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Renewable Energy: Tax Credit, Budget, and Electricity Production Issues

Updated September 24, 2003

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Renewable Energy: Tax Credit, Budget, and Electricity Production Issues

SUMMARY

Energy security, a major driver of federal renewable energy programs in the past, came back into play as oil and gas prices rose late in the year 2000. The terrorist attack of September 11, 2001, and the Iraq war of 2003 have led to heightened concern about energy security, energy infrastructure vulnerability, and the need for alternative fuels. Further, the 2001 electricity shortages in California, the high natural gas prices in 2003, and the northeast-midwest blackout of 2003 brought a new emphasis to the role that renewable energy may play in producing electricity, displacing fossil fuel use, and curbing demand for power transmission equipment.

Also, worldwide emphasis on environmental problems of air and water pollution and global climate change, the related development of clean energy technologies in western Europe and Japan, and technology competitiveness may remain important influences on renewable energy policymaking.

In the 108th Congress, debate over renewable energy programs is focusing on tax credits, incentives, budget, and provisions of the omnibus energy policy bills, S. 14 and H.R. 6.

The Bush Administration's FY2004 budget request for DOE's Renewable Energy Program seeks \$444.2 million (including \$72.9 million for Electric/Storage). The House-passed Energy and Water Appropriations bill recommends \$330.1 million for Renewable Energy and \$77.4 million for a new Electricity Transmission and Distribution (ET&D) program that replaces the former Electric/Storage subprogram. The Renewable Energy total is \$41.2 million less than the request and \$4.9 million less than the FY2003

appropriation.

The Senate approved \$358.5 million (including an \$8.0 million transfer) for the DOE Renewable Energy Program and \$100.4 million for the new Office of Electricity Transmission and Distribution (OETD), which replaced the Electric/Storage subprogram. Compared to FY2003, there is \$23.4 million more for renewables and \$16.0 million more for OETD.

The Senate version of the Foreign Operations appropriations bill (S. 1426, S.Rept. 108-222) has \$185 million for "energy conservation, energy efficiency, and clean energy" in developing countries to reduce greenhouse gases.

The House-passed omnibus energy bill (H.R. 6) has a renewable energy production tax credit (PTC), renewable energy fuel standard (RFS), and several other renewables provisions.

After floor action on S. 14 stalled, the Senate passed its version of H.R. 6 with the text of the Senate version of H.R. 4 from the 107th Congress. It has many renewables provisions similar to those in the House bill, but without refinements that had been worked out for S. 14. One renewable portfolio standard (RPS) floor amendment to S. 14 (S.Amdt. 1480) is expected to see action in conference. It would create a 10% RPS target. It is similar to the RPS in the Senate version of H.R. 6, but it is simpler and less prescriptive. The Administration opposes RPS in the Senate version of H.R. 6, citing higher power costs. RPS proponents say DOE reports show the cost impact is negligible.



MOST RECENT DEVELOPMENTS

On September 16, 2003, the Senate passed the Energy and Water Appropriations Bill, FY2004 (as H.R. 2754, in lieu of S. 1424, S.Rept. 108-105). Under DOE's Office of Energy Efficiency and Renewable Energy (EERE), the Senate approved \$358.5 million for the Renewable Energy Program and \$100.4 million for the new Office of Electricity Transmission and Distribution (OETD), which replaced the former Electric/Storage subprogram. Three floor amendments for renewables (S.Amdt. 1697, S.Amdt. 1709, S.Amdt. 1717) do not change funding amounts, but do qualify some funding uses. Compared to the FY2003 appropriation, the Senate bill has \$39.4 million more. This includes \$23.4 million, or 7%, more for renewables and \$16.0 million, or 19%, more for OETD. (For more details, see "FY2004 DOE Budget" and **Table 4**.)

In a September 10, 2003, letter to the energy conference committee, DOE Secretary Spencer Abraham stated support for the renewable fuel standard (RFS) provision and opposition to the provisions for hydrogen, renewable portfolio standard (RPS), and research and development authorizations. The most important and difficult provisions before the committee, labeled as "tier 1" issues, include the liability aspects of the fuel standard and the RPS. The conference leadership has set an October 1 target to present a proposal to the conference committee that addresses the tier 1 issues.

The omnibus energy bill, H.R. 6, has a number of renewable energy provisions. In particular, the Senate version of H.R. 6, as passed, has an RPS provision in Sections 264 and 271. It is the same provision that the Senate adopted in the 107th Congress. There is no RPS provision in S. 14. Two RPS floor amendments (S.Amdt. 1480 and S.Amdt. 1530) to S. 14 were filed, but did not see action before the Senate substituted the text of the Senate version of H.R. 4 from the 107th Congress. Conference action is not expected for S.Amdt. 1530, but action is expected on S.Amdt. 1480, which may come up as part of a broader proposal on electricity. S.Amdt. 1480 would have set a 10% RPS and included refinements to the RPS provision in the Senate version of H.R. 6. (For a comparison of the House and Senate provisions, see "Renewables in Omnibus Energy Bills, 108th Congress," below; and see CRS Report RL32033, *Omnibus Energy Legislation (H.R. 6): Side-by-Side Comparison of Non-tax provisions*.)

(The DOE FY2004 Budget Request is on the DOE web site at [<http://www.mbe.doe.gov/budget/04budget/content/es/solar.pdf>].)

BACKGROUND AND ANALYSIS

Renewable Energy Concept

Renewable energy is derived from resources that are generally not depleted by human use, such as the sun, wind, and water movement. These primary sources of energy can be converted into heat, electricity and mechanical energy in several ways. There are some mature technologies for conversion of renewable energy such as hydropower, biomass, and waste combustion. Other conversion technologies, such as wind turbines and photovoltaics, are already well-developed, but have not achieved the technological efficiency and market

penetration which many expect they will ultimately reach. Although geothermal energy is produced from geological rather than solar sources, it is often included as a renewable energy resource and this brief treats it as one. Commercial nuclear power is not generally considered to be a renewable energy resource. (For further definitions of renewable energy, see the National Renewable Energy Laboratory's web site information on "Clean Energy 101" at [http://www.nrel.gov/clean_energy/].)

Contribution to National Energy Supply

According to the Energy Information Administration's (EIA's) *Annual Energy Outlook 2003*, renewable energy resources (excluding wood use for home heating) supplied about 5.3 Q (quadrillion Btu's or quads) of the 97.3 Q the nation used in 2001, or about 5.4% of national energy demand. More than half of renewable energy production takes the form of electricity supply. Of this, most is provided by large hydropower. However, from 1998 through 2001, a drought-driven decline in hydroelectric availability led to a major drop in national renewable energy use. Industrial use of renewables, supplied primarily by biofuels, accounts for most of the remaining contribution.

After more than 25 years of federal support, some note that renewable energy has achieved neither a high level of market penetration nor a growing market share among other energy sources. A recent review of renewable energy studies by Resources for the Future, *Renewable Energy: Winner, Loser, or Innocent Victim?*, concludes that the lower-than-projected market penetration and flat market share are due primarily to declining fossil fuel and electricity prices during this period. In contrast, however, it notes that the costs for renewable energy technologies have declined by amounts equal to or exceeding those of earlier projections.

EIA's *Annual Energy Outlook 2003* projects that current policies would yield a 2.1% average annual increase in renewable energy production to 8.8 Q through 2025, resulting in a 65% total increase. This would amount to about 6.3% of the projected 139 Q total demand in 2025. (Detailed breakdowns of renewable energy use appear in EIA's *Renewable Energy Annual 2001* and *Renewable Energy 2000: Issues and Trends*.)

Role in Long-Term Energy Supply

Our Common Future, the 1987 report of the United Nations' World Commission on Environment and Development, found that "energy efficiency can only buy time for the world to develop 'low-energy paths' based on renewable sources." Though many renewable energy systems are in a relatively early stage of development, they offer "a potentially huge primary energy source, sustainable in perpetuity and available in various forms to every nation on Earth." The report suggested that a Research, Development, and Demonstration (RD&D) program of renewable energy projects is required to attain the level of primary energy now obtained from a mix of fossil, nuclear, and renewable energy resources.

The *Agenda 21* adopted at the 1992 United Nations Conference on Environment and Development (UNCED) concluded that mitigating urban air pollution and the adverse impact of energy use on the atmosphere — such as acid rain and climate change — requires an emphasis on "clean and renewable energy sources." The U.N. Commission on Sustainable

Development oversees implementation of *Agenda 21*. The 2002 U.N. World Summit on Sustainable Development (Johannesburg Summit) adopted a *Political Declaration* and a *Plan of Implementation* (<http://www.johannesburgsummit.org/>), which includes “Clean Energy” as one of five key policy actions. The U.S. Department of State plans to implement a \$43 million Clean Energy Initiative in 2003 (<http://www.state.gov/g/oes/sus/wssd/>), and the European Union committed to a \$700 million energy partnership.

History

The oil embargo of 1973 sparked a quadrupling of energy prices, major economic shock, and the establishment of a comprehensive federal energy program to help with the nation’s immediate and long-term energy needs. During the 1970s, the federal renewable energy program grew rapidly to include basic and applied R&D, and joint federal participation with the private sector in demonstration projects, commercialization, and information dissemination. In addition, the federal government instituted market incentives, such as business and residential tax credits, and created a utility market for non-utility produced electric power through the Public Utility Regulatory Policies Act (P.L. 95-617).

The subsequent failure of the oil cartel and the return of low oil and gas prices in the early 1980s slowed the federal program. Despite Congress’s consistent support for a broader, more aggressive renewable energy program than any Administration, federal spending for these programs fell steadily through 1990. Until 1994, Congress led policy development and funding through legislative initiatives and close reviews of annual budget submissions. FY1995 marked a noteworthy shift, with the 103rd Congress for the first time approving less funding than the Administration had requested. The 104th Congress approved 23% less than the Clinton Administration request for FY1996 and 8% less for FY1997. However, funding turned upward again during the 105th Congress and in the 106th Congress. (A detailed description of DOE programs appears in DOE’s *FY2003 Congressional Budget Request*, DOE/ME-0003, v. 3, February 2002.)

From FY1973 through FY2002, the federal government spent about \$14.2 billion (in 2003 constant dollars) for renewable energy R&D. Renewable energy R&D funding grew from less than \$1 million per year in the early 1970s to over \$1.4 billion in FY1979 and FY1980, then declined steadily to \$148 million in FY1990. By FY2002, it reached \$403 million in 2003 constant dollars.

This spending history can be viewed within the context of DOE spending for the three major energy supply R&D programs: nuclear, fossil, and energy efficiency R&D. From FY1948 through FY1972, in 2003 constant dollars, the federal government spent about \$24.3 billion for nuclear (fission and fusion) energy R&D and about \$5.5 billion for fossil energy R&D. From FY1973 through FY2002, the federal government spent \$49.1 billion for nuclear (fission and fusion), \$24.8 billion for fossil, \$14.2 billion for renewables, and \$11.1 billion for energy efficiency. Total energy R&D spending from FY1948-FY2002, in 2003 constant dollars, reached \$128.9 billion, including \$73.4 billion, or 57%, for nuclear, \$30.2 billion, or 23%, for fossil, \$14.2 billion, or 11%, for renewables, and \$11.1 billion, or 9%, for energy efficiency.

Tax Credits. The Energy Tax Act of 1978 (P.L. 95-618) created residential solar credits and the residential and business credits for wind energy installations; it expired on

December 31, 1985. However, business investment credits were extended repeatedly through the 1980s. Section 1916 of the Energy Policy Act of 1992 (EPACT, P.L. 102-486) extended the 10% business tax credits for solar and geothermal equipment indefinitely. Also, EPACT Section 1914 created an income tax “production” credit of 1.5 cents/kwh for electricity produced by wind and closed-loop biomass (energy crops or trees grown only for use as a fuel) systems. P.L. 106-170 expanded this credit to include poultry waste. On March 9, 2002, the Job Creation and Worker Assistance Act of 2002 (P.L. 107-147, H.R. 3090) was signed into law. Section 603 extends the production tax credit for wind, closed-loop biomass, and poultry waste, retrospectively, from December 31, 2001 to December 31, 2003.

Public Utility Regulatory Policies Act. The Public Utilities Regulatory Policies Act (PURPA, P.L. 96-917) required electric utilities to purchase power produced by qualified renewable power facilities. Under PURPA, the Federal Energy Regulatory Commission (FERC) established rules requiring that electric utilities purchase power from windfarms and other small power producers at an “avoided cost” price based on energy and capacity costs that the utility would otherwise incur by generating the power itself or purchasing it elsewhere. However, to receive avoided cost payments, each renewables facility must file for, and obtain, qualifying facility (QF) status from FERC. EIA’s *Renewable Energy 2000: Issues* reports that, in 1998, QF renewable power capacity reached 12,700 megawatts (MW) and generation reached 64 billion kilowatt-hours (kwh). Thus, QFs provided about 1.6% of national electric capacity and about 1.7% of national electricity generation. In comparison, the capacity of all renewables reached 94,800 MW, or about 12% of national capacity; and generation for all renewables stood at 418,000, which is about 11.5% of national generation.

State and Local Government Roles. State and local governments have played a key role in renewable energy development. For example, in the early 1980s, a generous state investment tax for wind energy in California combined with PURPA and the federal tax credit to stimulate industry development of the first windfarms. California and New York have invested some state funds in renewable energy R&D. Recently, Texas and several other states have used a regulatory tool, the renewable energy portfolio standard (RPS), to encourage renewable energy. Also, in 2001, the City of San Francisco enacted a \$100 million revenue bond (Proposition B, “Vote Solar”) to support solar and wind energy implementation.

(For more on federal, state, and local policies (incentives, grants, standards) for renewable energy, see Database of Incentives for Renewable Energy [<http://www.dsireusa.org/>].)

Renewables in Omnibus Energy Bills, 108th Congress

In the 108th Congress, most legislative action on renewables has focused on the omnibus energy policy bills, H.R. 6 and S. 14, the renewable fuel standard bills (S. 385 and S. 791), and the Senate energy tax bill, S. 1149 (replaced S. 597), which is expected to be considered in conference. On April 10, 2003, the House passed the omnibus energy bill (H.R. 6). It has a renewable energy production tax credit (PTC), renewable energy production incentive (REPI), renewable fuel standard (RFS), the residential solar and geothermal tax credit, and certain alternative fuels incentives. S. 14 and S. 1149 had similar provisions, but with some differences, including some refinements of the corresponding provisions in the Senate version of H.R. 6. Other renewables provisions cover hydroelectric relicensing, geothermal

leasing, biomass grants, and authorizations for renewable energy R&D programs. (For tier 1 issues [RPS, RFS, hydrogen], see CRS Report RL32078, which compares House and Senate versions of H.R. 6 with S. 14. For side-by-side comparisons of provisions in H.R. 6, see CRS Report RL32033 [non-tax provisions], CRS Report RL32042 [tax provisions], and CRS Report RL32041 [electricity provisions].)

Renewable Portfolio Standard (RPS). In the 107th Congress, a 10% RPS provision was adopted (58-42) into the Senate version of H.R. 4, the omnibus energy bill. The same provision is in the Senate-passed version of H.R. 6. While S. 14 did not include an RPS provision, S.Amdt. 1480 would have added one and is expected to be brought up in conference. The RPS provision in S.Amdt. 1480 has several differences from that in the Senate version of H.R. 6. The target percentage would ramp up 2.5% once every four years instead of 1.2% once every two years; and the sunset of the 10% peak would be extended for 10 years through 2030, maintaining the incentive effect in later years. Further, the exemption for small utilities would be expanded to include those that sell less than 4.0 billion kwh per year, and a triple credit would be provided for small (one megawatt or less) distributed generators. Also, the relationship between federal and state RPS measures would be structured in a more comprehensive yet more flexible way. An entirely new provision would direct DOE collections from penalties and credit sales to fund a state grant program to promote renewables, giving a priority to states that have a relatively small share of renewable energy generation capacity. (For more background information on how the RPS works, see *CRS Memorandum on Renewable Energy Portfolio Standard* at [<http://www.congress.gov/brbk/pdf/ebele27.pdf>]. For current status of RPS policies in the states, see Database of State Incentives for Renewable Energy at [<http://www.dsireusa.org/>].)

The Bush Administration has stated its opposition to the RPS provision in the Senate version of H.R. 6, noting concern that it could "... raise consumer costs, especially in areas where [renewable] resources are less abundant and harder to cultivate or distribute." In response, proponents of RPS cite the Energy Information Administration's (EIA's) 2001 report *Analysis of Strategies for Reducing Multiple Emission from Electric Power Plants: Sulfur Dioxide, Nitrogen Oxides, Carbon Dioxide, and Mercury and a Renewable Portfolio Standard*, which found that the RPS provision in the Senate version of H.R. 6 would have a negligible impact on consumer electricity prices, due its dampening effect on the cost of natural gas used for power generation. EIA studies of the RPS provision in S.Amdt. 1480 reached a similar finding. Further, proponents note that S.Amdt. 1480 would create a state grant program to help resource-constrained states meet the RPS targets. (The EIA study of the RPS in H.R. 6 is at [<http://tonto.eia.doe.gov/FTPROOT/service/oiaf2001-03.pdf>], and the EIA studies of the RPS in S.Amdt. 1480 are at [<http://tonto.eia.doe.gov/FTPROOT/service/servicepubs.htm>].)

Production Tax Credit (PTC) and Production Incentive. The existing renewable energy production tax credit provides a 1.8 cents/kwh credit for businesses that generate power from wind, closed-loop biomass (energy crops), and poultry waste for sale to the grid. P.L. 107-147 extended this credit through Dec. 31, 2003. Both the House version of H.R. 6 (Section 41002) and S. 1149 would extend the credit for three years, through Dec. 31, 2006. They would also expand the eligible sources to include open-loop biomass (forest, agricultural, and construction wastes). The House version of H.R. 6 would further extend the credit to landfill gas and trash combustion facilities. S. 1149 does not include landfill gas and trash facilities, but would expand credit eligibility to swine and

bovine waste, geothermal energy, solar energy, small irrigation power facilities, municipal biosolids, and recycled sludge. Further, S. 1149 (Section 104) sets conditions under which the credit could be transferable.

Parallel to the PTC, there is a renewable energy production “incentive” (REPI) for state and local governments. This 1.5 cent/kwh incentive was created by EPACT Section 1212 and it is funded through appropriations to DOE. The House version of H.R. 6 (Section 16072) and S. 14 (Section 502) have identical provisions that would extend this incentive through 2023 and add landfill gas to the list of eligible resources.

Renewable Energy Fuel Standard (RFS). According to the Renewable Fuels Association, the ethanol industry produced 2.2 billion gallons in 2002. The House version of H.R. 6 (Section 17101) sets a target for blending gasoline with renewable fuels, including ethanol and biodiesel. The RFS would start in 2005 at 2.7 billion gallons per year and grow to 5.0 billion gallons per year in 2015. Also, it extends exemption from product liability claims (safe harbor) to methyl tertiary-butyl ether (MTBE) producers. S.Amdt 850 (approved 67-29) to S. 14 added an RFS provision that sets a 5.0 billion gallon target for 2012. Further, it bans use of MTBE. Also, S.Amdt. 854 was approved (voice vote) as a second-degree amendment to S.Amdt. 850. It encourages the use of cellulosic ethanol to attain the target by raising the value of 1.0 gallon of cellulosic ethanol from a previous level of 1.5 gallons of renewable fuel to 2.5 gallons. Several amendments (nos. 843, 844, 851, 853) to allow waivers or exemptions from the RFS were defeated.

Renewable Hydrogen. The House version of H.R. 6 (Section 60003) would create a program to produce hydrogen from a variety of sources, including renewable energy and renewable fuels, as part of a broader effort to develop hydrogen fuels, vehicles, and infrastructure. Some hydrogen provisions of S. 14 (Sections 801-825) include references (e.g. Section 802) to renewables.

Residential Tax Credit. The House version of H.R. 6 (Section 41001) and S. 1149 (Section 303) would create a 15% residential tax credit worth up to \$2,000 for homeowners who purchase photovoltaics and solar water heating equipment. The Solar Energy Industry Association says the credit would be more effective with a \$4,000 cap and shorter eligibility period. S. 1149 also provides a 30% credit worth up to \$1,000 for wind energy equipment.

Alternative Fuels Incentives. In the House version of H.R. 6, Sections 15011-15024, 15046, 17102-17108, and 21703 have measures related to alternative fuels and vehicles. In S. 1149, Sections 201-209 contain incentives for ethanol, biodiesel, and other alternative fuels.

Other renewable energy provisions are identified in **Table 1**.

Table 1. Omnibus Energy Bills: Other Provisions

Provision	H.R. 6 (House)	S. 14
Hydropower	13001-13204	511
Cogen. / Small Power	16062	1145

Provision	H.R. 6 (House)	S. 14
Net Metering	16071	1141
Federal Lands	16073, 30501-30503	121-126
Resource Assessment	16074	501
Funding Authorization	21301-21322	931-935
Biomass / Biopower	21706, 30301	531-534
Indian Energy	30301	303
Geothermal Energy	30601-30614	521-526
Insular Areas	30801	505
Federal Purchases	H.Amdt. 72	504

Renewables Tax Revenue Effect. Table 2 compares the estimated 10-year revenue effect of renewable energy and alternative fuel tax provisions in H.R. 6 (House) and S. 1149. It also shows percentage share of renewables relative to the total in each bill.

Table 2. Omnibus Energy Bills, Tax Revenue Effect
(\$ billions)

	H.R. 6 (House)	S. 1149
Renewable Production Tax Credit	\$ 3.19	\$ 2.95
Residential Solar Tax Credit	\$ 0.11	\$ 0.11
Alternative Fuels and Vehicles	\$ 0.31	\$ 2.32
Total, Renewables & Alternative Fuels	\$ 3.61	\$ 5.38
Total, All Tax Provisions	\$18.67	\$15.25
Renewables Share of Total	19.3%	35.3%

Source: Joint Tax Committee. Estimated Revenue Effects of H.R. 1531, April 3, 2003, and Estimated Revenue Effects of S. 1149, May 30, 2003.

FY2004 DOE Budget

The House (H.R. 2754, H.Rept. 108-212) recommends \$330.1 million for the Renewable Energy Program and \$77.4 million for a new Electricity Transmission and Distribution (ET&D) program that replaces the former Electric/Storage subprogram. Under the Committee's structure, the total for the Renewable Energy Program is \$4.9 million less than the FY2003 appropriation. This includes \$19.7 million less for Biomass/Biofuels, \$14.7 million less for Solar Energy, \$4.3 million less for Geothermal, and \$3.7 million less for Program Direction. Partially offsetting these cuts, there is \$28.2 million more for Hydrogen and \$3.6 million more for Facilities & Infrastructure. Further, the Committee seeks \$7.1 million less for ET&D. Also, the House renewables total is \$41.2 million, or 11%, less than the request.

The Bush Administration’s request seeks \$444.2 million (including \$72.9 million for Electric/Storage and \$4.0 million for the Production Incentive). The request presents a new budget structure that follows from a major reorganization of the EERE Office. The FY2004 request for DOE finds that hydrogen energy is the “most promising long-term revolution in energy use that can help the nation “liberate itself from dependence on imported oil,” according to the Budget of the U.S. Government FY2004 (p. 105). The FY2004 request for DOE’s Renewable Energy Program elaborates that its aim is to “accelerate progress” and make hydrogen technologies “cleaner, safer, and lower in cost.” Further, it stresses that the new National Climate Change Technology Initiative will create “competitive solicitations” in applied research that aims to reduce greenhouse gas emission and will “complement” existing R&D programs.

FY2003 USDA Budget

In the 108th Congress, debate has surfaced over appropriations for executing the mandatory spending requirements for renewable energy and energy efficiency programs, set by Title IX (Section 9006) of the Farm Security and Rural Investment Act of 2002.

The Department of Agriculture’s (USDA) renewable energy programs have recently grown, spurred by federal bioenergy initiatives (P.L. 106-224, Executive Order 13134), the President’s National Energy Policy, and the Farm Security Act (P.L. 107-171). According to USDA, renewable energy program funding reached \$247.6 million in FY2002. **Table 3** shows some funding details. Also, for FY2003, Section 6013 of the Farm Security Act of 2002 provides loan guarantees for renewable energy equipment and broadens the range of renewable energy equipment available for loans. Sections 2101 and 6401 of the Act provide other programs and incentives for renewable energy (For more information about USDA Bioenergy Programs, go to the website at [<http://www.ars.usda.gov/bbcc/index.htm>]).

Table 3. USDA Funding for Renewable Energy Programs
(\$ millions)

	FY2001	FY2002	FY2003*
Biobased Products and Bioenergy Programs			
Agricultural Research Service	48.9	64.2	67.4
Commodity Credit Corporation (CCC)*	40.7	150	—
Cooperative State Research, Education, Extension	23	12.3	14.2
Forest Service	12.5	12.5	17.5
Other	8	8.2	3.4
Subtotal, Biobased Products and Bioenergy Programs*	133	247.2	102.5
Substitution: Solar and Wind Energy Programs			
Farm Security Act, Title IX (mandatory appropriations)	—	—	39
Total*	133.4	247.6	141.9
*The appropriations for the FY2003 CCC Bioenergy Incentives Program have not yet been set. The Senate has recommended \$50 million and the House has recommended \$150 million.			

Source: USDA. Office of Energy Policy and New Uses. Selected tables from Roger Conway, October 29, 2002.

Using Renewable Energy to Produce Electricity

The Public Utility Regulatory Policies Act (PURPA) has been key to the growth of electric power production from renewable energy facilities. Since 1994, state actions to restructure the electric utility industry have dampened PURPA's effect. H.R. 6 (Section 16062) and S. 14 (Section 1145) include a conditional repeal of the mandatory renewables purchase requirement in Section 210 of PURPA. (For a discussion of broader electricity restructuring issues, see the CRS Electronic Briefing Book on *Electricity Restructuring* at [<http://www.congress.gov/brbk/html/ebele1.shtml>].)

Renewables Under Electric Industry Restructuring. To encourage a continued role for renewable energy under restructuring, some states and utilities have enacted such measures as a renewable energy portfolio standard (RPS), public benefits fund (PBF), and/or "green" pricing and marketing of renewable power. In the 107th Congress, the Senate version of H.R. 4 had an RPS (see above under "Renewable Energy Portfolio Standard").

Green Power. The term "green power" generally refers to electricity supplied in whole or in part from renewable energy sources. Green power marketing (retail or wholesale) is underway in California, Illinois, Massachusetts, New Jersey, New York, Pennsylvania, and Texas. Green pricing is an optional utility service that allows electricity customers who are willing to pay a premium for the environmental benefits of renewable energy to purchase green power instead of conventional power. Utility green pricing programs reach more than one-third of the nation's consumers. (For more on green power see the web site [<http://www.eren.doe.gov/greenpower/home.shtml>].)

Distributed Generation. Distributed generation involves the use of small, modular electricity generators sited close to the customer load that can enable utilities to defer or eliminate costly investments in transmission and distribution system upgrades, and provide customers with quality, reliable energy supplies that may have less environmental impact than traditional fossil fuel generators. Technologies for distributed electricity generation use wind, solar, bioenergy, fuel cells, gas microturbines, hydrogen, combined heat and power, and hybrid power systems. (More information about DOE's Distributed Power Program is available at [<http://www.eren.doe.gov/distributedpower/>].)

Net Metering. Net metering allows customers with generating facilities to "turn their electric meters backwards" when feeding power into the grid; they receive retail prices for the excess electricity they generate. This encourages customer investment in distributed generation, which includes renewable energy equipment. In 2002, California enacted laws (AB58, Chapter 836; AB2228, Chapter 845) that encourage net metering, including a provision that permanently raises the size limit from 10 kw to 1 Mw. Also, H.R. 6 (Section 16071) and S. 14 (Section 1141) provide nearly identical language for net metering.

Natural Gas and Renewables

Biomass-Generated Synthetic Natural Gas. The natural gas price spike in 2003 has created interest in using renewables to dampen natural gas demand. EIA data presented at a June 10 hearing of the House Energy and Commerce Committee show not only that natural gas is used for heating, but that a growing share is used for electric power generation.

Renewable energy (mainly biomass) can be used to produce methane (the main component of natural gas) to substitute for natural gas directly. Also, a variety of renewables can generate electricity that indirectly displaces natural gas use for power generation. DOE projects that, by 2020, biomass and energy crops could produce 15% of natural gas needs.

Substituting Electricity from Renewables for Gas-Fired Generation. The American Wind Energy Association (AWEA) says that the installed base of wind farms, including those that will be installed by the end of 2003, will produce enough electric power to lessens the natural gas shortfall by 10% to 15% in 2004. With certain assumptions about power transmission capacity, AWEA further projects that wind power production could reach the equivalent of 1.1 Tcf per year in four years. Similarly, with certain assumptions about federal policy changes, DOE's report *Scenarios for a Clean Energy Future* (Table 7.11) projects that biomass-based power production could be greatly accelerated through 2010. (See ACEEE's September 2003 report, *Impacts of Energy Efficiency and Renewable Energy on Natural Gas Markets*.)

Climate Change and Renewables

Because most forms of renewable energy generate no carbon dioxide (CO₂), renewables are seen as a key long-term resource that can substitute for fossil energy sources used to produce vehicle fuels and electricity. The percentage of renewable energy substitution depends on technology cost, market penetration, and the use of energy efficiency measures to control energy prices and demand. DOE's 2000 report *Scenarios for a Clean Energy Future* estimates that new policies could triple non-hydro renewables electricity production in 2010 from a projected business-as-usual 86 billion kilowatt-hours (Bkwh) to 265 Bkwh. EPA's *Climate Action Report-2002* describes federal renewable energy programs aimed at reducing greenhouse gas emissions. In *Climate Change 2001: Mitigation*, the Intergovernmental Panel on Climate Change looks at the role that renewables can play in curbing global CO₂ emissions.

Since 1988, the federal government has accelerated programs that study the science of global climate change and has initiated programs aimed at mitigating fossil fuel-generated carbon dioxide (CO₂) and other human-generated emissions. The federal government funds programs for renewable energy as a mitigation measure at DOE, the Department of Agriculture (USDA), the Environmental Protection Agency (EPA), the Agency for International Development (AID), and the World Bank. The latter two agencies have received funding for renewable energy-related climate actions through Foreign Operations appropriations bills.

Because CO₂ contributes the largest share of greenhouse gas emission impact, it has been the focus of studies of the potential for reducing emissions through renewable energy and other means. Except for biofuels and biopower, wherever renewable energy equipment displaces fossil fuel use, it will also reduce carbon dioxide (CO₂) emissions, as well as pollutants that contribute to water pollution, acid rain, and urban smog. In general, the combustion of biomass for fuel and power production releases CO₂ at an intensity that may rival or exceed that for natural gas. However, the growth of biomass material, which absorbs CO₂, offsets this release. Hence, net emissions occur only when combustion is based on deforestation. In a "closed loop" system, biomass combustion is based on rotating energy

crops, there is no net release, and its displacement of any fossil fuel, including natural gas, reduces CO₂ emissions.

LEGISLATION

H.R. 6, House Version (Tauzin)/H.R. 6, Senate Version (Domenici)

Omnibus Energy Bill. House version includes provisions for renewable energy production tax credit (PTC), renewable energy production incentive (REPI), renewable energy fuel standard (RFS), renewable hydrogen, residential solar tax credit, alternative fuels, and others. Incorporates renewable energy provisions of H.R. 39, H.R. 238, and H.R. 1531. Introduced April 7, 2003; referred to Committee on Energy and Commerce and several other committees. Passed House, amended, April 10. Senate version incorporates text of omnibus energy bill (H.R. 4) that the Senate adopted in the 107th Congress. Passed Senate July 31, in lieu of S. 14.

H.R. 2754 (Hobson)/S. 1424 (Domenici)

The Energy and Water Appropriations Bill, FY2004. Includes funding for the DOE Renewable Energy Program and the Electricity Transmission and Distribution Program. House bill reported (H.Rept. 108-212) July 16, 2003. Passed House July 21. Senate bill reported (S.Rept. 108-105) July 17. Passed Senate, amended, September 16.

H.R. 2800 (Kolbe) / S. 1426 (McConnell)

Foreign Operations, Export Financing, and Related Programs Appropriations Bill, 2004. House bill reported (H.Rept. 108-222) July 21, 2004. Senate bill reported (S.Rept. 108-106, p. 17) July 17. Under Environment Programs, Senate bill appropriates \$185 million for “energy conservation, energy efficiency, and clean energy” in developing countries to reduce greenhouse gases.

S. 14 (Domenici)

Omnibus Energy Bill. Renewable energy appears as Title V. Also, Title VII A covers alternative fuels, Title VIII covers hydrogen, Title IX covers R&D authorizations, and Title XI on Electricity includes provisions on PURPA and net metering. S. 1149 (energy tax bill) and S. 385 and S. 791 (renewable fuels mandate) are expected to be incorporated into S. 14. Introduced April 30, 2003. On July 31, after floor action on S. 14 stalled, the Senate substituted the energy bill (H.R. 4) that the Senate had sent to conference in the 107th Congress, and passed it as the Senate version of H.R. 6.

S. 944 (Jeffords)

Renewable Energy Investment Act. Would establish a renewable portfolio standard (RPS) that reaches 20% by the year 2020. Introduced April 9, 2003; referred to Committee on Energy and Natural Resources. The provisions of this bill were incorporated into an amendment (S.Amdt. 1530) to S. 14, but action stopped when the Senate substituted the energy bill (H.R. 4) that it had sent to conference in the 107th Congress.

S. 1149 (Grassley)

Energy Tax Incentives Act of 2003. Supersedes S. 597. Contains provisions for renewable energy production tax credit (Title I, Section 101), alternative fuels incentives (Title II), and residential solar energy property (Title III, Section 301). Committee on

Finance reported (S.Rept. 108-54) May 23, 2003. Expected to be considered in the energy conference committee on H.R. 6.

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CRS Report RS21442. *Hydrogen and Fuel Cell Vehicle R&D: freedomCAR and the President's Hydrogen Fuel Initiative*, by Brent Yacobucci.

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FOR ADDITIONAL READING

Tables showing DOE Renewable Energy R&D Funding (current and constant) trends back to FY1974 are available from the author of this issue brief.

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Table 4. DOE Renewable Energy Budget for FY2003-FY2004
(selected programs, \$ millions)

OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY	FY2003 App.	FY2004 Request	FY2004 House	FY2004 Senate	
				Amount	Diff. from FY2003
BIOMASS / BIOFUELS	89.4	69.8	69.8	75.0	-14.4
Power	-----	-----	-----	-----	-----
Transportation	-----	-----	-----	-----	-----
GEOTHERMAL	29.8	25.5	25.5	26.3	-3.5
HYDROGEN	39.7	88.0	68.0	88.0	48.2
HYDROPOWER	5.3	7.5	5.5	5.0	-0.3
SOLAR ENERGY	94.4	79.7	79.7	89.7	-4.7
Concentrating Solar	-----	0.0	-----	5.0	-----
Photovoltaics	-----	76.7	-----	-----	-----
Solar Building Technology Research	-----	3.0	-----	-----	-----
ZERO-ENERGY BUILDINGS	-----	4.0	-----	-----	-----
WIND	43.7	41.6	41.6	41.6	-2.1
INTERGOV. / RENEW. SUPPORT ¹	21.4	18.8	18.8	19.3	-2.1
Dept. Energy Management	1.5	2.3	2.3	1.8	0.3
International Renewables	4.0	6.5	6.5	4.5	0.5
Production Incentive	5.0	4.0	4.0	4.0	-1.0
Tribal Energy	6.0	6.0	6.0	5.0	-1.0
Program Support	5.0	0.0	0.0	4.0	-1.0
NAT. CLIMATE CHANGE INIT.	-----	15.0	0.0	0.0	-----
FACILITIES & INFRASTRUCTURE	5.5	5.0	9.1	8.5	3.0
PROGRAM DIRECTION	15.9	16.6	12.2	13.1	-2.8
RENEWABLES, SUBTOTAL	345.0	371.3	330.1	366.5	21.4
Prior Year Balances	-10.0	-----	-----	-----	-----
Transfers	-----	-----	-----	-8.0	-8.0
RENEWABLES, TOTAL	335.0	371.3	330.1	358.5	23.4
Office of Electricity T&D (OETD) ²	84.4	72.9	77.4	100.4	16.0
RENEWABLES + ET&D, Total	419.5	444.2	407.5	458.9	39.4

¹ Combines "Intergovernmental Activities" and "Renewable Support and Implementation."

² Replaces "Electric/Storage" in FY2003 and "Electricity Reliability" in FY2004 request.

Source: S.Rept. 108-105; July 17, 2003; H.Rept. 108-212; July 16, 2003; DOE FY2004 Cong. Budget Request, v. 3; Feb. 2003 (p. 244-247).