear power plants were included in the Energy Policy Act of 2005 (P.L. 109-58), signed by the President on August 8, 2005. Particularly significant is a 1.8-cents/kilowatt-hour tax credit for up to 6,000 megawatts of new nuclear capacity for the first eight years of operation, up to $125 million annually per 1,000 megawatts.

The Treasury Department published interim guidance for the nuclear tax credit on May 1, 2006.[6] Under the guidance, the 6,000 megawatts of eligible capacity will be allocated among reactors that file license applications by the end of 2008 or, after that date, until enough applications are filed to use the capacity. If license applications for more than 6,000 megawatts of nuclear capacity are submitted by 2008, then the tax credit will be allocated proportionally among the proposed reactors.

Because the nuclear industry has often blamed licensing delays for past nuclear reactor construction cost overruns, the new law would authorize the Secretary of Energy to pay for up to $500 million in costs resulting from NRC delays for each of the first two new reactors and up to $250 million for the next four. DOE published a final rule for the "standby support" program August 11, 2006.[7]

Nuclear power plants would also be eligible for federal loan guarantees for up to 80% of construction costs. DOE issued guidelines for the initial round of loan guarantees on August 8, 2006. However, the initial round is limited to $2 billion and does not include nuclear power plants.

The Energy Information Administration (EIA) has previously concluded that the nuclear energy tax credit would stimulate construction of new commercial reactors,[8] and nuclear industry officials recently predicted that the tax credits and other incentives would prove effective.[9] Without such assistance, EIA has projected that no new reactors would be built by 2025.[10]

A new White House working group held its first meeting May 4, 2006, to coordinate the Administration's policies for encouraging the growth of U.S. nuclear power. The group is headed by the National Economic Council and includes officials from other White House offices and DOE.[11]

Global warming that may be caused by fossil fuels — the "greenhouse effect" — is cited by nuclear power supporters as an important reason to develop a new generation of reactors. On May 19, 2003, New Hampshire became the first state to provide emissions credits for incremental nuclear generating capacity. But the large

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[6] Department of the Treasury, Internal Revenue Service, *Internal Revenue Bulletin*, No. 2006-18, "Credit for Production From Advanced Nuclear Facilities," Notice 2006-40, May 1, 2006, p. 855.

[7] Department of Energy, "Standby Support for Certain Nuclear Plant Delays," *Federal Register*, Aug. 11, 2006, p. 46306.

[8] Energy Information Administration, *Analysis of Five Selected Tax Provisions of the Conference Energy Bill of 2003*, February 2004.

[9] Fialka, John J., "Energy Bill May Revive Nuclear Power in U.S." *Wall Street Journal*, July 28, 2005, p. A4.

[10] Energy Information Administration, *Annual Energy Outlook 2005*, DOE/EIA-0383(2005), February 2005, p. 6.

[11] "White House Forms Group to Support Revival of Nuclear Power," *EnergyWashington Week*, May 19, 2006.

obstacles noted above must still be overcome before electric generating companies will risk ordering new nuclear units. (For more on federal incentives and the economics of nuclear power, see CRS Report RL33442, *Nuclear Power: Outlook for New U.S. Reactors*, by Larry Parker and Mark Holt.)

Nuclear Power Research and Development

For nuclear energy research and development — including advanced reactors, fuel cycle technology, nuclear hydrogen production, and infrastructure support — DOE requested $632.7 million for FY2007, an 18.1% increase from the FY2006 appropriation. The request would boost funding for the Advanced Fuel Cycle Initiative (AFCI) from $79.2 million in FY2006 to $243.0 million in FY2007. The higher AFCI funding would allow DOE to begin developing an engineering-scale facility to demonstrate new technology for separating plutonium and uranium in spent nuclear fuel, as part of the Administration's Global Nuclear Energy Partnership (GNEP). The nuclear energy program is run by DOE's Office of Nuclear Energy, Science, and Technology.

The House on May 24, 2006, passed its version of the FY2007 Energy and Water Development Appropriations Bill (H.R. 5427, H.Rept. 109-474) with $572.8 million for nuclear energy research and development — $59.9 million below the Bush Administration's request but $20.8 million above the FY2006 funding level. The House-passed funding bill would have cut the AFCI funding request to $120 million, which would still be 50% above the FY2006 level. In contrast, the Senate Appropriations Committee voted June 29 to increase nuclear energy funding by $151.5 million over the request, to $784.2 million, including $279.0 million for AFCI (S.Rept. 109-274). However, the FY2007 appropriations measure was not enacted, and all DOE programs are currently funded by a continuing resolution (H.J.Res. 102) at the FY2006 level.

According to DOE's FY2007 budget justification, the nuclear energy R&D program is intended "to enable nuclear energy to fulfill its promise as a safe, advanced, inexpensive and environmentally benign approach to providing reliable energy to all of the world's people." However, opponents have criticized DOE's nuclear research program as providing wasteful subsidies to an industry that they believe should be phased out as unacceptably hazardous and economically uncompetitive.

Under the Administration's GNEP initiative, plutonium partially separated from the highly radioactive spent fuel from nuclear reactors would be recycled into new fuel to expand the future supply of nuclear fuel and potentially reduce the amount of radioactive waste to be disposed of in a permanent repository. The United States and other advanced nuclear nations would lease new fuel to other nations that agreed to forgo uranium enrichment, spent fuel recycling (also called reprocessing), and other fuel cycle facilities that could be used to produce nuclear weapons materials. The leased fuel would then be returned to supplier nations for reprocessing. Solidified high-level reprocessing waste would be sent back to the nation that had used the leased fuel, along with supplies of fresh nuclear fuel, according to the GNEP concept; see [http://www.gnep.energy.gov].

Although GNEP is largely conceptual at this point, DOE issued a Spent Nuclear Fuel Recycling Program Plan in May 2006 that provides a general schedule for a GNEP Technology Demonstration Program (TDP),[12] which would develop the necessary technologies to achieve GNEP's goals. According to the Program Plan, the first phase of the TDP, running through FY2006, consisted of "program definition and development" and acceleration of AFCI. Phase 2, running through FY2008, is to focus on the design of technology demonstration facilities, which then are to begin operating during Phase 3, from FY2008 to FY2020.

Nuclear critics oppose GNEP's emphasis on spent fuel reprocessing, which they see as a weapons proliferation risk, even if weapons-useable plutonium is not completely separated from other spent fuel elements, as envisioned by the Administration. "As the research of DOE scientists makes clear, the reprocessing technologies under consideration would still produce a material that is not radioactive enough to deter theft, and that could be used to make nuclear weapons," according to the Union of Concerned Scientists.[13]

Nuclear Power 2010. President Bush's specific mention of "clean, safe nuclear energy" in his 2006 State of the Union address reiterated the Administration's interest in encouraging construction of new commercial reactors — for which there have been no U.S. orders since 1978. DOE's efforts to restart the nuclear construction pipeline have been focused on the Nuclear Power 2010 Program, which will pay up to half of the nuclear industry's costs of seeking regulatory approval for new reactor sites, applying for new reactor licenses, and preparing detailed plant designs. The program is intended to provide assistance for advanced versions of existing commercial nuclear plants that could be ordered within the next few years.

The Nuclear Power 2010 Program is helping three utilities seek NRC approval for potential nuclear reactor sites in Illinois, Mississippi, and Virginia. In addition, two industry consortia are receiving DOE assistance over the next several years to design and license new nuclear power plants. DOE awarded the first funding to the consortia in 2004. DOE's FY2007 budget request included $54.0 million for Nuclear Power 2010; the House-passed funding bill would have provided the full request, whereas the Senate Appropriations Committee voted to increase the program's funding to $88.0 million. DOE assistance under the program, including the early site permits, is planned to reach a multiyear total of about $550 million.

The nuclear license applications under the Nuclear Power 2010 program are intended to test the "one-step" licensing process established by the Energy Policy Act of 1992 (P.L. 102-486). Even if the licenses are granted by NRC, the industry

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[12] DOE, *Spent Nuclear Fuel Recycling Plan*, Report to Congress, May 2006.

[13] Union of Concerned Scientists, *U.S. Nuclear Fuel Reprocessing Initiative*, [http://www.ucsusa.org/global_security/nuclear_terrorism/doe_proliferation_resistance.html]

consortia funded by DOE have not committed to building new reactors. As discussed above, loan guarantees and tax credits to encourage construction of new reactors are included in the Energy Policy Act of 2005 (P.L. 109-58). The 2005 act also authorizes DOE to provide compensation to the first six new reactors for regulatory delays beyond their control. The following two consortia receive COL assistance under the Nuclear Power 2010 program:

- A consortium led by Dominion Resources that is preparing a COL for an advanced General Electric reactor. The proposed reactor would be located at Dominion's existing North Anna plant in Virginia, where the company is seeking an NRC early-site permit with DOE assistance.

- A consortium called NuStart Energy Development, including Exelon and several other major nuclear utilities, which announced on September 22, 2005, that it would seek a COL for a Westinghouse design at the site of TVA's uncompleted Bellefonte nuclear plant in Alabama and for a General Electric design at the Grand Gulf plant in Mississippi.

The advanced Westinghouse reactor selected by NuStart, the AP-1000, may first be built in China. Under a contract signed December 16, 2006, four of the Westinghouse reactors are to be constructed at two sites, with the first two units to begin operating by 2013.[14] The contract could help pay for detailed engineering and demonstrate the commercial viability of the new design, which received final design certification from NRC effective February 27, 2006.[15] A preliminary commitment to provide almost $5 billion in financial support for the China reactor sale was approved on February 18, 2005, by the Export-Import Bank of the United States. Critics contend that the Ex-Im financing could provide unwarranted subsidies to the nuclear power industry and unwisely transfer U.S. nuclear technology to China.

Generation IV. Advanced commercial reactor technologies that are not yet close to deployment are the focus of DOE's Generation IV Nuclear Energy Systems Initiative, for which $31.4 million was requested for FY2007 — 30% less than the FY2006 request and more than 40% below the final appropriation of $54.5 million. The House-passed funding bill would have provided the requested amount; most of the proposed reduction would have come from the Next Generation Nuclear Plant (NGNP), which would have dropped from $40 million to $23.4 million. The Senate Appropriations Committee voted to provide $48.0 million for the program and continue level funding of $40.0 million for NGNP. The Energy Policy Act of 2005 authorizes $1.25 billion through FY2015 for NGNP development and construction (Title VI, Subtitle C). The authorization requires that NGNP be based on research conducted by the Generation IV program and be capable of producing electricity, hydrogen, or both.

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[14] "Westinghouse Wins China Contract; Chinese Look at Next Expansion," *Nucleonics Week*, Dec. 21, 2006, p. 1.

[15] 71 *Federal Register* 4464, Jan. 27, 2006.

The Generation IV program is focusing on six advanced designs that could be commercially available around 2020-2030: two gas-cooled, one water-cooled, two liquid-metal-cooled, and one molten-salt concept. Some of these reactors would use "fast" neutrons, whereas others would use "thermal" neutrons, as explained below.

The GNEP Technology Demonstration Program plans to focus on the "fast neutron" reactors. Existing U.S. commercial nuclear reactors use water to slow down, or "moderate," the neutrons released by the fission process (splitting of nuclei). The relatively slow (thermal) neutrons are highly efficient in causing fission in certain isotopes of heavy elements, such as uranium 235 and plutonium 239.[16] Therefore, fewer of those isotopes are needed in nuclear fuel to sustain a nuclear chain reaction (in which neutrons released by a fissioned nuclei then induce fission in other nuclei, and so forth). The downside is that thermal neutrons cannot efficiently induce fission in more than a few specific isotopes.

In contrast, "fast" neutrons, which have not been moderated, are less effective in inducing fission than thermal neutrons but can induce fission in a much wider range of isotopes, including all major plutonium isotopes. Therefore, nuclear fuel for a fast reactor must have a higher proportion of fissionable isotopes than a thermal reactor to sustain a chain reaction, but a larger number of different isotopes can constitute that fissionable proportion.

A fast reactor's ability to fission most heavy radioactive isotopes, called "transuranics" (TRU), makes it theoretically possible to repeatedly separate those materials from spent fuel and feed them back into the reactor until they are entirely fissioned. In a thermal reactor, the buildup of non-fissile isotopes sharply limits the number of such separation cycles before the recycled fuel can no longer sustain a nuclear chain reaction.

"Given the benefits of continuous recycling, at this time GNEP-TDP is focused on the development of fast reactor technologies, recognizing that fast reactor operating experience is much more limited than thermal reactor operating experience, and that fast burn reactor fuels, or transmutation fuels, are not fully developed," according to the DOE Program Plan.[17]

Advanced Fuel Cycle Initiative. The nuclear energy program's Advanced Fuel Cycle Initiative (AFCI) was the primary component of GNEP in the FY2007 budget request. The $243 million budget request for AFCI constituted nearly all of the $250 million GNEP program (with the remaining $7 million requested for program direction).

According to the budget justification, AFCI will develop and demonstrate nuclear fuel cycles that could reduce the long-term hazard of spent nuclear fuel and recover additional energy. Such technologies would involve separation of plutonium, uranium, and other long-lived radioactive materials from spent fuel for re-use in a

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[16] Isotopes are atoms of the same chemical element but with different numbers of neutrons in their nuclei.

[17] *Spent Nuclear Fuel Recycling Program Plan*, p. 8.

nuclear reactor or for transmutation in a particle accelerator. Most of the proposed AFCI funding ($155 million) would be for an engineering-scale demonstration of a separations technology called UREX+, in which uranium and other elements are chemically removed from dissolved spent fuel, leaving a mixture of plutonium and other highly radioactive elements. Proponents believe the process is proliferation-resistant, because further purification would be required to make the plutonium useable for weapons and because its high radioactivity would make it difficult to divert or work with.

However, the House Appropriations Committee expressed concern that more fundamental research on the UREX+ process was needed, particularly on waste byproducts, before moving ahead to the demonstration phase. As a result, the House-passed energy and water funding bill would have held the program's spending increase to $120 million. But the Senate Appropriations Committee, calling GNEP "imperative" for reducing nuclear waste and increasing energy supplies, boosted AFCI funding by $36 million over the request.

Removing uranium from spent fuel would eliminate most of the volume of spent nuclear fuel that would otherwise require disposal in a deep geologic repository, which DOE is developing at Yucca Mountain, Nevada. The UREX+ process also would reduce the heat generated by nuclear waste — the major limit on the repository's capacity — by removing cesium and strontium for separate storage and decay over several hundred years. Plutonium and other long-lived elements would be fissioned in accelerators or fast reactors (such as the type under development by the Generation IV program) to reduce the long-term hazard of nuclear waste. Even if technically feasible, however, the economic viability of such waste processing has yet to be determined, and it still faces significant opposition on nuclear nonproliferation grounds, as noted above.

Nuclear Hydrogen Initiative. In support of President Bush's program to develop hydrogen-fueled vehicles, DOE requested $18.7 million in FY2007 for the Nuclear Hydrogen Initiative, a 25% reduction from the FY2006 level. The House-passed funding bill would provide the same amount, but the Senate Appropriations Committee would boost the program to $31.7 million. According to DOE's FY2005 budget justification, "preliminary estimates ... indicate that hydrogen produced using nuclear-driven thermochemical or high-temperature electrolysis processes would be only slightly more expensive than gasoline" and result in far less air pollution.

Nuclear Power Plant Safety and Regulation

Safety

Controversy over safety has dogged nuclear power throughout its development, particularly following the March 1979 Three Mile Island accident in Pennsylvania and the April 1986 Chernobyl disaster in the former Soviet Union. In the United States, safety-related shortcomings have been identified in the construction quality of some plants, plant operation and maintenance, equipment reliability, emergency planning, and other areas. In a relatively recent example, it was discovered in March

2002 that leaking boric acid had eaten a large cavity in the top of the reactor vessel in Ohio's Davis-Besse nuclear plant. The corrosion left only the vessel's quarter-inch-thick stainless steel inner liner to prevent a potentially catastrophic loss of reactor cooling water. Davis-Besse remained closed for repairs and other safety improvements until NRC allowed the reactor to restart in March 2004.

NRC's oversight of the nuclear industry is an ongoing issue; nuclear utilities often complain that they are subject to overly rigorous and inflexible regulation, but nuclear critics charge that NRC frequently relaxes safety standards when compliance may prove difficult or costly to the industry.

Domestic Reactor Safety. In terms of public health consequences, the safety record of the U.S. nuclear power industry in comparison with other major commercial energy technologies has been excellent. During approximately 2,700 reactor-years of operation in the United States,[18] the only incident at a commercial nuclear power plant that might lead to any deaths or injuries to the public has been the Three Mile Island accident, in which more than half the reactor core melted. Public exposure to radioactive materials released during that accident is expected to cause fewer than five deaths (and perhaps none) from cancer over the subsequent 30 years. A study of 32,000 people living within 5 miles of the reactor when the accident occurred found no significant increase in cancer rates through 1998, although the authors noted that some potential health effects "cannot be definitively excluded."[19]

The relatively small amounts of radioactivity released by nuclear plants during normal operation are not generally believed to pose significant hazards, although some groups contend that routine emissions are unacceptably risky. There is substantial scientific uncertainty about the level of risk posed by low levels of radiation exposure; as with many carcinogens and other hazardous substances, health effects can be clearly measured only at relatively high exposure levels. In the case of radiation, the assumed risk of low-level exposure has been extrapolated mostly from health effects documented among persons exposed to high levels of radiation, particularly Japanese survivors of nuclear bombing in World War II.

The consensus among most safety experts is that a severe nuclear power plant accident in the United States is likely to occur less frequently than once every 10,000 reactor-years of operation. (For the current U.S. fleet of about 100 reactors, that rate would yield an average of one severe accident every 100 years.) These experts believe that most severe accidents would have small public health impacts, and that accidents causing as many as 100 deaths would be much rarer than once every 10,000 reactor-years. On the other hand, some experts challenge the complex calculations that go into predicting such accident frequencies, contending that accidents with serious public health consequences may be more frequent.

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[18] *Nuclear Engineering International*, "Country averages as at end March 2006," August 2006, p. 38.

[19] Evelyn O. Talbott et al., "Long Term Follow-Up of the Residents of the Three Mile Island Accident Area: 1979-1998," Environmental Health Perspectives, published online Oct. 30, 2002, at [http://ehp.niehs.nih.gov/docs/2003/5662/abstract.html].

Reactor Safety in the Former Soviet Bloc. The Chernobyl accident was by far the worst nuclear power plant accident to have occurred anywhere in the world. At least 31 persons died quickly from acute radiation exposure or other injuries, and thousands of additional cancer deaths among the tens of millions of people exposed to radiation from the accident may occur during the next several decades.

According to a 2006 report by the Chernobyl Forum organized by the International Atomic Energy Agency, the primary observable health consequence of the accident was a dramatic increase in childhood thyroid cancer. The Chernobyl Forum estimated that about 4,000 cases of thyroid cancer have occurred in children who after the accident drank milk contaminated with high levels of radioactive iodine, which concentrates in the thyroid. Although the Chernobyl Forum found only 15 deaths from those thyroid cancers, it estimated that about 4,000 other cancer deaths may have occurred among the 600,000 people with the highest radiation exposures, plus an estimated 1% increase in cancer deaths among persons with less exposure. The report estimated that about 77,000 square miles were significantly contaminated by radioactive cesium.[20] Greenpeace issued a report in 2006 estimating that 200,000 deaths in Belarus, Russia, and Ukraine resulted from the Chernobyl accident between 1990 and 2004.[21]

Licensing and Regulation

For many years, a top priority of the nuclear industry was to modify the process for licensing new nuclear plants. No electric utility would consider ordering a nuclear power plant, according to the industry, unless licensing became quicker and more predictable, and designs were less subject to mid-construction safety-related changes required by NRC. The Energy Policy Act of 1992 (P.L. 102-486) largely implemented the industry's licensing goals, but no plants have been ordered.

Nuclear plant licensing under the Atomic Energy Act of 1954 (P.L. 83-703; U.S.C. 2011-2282) had historically been a two-stage process. NRC first issued a construction permit to build a plant and then, after construction was finished, an operating permit to run it. Each stage of the licensing process involved complicated proceedings. Environmental impact statements also are required under the National Environmental Policy Act.

Over the vehement objections of nuclear opponents, the Energy Policy Act of 1992 provides a clear statutory basis for one-step nuclear licenses, which would combine the construction permits and operating licenses and allow completed plants to operate without delay if construction criteria were met. NRC would hold preoperational hearings on the adequacy of plant construction only in specified circumstances. DOE's Nuclear Power 2010 initiative (discussed above) proposes to pay up to half the cost of combined construction and operating licenses for two

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[20] The Chernobyl Forum: 2003-2005, *Chernobyl's Legacy: Health, Environmental and Socio-Economic Impacts*, International Atomic Energy Agency, April 2006.

[21] Greenpeace. *The Chernobyl Catastrophe: Consequences on Human Health*, April 2006, p. 10.

advanced reactors. Section 638 of the Energy Policy Act of 2005 authorizes federal payments to the owner of a completed reactor whose operation is delayed by regulatory action.

A fundamental concern in the nuclear regulatory debate is the performance of NRC in issuing and enforcing nuclear safety regulations. The nuclear industry and its supporters have regularly complained that unnecessarily stringent and inflexibly enforced nuclear safety regulations have burdened nuclear utilities and their customers with excessive costs. But many environmentalists, nuclear opponents, and other groups charge NRC with being too close to the nuclear industry, a situation that they say has resulted in lax oversight of nuclear power plants and routine exemptions from safety requirements.

Primary responsibility for nuclear safety compliance lies with nuclear plant owners, who are required to find any problems with their plants and report them to NRC. Compliance is also monitored directly by NRC, which maintains at least two resident inspectors at each nuclear power plant. The resident inspectors routinely examine plant systems, observe the performance of reactor personnel, and prepare regular inspection reports. For serious safety violations, NRC often dispatches special inspection teams to plant sites.

In response to congressional criticism, NRC has been reorganizing and overhauling many of its procedures. The Commission is moving toward "risk-informed regulation," in which safety enforcement is guided by the relative risks identified by detailed individual plant studies. NRC's risk-informed reactor oversight system, inaugurated April 2, 2000, relies on a series of performance indicators to determine the level of scrutiny that each reactor should receive.

Reactor Security

Nuclear power plants have long been recognized as potential targets of terrorist attacks, and critics have long questioned the adequacy of the measures required of nuclear plant operators to defend against such attacks. All commercial nuclear power plants licensed by NRC have a series of physical barriers to accessing the operating reactor area and are required to maintain a trained security force to protect them. Following the terrorist attacks of September 11, 2001, NRC began a "top-to-bottom" review of its security requirements.

A key element in protecting nuclear plants is the requirement that simulated terrorist attack exercises, monitored by NRC, be carried out to test the ability of the plant operator to defend against them. The severity of attacks to be prepared for are specified in the form of a "design basis threat" (DBT). After more than a year's review, on April 29, 2003, NRC changed the DBT to "represent the largest reasonable threat against which a regulated private guard force should be expected to defend under existing law." The details of the revised DBT were not released to the public.

The Energy Policy Act of 2005 requires NRC to revise the DBT based on an assessment of terrorist threats, the potential for multiple coordinated attacks, possible suicide attacks, and other criteria. NRC's proposed DBT revision was published in the *Federal Register* on November 7, 2005. The new energy law also requires NRC to conduct force-on-force security exercises at nuclear power plants every three years (which was NRC's previous policy), authorizes firearms use by nuclear security personnel (preempting some state restrictions), establishes federal security coordinators, and requires fingerprinting of nuclear facility workers.

(For background on security issues, see CRS Report RS21131, *Nuclear Power Plants: Vulnerability to Terrorist Attack*, by Mark Holt and Anthony Andrews.)

Decommissioning

When nuclear power plants end their useful lives, they must be safely removed from service, a process called *decommissioning*. NRC requires nuclear utilities to make regular contributions to special trust funds to ensure that money is available to remove radioactive material and contamination from reactor sites after they are closed. The first full-sized U.S. commercial reactors to be decommissioned were the Trojan plant in Oregon, whose decommissioning received NRC approval on May 23, 2005, and the Maine Yankee, for which NRC approved most of the site cleanup on October 3, 2005. The Trojan decommissioning cost $429 million, according to reactor owner Portland General Electric, and the Maine Yankee decommissioning cost about $500 million.[22] Those costs are within the range estimated by a 1996 DOE report of about $150 million to $600 million in 1995 dollars.

The tax treatment of decommissioning funds has been a continuing issue. The Energy Policy Act of 2005 provides favorable tax treatment to nuclear decommissioning funds, subject to certain restrictions.

Nuclear Accident Liability

Liability for damages to the general public from nuclear incidents is addressed by the Price-Anderson Act (primarily Section 170 of the Atomic Energy Act of 1954, 42 U.S.C. 2210). The Energy Policy Act of 2005 extended Price-Anderson coverage for new reactors and new DOE nuclear contracts through the end of 2025.

Under Price-Anderson, the owners of commercial reactors must assume all liability for nuclear damages awarded to the public by the court system, and they must waive most of their legal defenses following a severe radioactive release ("extraordinary nuclear occurrence"). To pay any such damages, each licensed reactor must carry financial protection in the amount of the maximum liability insurance available, currently $300 million. Any damages exceeding that amount are to be assessed equally against all covered commercial reactors, up to $95.8 million per reactor. Those assessments — called "retrospective premiums" — would be paid at an annual rate of no more than $15 million per reactor, to limit the potential financial burden on reactor owners following a major accident. According to NRC, 104 commercial reactors are currently covered by the Price-Anderson retrospective premium requirement.

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[22] Sharp, David, "NRC Signs Off On Maine Yankee's Decommissioning," *Associated Press*, Oct. 3, 2005.

For each nuclear incident, the Price-Anderson liability system currently would provide up to $10.8 billion in public compensation. That total includes the $300 million in insurance coverage carried by the reactor that suffered the incident, plus the $95.8 million in retrospective premiums from each of the 104 currently covered reactors, totaling $10.3 billion. On top of those payments, a 5% surcharge may also be imposed, raising the total per-reactor retrospective premium to $100.6 million and the total available compensation to about $10.8 billion. Under Price-Anderson, the nuclear industry's liability for an incident is capped at that amount, which varies depending on the number of covered reactors, the amount of available insurance, and an inflation adjustment that is made every five years. Payment of any damages above that liability limit would require congressional approval under special procedures in the act.

The Energy Policy Act of 2005 raised the limit on per-reactor annual payments to $15 million from the previous $10 million, and required the annual limit to be adjusted for inflation every five years. As under previous law, the total retrospective premium limit of $95.8 million is to be adjusted every five years as well. For the purposes of those payment limits, a nuclear plant consisting of multiple small reactors (100-300 megawatts, up to a total of 1,300 megawatts) would be considered a single reactor. Therefore, a power plant with six 120-megawatt pebble-bed modular reactors would be liable for retrospective premiums of up to $95.8 million, rather than $574.8 million (excluding the 5% surcharge).

The Price-Anderson Act also covers contractors who operate hazardous DOE nuclear facilities. The Energy Policy Act of 2005 set the liability limit on DOE contractors at $10 billion per accident, to be adjusted for inflation every five years. The liability limit for DOE contractors previously had been the same as for commercial reactors, excluding the 5% surcharge, except when the limit for commercial reactors dropped because of a decline in the number of covered reactors. Price-Anderson authorizes DOE to indemnify its contractors for the entire amount of their liability, so that damage payments for nuclear incidents at DOE facilities would ultimately come from the Treasury. However, the law also allows DOE to fine its contractors for safety violations, and contractor employees and directors can face criminal penalties for "knowingly and willfully" violating nuclear safety rules.

The Energy Policy Act of 2005 limits the civil penalties against a nonprofit contractor to the amount of management fees paid under that contract. Previously, Atomic Energy Act §234A specifically exempted seven nonprofit DOE contractors and their subcontractors from civil penalties and authorized DOE to automatically remit any civil penalties imposed on nonprofit educational institutions serving as DOE contractors. The Energy Policy Act eliminated the civil penalty exemption for future contracts by the seven listed nonprofit contractors and DOE's authority to automatically remit penalties on nonprofit educational institutions.

The Price-Anderson Act's limits on liability were crucial in establishing the commercial nuclear power industry in the 1950s. Supporters of the Price-Anderson system contend that it has worked well since that time in ensuring that nuclear accident victims would have a secure source of compensation, at little cost to the taxpayer. Extension of the act was widely considered a prerequisite for new nuclear reactor construction in the United States. Opponents contend that Price-Anderson inappropriately subsidizes the nuclear power industry by reducing its insurance costs and protecting it from some of the financial consequences of the most severe conceivable accidents.

Nuclear Waste Management

One of the most controversial aspects of nuclear power is the disposal of radioactive waste, which can remain hazardous for thousands of years. Each nuclear reactor produces an annual average of about 20 metric tons of highly radioactive spent nuclear fuel, for a nationwide total of about 2,000 metric tons per year. Each reactor also annually generates about 50-200 cubic meters of low-level radioactive waste, plus contaminated reactor components that are also disposed of as low-level waste, especially after a reactor is decommissioned.

The federal government is responsible for permanent disposal of commercial spent fuel (paid for with a fee on nuclear power) and federally generated radioactive waste, whereas states have the authority to develop disposal facilities for commercial low-level waste. Under the Nuclear Waste Policy Act (42 U.S.C. 10101, et seq.), spent fuel and other highly radioactive waste is to be isolated in a deep underground repository, consisting of a large network of tunnels carved from rock that has remained geologically undisturbed for hundreds of thousands of years. Yucca Mountain in Nevada is the only candidate site for the national repository. The act required DOE to begin taking waste from nuclear plant sites by 1998 — a deadline that under DOE's latest schedule will be missed by nearly 20 years.

After numerous delays, DOE announced July 19, 2006, that it would submit a Yucca Mountain license application to NRC by June 30, 2008. If Congress passes proposed changes in the repository licensing process, according to DOE, nuclear waste shipments to Yucca Mountain could begin by 2017. The waste program is run by DOE's Office of Civilian Radioactive Waste Management (OCRWM).

For FY2007, the Administration requested $544.5 million for the civilian nuclear waste program, $50 million above the FY2006 level. Because of the Yucca Mountain delays, the House added $30 million to the request "to initiate the process for selecting and licensing one or more interim storage sites," as explained by the House Appropriations Committee:

> If the Congress has not provided the Department with clear statutory authority for interim storage by the end of FY2007, the remaining funds shall be re-directed to non-site-specific activities to select a second repository for nuclear waste disposal, consistent with Section 161 of the Nuclear Waste Policy Act [which prohibits site-specific activities on a second repository].

The Senate Appropriations Committee voted to cut the request to $494.5 million, about the same as the FY2006 funding level. Delays in the Yucca Mountain program "have forced the Committee to reconsider the project's budget needs," according to the panel's report.

Because of the continued delays, the Senate panel added an extensive provision to the Energy and Water bill (section 313) to authorize the Secretary of Energy to designate storage sites for spent nuclear fuel. The Secretary would be required, after consultation with the governor, to designate a storage site in each state with a nuclear power plant, if feasible, or to designate regional facilities. Such sites would have to be federally owned or able to be purchased by the federal government from a willing seller and could not be located in Nevada or Utah (which has a licensed but undeveloped private storage site). DOE would be required to take over all responsibility for spent fuel stored at shutdown reactors, upon the reactor owners' request. The storage provisions in this section would be deemed sufficient to satisfy NRC requirements that new nuclear power plants demonstrate the ability to safely dispose of nuclear waste before being licensed to operate. However, the appropriations bill died at the end of the 109th Congress, and the waste program is currently funded by a continuing resolution.

The delays in the Yucca Mountain program follow a July 9, 2004, ruling by the U.S. Court of Appeals for the District of Columbia Circuit that overturned a key aspect of the Environmental Protection Agency's (EPA's) regulations for the planned repository.[23] The three-judge panel ruled that EPA's 10,000-year compliance period was too short, but it rejected several other challenges to the rules. EPA proposed a new standard on August 9, 2005, that would allow higher radiation exposure from the repository after 10,000 years.

The quality of scientific work at Yucca Mountain was called into question by DOE's March 16, 2005, disclosure of e-mails from geologists indicating that some quality assurance documentation had been falsified. DOE announced February 17, 2006, that the technical work conducted by the geologists was sound but that some work would be redone or further corroborated before submission of a repository license application.

Further delays in the nuclear waste program could prove costly to the federal government under a settlement announced on August 10, 2004, between the Department of Justice and Exelon Corporation, which had filed a breach-of-contract suit over DOE's failure to begin accepting spent fuel by 1998 as required by NWPA. Under the settlement, Exelon is to be reimbursed from the federal Judgment Fund for its spent fuel storage costs caused by the waste program delays. Exelon estimates that it will receive up to $600 million if waste acceptance does not begin until 2015. Several other utilities have also negotiated settlements. The Tennessee Valley Authority on January 31, 2006, won a $34.9 million judgment from the U.S. Court of Federal Claims for waste storage costs incurred through September 2004, and three New England reactor owners were granted awards totaling $143 million in

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[23] *Nuclear Energy Institute v. Environmental Protection Agency*, U.S. Court of Appeals for the District of Columbia Circuit, no. 01-1258, July 9, 2004.

September 2006.[24] Numerous other utility claims are pending.[25] (For further details, see CRS Report RL33461, *Civilian Nuclear Waste Disposal*, by Mark Holt.)

Federal Funding for Nuclear Energy Programs

The following tables summarize current funding for DOE nuclear fission programs and NRC. The sources for the funding figures are Administration budget requests and committee reports on the Energy and Water Development Appropriations Acts, which fund all the nuclear programs. President Bush submitted his FY2007 funding request on February 6, 2006. The House passed the FY2007 Energy and Water Development Appropriations Bill (H.R. 5427, H.Rept. 109-474) on May 24, 2006, and the Senate Appropriations Committee approved its version of the measure June 29, 2006. The bill was not enacted by the 109th Congress, so all DOE programs are currently funded under a continuing resolution.

Table 2. Funding for the Nuclear Regulatory Commission

(budget authority in millions of current dollars)

	FY2006 Approp.	FY2007 Request	FY2007 House	FY2007 Sen. Com.
Nuclear Regulatory Commission				
— Reactor Licensing	302.8	341.3	— [a]	— [a]
— Reactor Inspection	212.4	222.0	—	—
— Fuel Facility Licensing and Inspection	40.1	37.6	—	—
— Nuclear Materials	80.1	74.3	—	—
— High-Level Waste Repository	45.7	41.0	—	—
— Decommission. and Low-Level Waste	27.4	25.7	—	—
— Spent Fuel Storage and Transportation	24.8	26.5	—	—
— Inspector General	8.3	8.1	8.1	8.1
Total NRC budget Authority	**741.5**	**776.6**	**816.5**	**816.5**
— Offsetting fees	**624.7**	**627.7**	**663.6**	**663.6**
Net appropriation	**116.8**	**148.9**	**152.9**	**152.9**

a. Subcategories not specified.

[24] U.S. Court of Federal Claims, *Yankee Atomic Electric Company v. the United States*, No. 98-126C, unsealed Oct. 4, 2006.

[25] Hiruo, Elaine, and Tom Harrison, "TVA, Negotiated Settlements Add to Taxpayers' Yucca Mt. Bill," *NuclearFuel*, Mar. 13, 2006, p. 11.

Table 3. DOE Funding for Nuclear Activities
(budget authority in millions of current dollars)

	FY2006 Approp.	FY2007 Request	FY2007 House	FY2007 Sen. Com.
Nuclear Energy (selected programs)				
University Reactor Assistance	26.7	0	27.0	27.0
Nuclear Power 2010	65.3	54.0	54.0	88.0
Generation IV Nuclear Systems	54.5	31.4	31.4	48.0
Nuclear Hydrogen Initiative	24.8	18.7	18.7	31.7
Advanced Fuel Cycle Initiative	79.2	243.0	120.0	279.0
Nuclear R&D Infrastructure[a]	241.1	218.0	257.0	243.0
Program Direction	60.5	67.6	64.6	67.6
Total, Nuclear Energy	535.7	632.7	572.8	784.2
Civilian Nuclear Waste Disposal[b]	495.0	544.5	574.5	494.5

a. Funded under "other defense activities" and naval reactors until FY2007. In FY2007 request, all infrastructure except $72.9 million for Idaho Sitewide Safeguards and Security is transferred to the Energy Supply and Conservation account.

b. Funded by a 1-mill-per-kilowatt-hour fee on nuclear power, plus appropriations for defense waste disposal and homeland security.

109th Congress Legislation

H.R. 6 (Barton)

Energy Policy Act of 2005. Omnibus energy legislation that provides incentives for new nuclear power plants, extends Price-Anderson nuclear liability system, authorizes nuclear R&D programs, and requires security measures at nuclear facilities. Introduced April 18, 2005; referred to multiple committees. Passed House April 21, 2005, by vote of 249-183. Passed Senate June 28, 2005, by vote of 85-12. Conference report (H.Rept. 109-90) passed House July 28, 2005, by vote of 275-156; passed Senate July 29 by vote of 74-26. Signed by President August 8, 2005 (P.L. 109-58).

H.R. 526 (Berkley)

Redirect the Nuclear Waste Fund established under the Nuclear Waste Policy Act of 1982 into research, development, and utilization of risk-decreasing technologies for the onsite storage and eventual reduction of radiation levels of nuclear waste, and for other purposes. Introduced February 2, 2005; referred to Committees on Energy and Commerce; Science; Ways and Means.

H.R. 966 (Saxton)

Require the Nuclear Regulatory Commission to consider certain criteria in relicensing nuclear facilities, and to provide for an independent assessment of the Oyster Creek Nuclear Generating Station by the National Academy of Sciences prior to any relicensing of that facility. Introduced February 17, 2005; referred to Committee on Energy and Commerce.

H.R. 2419 (Hobson)

Energy and Water Development Appropriations for FY2006. Includes funding for DOE nuclear programs. Introduced and reported as an original measure by the House Appropriations Committee May 18, 2005 (H.Rept. 109-86). Passed House May 24, 2005, by vote of 416-13. Passed Senate July 1, 2005, by vote of 92-3 (S.Rept. 109-84). Signed by President November 19, 2005 (P.L. 109-103).

H.R. 4538 (Matheson)/S. 2099 (Reid)

Spent Nuclear Fuel On-Site Storage Security Act of 2005. Requires commercial nuclear power plants to transfer spent fuel from pools to dry storage casks and then convey title to the Secretary of Energy. Introduced December 14, 2005. House bill referred to Committee on Energy and Commerce; Senate bill referred to Committee on Environment and Public Works.

H.R. 4601 (Lowey)

Nuclear Accountability Act. Prohibits operation of a nuclear power plant unless NRC finds that the state in which the facility is located, as well as each affected county or county-equivalent located within a 10-mile radius of such facility, has certified within the last year a radiological emergency response plan that provides reasonable assurance that public health and safety is not endangered by the facility's operation. Introduced December 16, 2005; referred to Committee on Energy and Commerce.

H.R. 4602 (Lowey)

Nuclear Security Act of 2005. Instructs NRC to (1) establish a nuclear security force composed of NRC employees to provide for the security of all sensitive nuclear facilities against the design basis threat and (2) develop and implement a security plan containing specified elements for each sensitive nuclear facility to ensure the security of all sensitive nuclear facilities against such threat. Introduced December 16,2005; referred to Committee on Energy and Commerce.

H.R. 4825 (Weller)/S. 2348 (Obama)

Nuclear Release Notice Act of 2006. Requires notification of federal and state agencies about releases of radioactive materials above allowable limits. Introduced March 1, 2006; referred to House Committee on Energy and Commerce and Senate Committee on Environment and Public Works.

H.R. 5360 (Barton, by request)/S. 2589 (Domenici, by request)

Nuclear Fuel Management and Disposal Act. Changes requirements for licensing, construction, and operation of planned Yucca Mountain nuclear waste repository. Senate bill introduced April 6, 2006; referred to Committee on Energy and Natural Resources. House bill introduced May 11, 2006; referred to multiple committees.

H.R. 5427 (Hobson)

Energy and Water Development Appropriations for FY2007. Includes funding for DOE nuclear programs. Introduced and reported as an original measure by the House Appropriations Committee May 19, 2006 (H.Rept. 109-474). Passed House May 24, 2006, by vote of 404-20. Approved by Senate Appropriations Committee June 29, 2006, by vote of 28-0.

S. 10 (Domenici)

Energy Policy Act of 2005. Includes provisions on electricity regulation and reliability, energy research and development, alternative fuels, and energy access to public lands. Introduced as an original bill and reported June 9, 2005, by the Committee on Energy and Natural Resources (S.Rept. 109-78). Ordered reported May 26 by a vote of 21-1. Text substituted for H.R. 6.

S. 387 (Hagel)

Amend the Internal Revenue Code of 1986 to provide tax incentives for investment in greenhouse gas intensity reduction projects, including a production tax credit for nuclear-generated electricity. Introduced February 15, 2005; referred to Committee on Finance.

S. 388 (Hagel)

Amend the Energy Policy Act of 1992 to direct the Secretary of Energy to carry out activities that promote the adoption of technologies that reduce greenhouse gas intensity, including advanced nuclear power plants, and to provide credit-based financial assistance and investment protection for projects that employ advanced climate technologies or systems. Introduced February 15, 2005; referred to Committee on Energy and Natural Resources.

S. 2610 (Inhofe)

Amends the Nuclear Waste Policy Act of 1982 regarding Yucca Mountain site application procedures to provide that an application for construction authorization shall not be required to contain information relating to any surface facility other than those necessary for initial operation of the repository. Introduced April 7, 2006; referred to Committee on Environment and Public Works.

S. 3962 (Domenici)

Nuclear Fuel Management and Disposal Act. Authorizes interim storage of spent nuclear fuel at the Yucca Mountain site, repeals the capacity limitation on the Yucca Mountain repository, authorizes a rail line to Yucca Mountain, and exempts Nuclear Waste Fund appropriations from budget allocations. Introduced September 27, 2006; referred to Committee on Energy and Natural Resources