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

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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 has focused on tax credits, incentives, budget, and provisions of the omnibus energy policy bill H.R. 6.

The Bush Administration's FY2005 budget request for DOE's Renewable Energy Program seeks \$374.8 million (excluding \$90.9 million for the new Office of Electricity Transmission and Distribution [OETD]). This is \$4.3 million, or 1%, more than the FY2004 appropriation (including \$13.0 million from prior year balances and excluding inflation).

In addition to the FY2004 Energy and Water appropriations bill (P.L. 108-137) funding for the DOE Renewable Energy Program, the consolidated appropriations bill (H.R. 2673, Division H) added a total of nearly \$20 million more for several renewable energy project earmarks.

FY2004 congressional funding earmarks have become a concern for DOE program officials. They contend that the resultant funding shift leaves insufficient resources for the Hydrogen Program and for the High Temperature Superconductivity Program under the Office of Electric Transmission and Distribution (OETD).

In the first session, the H.R. 6 conference bill left out the Senate-proposed renewable portfolio standard, but provided a renewable energy production tax credit (PTC), renewable energy fuel standard (RFS), and several other tax and non-tax measures.

In the second session, S. 2095 was introduced without the controversial MTBE safe harbor provision and with a cost about half that of H.R. 6. Its renewable energy provisions are nearly identical to those in H.R. 6. This includes a three-year extension of the renewable energy production tax credit (PTC), a residential solar energy tax credit, a renewable fuels standard (RFS), and several other tax and non-tax provisions.

MOST RECENT DEVELOPMENTS

On March 4, 2004, S.Amdt. 2687 to S. 1637 (“jobs bill”) was introduced, which would extend the renewable energy production tax credit (PTC) through December 31, 2004. A longer PTC extension is a major provision of the “leaner” omnibus energy bill, S. 2095, which was introduced February 12. Compared to H.R. 6, S. 2095 drops the controversial MTBE (methyl tertiary butyl ether) safe harbor provision and cuts the overall bill cost to about \$15 billion. S. 2095 otherwise provides renewables provisions nearly identical to those of H.R. 6. (For a summary of provisions in S. 2095 and H.R. 6, see “Renewables in Omnibus Energy Bills,” below.)

On February 2, 2004, President Bush issued the Administration’s budget request for FY2005. The Department of Energy (DOE) request seeks \$374.8 million for renewables, which is \$4.3 million, or 1%, more than the FY2004 appropriation (including \$13.0 million from prior year balances and excluding inflation). The main increases are for Hydrogen Safety (\$12.1 million) and Program Direction (\$8.3 million). The main cuts are for Small Modular Biopower and biomass earmarks (-\$13.9 million) and for Concentrating Solar Power (-\$3.4 million). (For more details, see “FY2005 DOE Budget” and **Table 3**.)

The Department of Agriculture (USDA) request would cut funding for the Bioenergy Program of the Commodity Credit Corporation by \$50 million and would cut discretionary funding of renewable energy grants by \$12 million. (See “FY2005 USDA Budget,” below)

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 website 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 2004*, renewable energy resources (excluding wood use for home heating) supplied about 5.8 Q (quadrillion Btu’s or quads) of the 97.7 Q the nation used in 2002, or about 6.0% 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 2004* projects that current policies would yield a 1.9% average annual increase in renewable energy production to 9.0 Q through 2025, resulting in a 71% total increase. This would amount to about 6.5% of the projected 136 Q total demand in 2025. (Detailed breakdowns of renewable energy use appear in EIA's *Renewable Energy Annual 2002* 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 implemented a \$42 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 *FY2005 Congressional Budget Request*, DOE/ME-0034, v. 3, February 2004.)

From FY1973 through FY2003, the federal government spent about \$14.6 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 FY2003, it reached \$411 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 FY2003, the federal government spent \$49.7 billion for nuclear (fission and fusion), \$25.4 billion for fossil, \$14.6 billion for renewables, and \$11.7 billion for energy efficiency. Total energy R&D spending from FY1948 to FY2003, in 2003 constant dollars, reached \$131.2 billion, including \$74.0 billion, or 56%, for nuclear; \$30.9 billion, or 24%, for fossil; \$14.6 billion, or 11%, for renewables; and \$11.7 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. Section 603 of the Job Creation and Worker Assistance Act (P.L. 107-147) extended the production tax credit to December 31, 2003. Additionally, P.L. 96-223 created an income tax credit for alcohol fuels; and Section 9003(a)(3) of P.L. 105-178 extends the 40- to 60-cent/gallon credit through December 31, 2007. Further, the Energy Tax Act created a 5.2 cents/gallon federal excise tax exemption for gasohol (gasoline blended with alcohol), which now stands at 5.3 cents/gallon.

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 (S. 2095 and H.R. 6)

In the 108th Congress, most legislative action on renewables has focused on the omnibus energy policy bills, S. 2095, H.R. 6 and S. 14/S. 1149. Late in 2003, a cloture motion to stop a filibuster on the conference report (H.Rept. 108-375) for H.R. 6 failed (57-40). Key objections cited in Senate debate included budget concerns and the Title XV provisions that would provide a “safe harbor” from product liability lawsuits for producers of methyl tertiary butyl ether (MTBE), ethanol, and other renewable fuels. This section summarizes key renewable energy provisions in S. 2095 and the conference version of H.R. 6. The renewable portfolio standard (RPS) proposed in the Senate bill was left out of the conference bill, but the production tax credit and the renewable fuel standard (RFS) for cellulosic ethanol and biodiesel remain in S. 2095 (and H.R. 6). Other renewables provisions include a renewable energy production incentive, a residential solar tax credit, and other tax and authorization measures. S. 2095 and H.R. 6 also include a provision (§920) for concentrating solar power R&D that did not appear in either the House or Senate bill. (For a detailed summary of provisions in the conference version of H.R. 6, see CRS Report RL32204. For more information about House and Senate bills, 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].)

Production Tax Credit (PTC) and Production Incentive (REPI). 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. This credit expired December 31, 2003, but would be extended, retroactively, through December 31, 2004, by S.Amdt. 2687 to S. 1637. S. 2095 (§1301) and H.R. 6 (§1302) would extend the placed-in-service date for three years, through December 31, 2006. Eligible sources would be expanded to include open-loop biomass (agricultural livestock nutrient, forest, and construction wastes), geothermal energy, solar energy, small irrigation power, and municipal solid waste (landfill gas and trash combustion facilities). However, these newly eligible sources would be allowed to claim the credit for five years after being placed in service — compared to 10 years for the currently eligible sources. Also, the General Accounting Office (GAO) would be required by June 30, 2006, to prepare a study of the market viability of these resources, comparing their costs with those for fossil-fueled power generators. This cost comparison would include estimates of the dollar value of the environmental impacts of power production.

Parallel to the PTC, there is a renewable energy production “incentive” (REPI) for state and local governments and nonprofit electrical cooperatives. This 1.5 cent/kwh incentive was created by EFACT §1212 and is funded by appropriations to DOE. Eligible facilities currently include solar, wind, biomass, and geothermal energy except municipal solid waste and certain types of dry steam geothermal energy. S. 2095 (§202) and H.R. 6 (§202) would make landfill gas eligible too. Also, the eligibility period would be extended for 10 fiscal years, through 2013; eligibility for payments would be extended through 2023.

Renewable Fuel Standard (RFS). The proposal for a renewable fuel standard (S. 2095, §1501; and H.R. 6, §1501) would be linked with other provisions involving methyl tertiary butyl ether (MTBE). While H.R. 6 (§1502) would provide a “safe harbor” from product liability lawsuits for producers of MTBE and other renewable fuels, S. 2095 dropped this controversial provision.

Under the Clean Air Act Amendments of 1990, reformulated gasoline (RFG) must contain 2% oxygen, a requirement that led to the use of MTBE, and to a lesser extent ethanol. However, MTBE has been implicated in numerous incidents of groundwater contamination, leading 17 states to ban or regulate its use. S. 2095 and H.R. 6 would put a qualified ban on the use of MTBE as a fuel additive and would replace the RFG requirement with a renewable fuel standard (RFS), which requires that the annual production of gasoline contain at least 5 billion gallons of “renewable fuel.”

S. 2095 and H.R. 6 (§1501) define “renewable fuel” to include ethanol, biodiesel, and natural gas produced from landfills, sewage treatment plants, and certain other sources. Ethanol is the only renewable motor fuel produced in large quantity. In 2002, about 2.1 billion gallons of ethanol were blended with gasoline. Biodiesel is used at a rate of about 50 million gallons per year. RFS would call for renewable fuels (primarily ethanol) production to grow to 3.1 billion gallons a year by 2005, and then increase stepwise to 5 billion gallons a year by 2012. An incentive would encourage the use of cellulosic and waste-derived ethanol, by raising the value of 1.0 gallon of cellulosic or waste-derived ethanol from a previous incentive level of 1.5 gallons of renewable fuel up to 2.5 gallons of renewable fuel.

For more information on the bill's provisions for renewable fuels and MTBE, see CRS Report RL31912, *Renewable Fuels and MTBE: Side-by-Side Comparison of the House and Senate Energy Bills and the Conference Report on H.R. 6*; and see CRS Report RS21673, *Selected Environmental Provisions in the Energy Bill (H.R. 6)*.

Renewable Hydrogen. Section 803 of S. 2095 and H.R. 6 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. The provision includes a focus on distributed energy that uses renewable sources.

Residential Tax Credit. Section 1323 of S. 2095 and H.R. 6 would create a 15% residential tax credit worth up to \$2,000 for homeowners who purchase photovoltaics, wind energy, and solar water heating equipment. The credit would be in effect for three calendar years, ending on December 31, 2006.

Other Non-Tax Provisions. Other renewable energy provisions (and sections) include resource assessment (201), federal purchases (203), insular areas (204), renewables in public buildings (205, 922), biomass/biopower (206, 207, 919), geothermal leasing (H.R. 6, 211-227; S. 2095, 211-227), hydropower (231, 241-248), federal lands (352), Indian energy (503), funding authorizations (918), concentrating solar (920), ocean/wave/marine (921, 923), net metering (1251), small power (1253), alternative fuels (1503-1514)

Renewables Tax Revenue Effect. Table 1 shows the estimated 10-year revenue effect of renewable energy and alternative fuel tax provisions in H.R. 6 and S. 2095. The amounts for S. 2095 are estimated from the scoring for S. 1149, as reported by committee.

Table 1. H.R. 6 and S. 2095, Tax Revenue Effect
(\$ billions)

	H.R. 6	S. 2095
Renewable Energy Production Tax Credit	\$ 3.04	\$3.04
Residential Solar Tax Credit	\$ 0.11	\$0.11
Alternative Fuels and Vehicles	\$ 2.42	\$2.42
Total, Renewables & Alternative Fuels	\$ 5.57	\$5.57
Net Total, All Tax Provisions	\$23.51	\$14.80
Renewables Share of Total	23.7%	37.6%

Source: Joint Tax Committee (JTC). Estimated Revenue Effects of the Conference Agreement for the "Energy Tax Policy Act of 2003." November 18, 2003; and JTC Estimated Revenue Effects of S. 1149 as Reported by the Committee on Finance, May 30, 2003.

FY2005 DOE Budget

The FY2005 budget request aims to promote "breakthroughs in hydrogen fuel cells," develop advanced technologies for cellulosic biomass as an energy source, and generally lower cost while improving the performance and efficiency of various renewable energy systems. The request also proposes competitive solicitations for applied research on technologies that would help curb greenhouse gas emissions. Further, anticipating passage of an omnibus energy bill, the request proposes \$4.1 billion in tax incentives for renewables

and energy efficiency, which includes support for the renewable energy production tax credit and the excise tax exemption for alcohol fuels.

As Table 3 shows, the request seeks \$374.8 million for renewables, which is \$4.3 million, or 1%, more than the FY2004 appropriation. This comparison includes the use of \$13.0 million in prior year balances for FY2004 and excludes the projected inflation from FY2004 to FY2005. The funding request includes \$13.3 million more for Hydrogen (due to increases of \$12.1 million for safety and \$2.7 million for renewable hydrogen), \$8.3 million more for Program Direction, and \$3.0 million for a new National Climate Change Technology program. However, it would terminate Program Support (a cut of \$4.9 million) and cut Biomass Utilization by \$15.2 million (to terminate Small Modular Biopower and discontinue congressional earmarks) and cut Concentrating Solar by \$3.4 million. Also, the request includes \$90.9 million for OETD, and increase of \$10.1 million, or 12%. The primary increase in OETD is for High Temperature Superconductivity.

FY2005 USDA Budget

For FY2005, the Administration's request for the Department of Agriculture (USDA) seeks to reduce the mandatory appropriation for the Bioenergy Program of the Commodity Credit Corporation (CCC) from \$150 million to \$100 million. Also, the Administration proposes to cut discretionary funding of renewable energy grants for Rural Development from \$23 million in FY2004 to \$11 million in FY2005.

The Agriculture, Rural Development, Food and Drug Administration, and Related Agencies appropriations bill for FY2004 is included as Division A of the conference report (H.Rept. 108-401) for the Consolidated Appropriations Act (H.R. 2673). Title III (H12329) includes \$23.0 million for renewable energy loans, loan guarantees, and grants as authorized by Section 9006 of the Farm Security Act of 2002. Also, under Title VII, Section 778 (H12334) would create a "Sun Grant Research Initiative," by amending Title IX of the Farm Security Act of 2002 to add a new section 9011 for "Research, Extension, and Educational Programs on Biobased Energy Technologies and Products." A program that includes plans, grants, and reports would be authorized \$25 million in FY2005, \$50 million in FY2006, and \$75 million annually for FY2007 through FY2010.

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 2** 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 2. USDA Funding for Renewables, FY2001-FY2003

(\$ 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	115.0
Cooperative State Research, Education, Extension	23.0	12.3	14.2
Forest Service	12.5	12.5	17.5
Other	8.0	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)	—	—	39.0
Total	133.4	247.6	141.9

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 108th Congress, the Senate version of H.R. 6 had an RPS (Sections 264 and 271).

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 website [<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 show that a growing share of natural gas 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. DOE projects that, by 2020, biomass and energy crops could produce 15% of natural gas needs.

Substituting Electricity from Renewables for Gas-Fired Generation. Also, a variety of renewables can generate electricity that indirectly displaces natural gas use for power generation. The American Wind Energy Association (AWEA) says that the installed base of wind farms through the end of 2003 will produce enough electric power to lessen the natural gas shortfall by 10% to 15% in 2004 and could reach the equivalent of 1.1 Tcf per year in four years. Similarly, with some 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 November 2003 report, *U.S. Climate Change Technology Program — Technology Options for the Near and Long Term*, compiles information from multiple federal agencies on more than 80 technologies. For these end-use and supply technologies, the report describes President Bush's initiatives and R&D goals for advancing technology development, but it does not estimate emissions saving potentials, as some previous DOE reports on the topic had presented.

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

P.L. 108-137 (H.R. 2754)

Energy and Water Appropriations Act, 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. Conference reported (H.Rept. 108-357) November 7. Signed into law December 1.

P.L. 108-199 (H.R. 2673, Division H, Miscellaneous)

Consolidated Appropriations Bill, FY2004. Division H, Sections 132 and 167 (H12745), includes nearly \$20 million in additional funding earmarks for the DOE Renewable Energy Program and the Electricity Transmission and Distribution Program. House bill reported (H.Rept. 108-193) July 9, 2003. Passed House July 14. Passed Senate, amended without report, November 6. Conference reported (H.Rept. 108-401) November 25. House approved December 8. Senate approved January 22, 2004. President signed January 23, 2004.

P.L. 108-199 (Division D, Foreign Operations Appropriations Bill)

Consolidated Appropriations Bill, FY2004. Division D contains the Foreign Operations, Export Financing, and Related Programs Appropriations Bill, 2004. Under Environment Programs, Senate bill appropriates \$185 million for “energy conservation, energy efficiency, and clean energy” in developing countries to reduce greenhouse gases.

House bill reported (H.Rept. 108-222) July 21, 2004. Senate bill reported (S.Rept. 108-106, p. 17) July 17. Passed Senate October 30. In Division D of the Consolidated Appropriations Bill, Section 555 on Environment Programs includes \$180 million for this provision.

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. Conference reported (H.Rept. 108-375) November 18. House approved November 18. Senate cloture motion failed (57-40) November 21.

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. 1548 (Grassley)

Volumetric Ethanol Excise Tax Credit (VEETC) Act. The bill's measures are described in a January 29, 2004, report by the Joint Tax Committee (JTC), *Description of the Highway Reauthorization and Excise Tax Simplification Act of 2004*. Also, in a January 30 report, JTC estimated VEETC would cost \$4.3 billion over 10 years. This bill is designed to be incorporated into the highway reauthorization bill (S. 1072, SAFETEA). Introduced July 31, 2003. Committee on Finance reported February 2, 2004.

S. 2095 (Domenici)

Omnibus Energy Bill. This bill is a pared-down version of the conference bill, H.R. 6, which failed under a Senate cloture vote (57-40). Renewable energy appears as Title II. Also, Title VII A covers alternative fuels, Title VIII covers hydrogen, Title IX covers R&D authorizations, Title XI on electricity includes a provision on PURPA and small power, and Title XIII has tax incentives. Introduced February 12, 2004. Under Rule 14, placed on Senate Calendar for floor action.

S.Amdt. 1480 to S. 14 (Bingaman)

This amendment would have set a 10% renewable portfolio standard (RPS) and included refinements to the RPS provisions (Sections 264 and 271) in the Senate version of the omnibus energy bill, H.R. 6.

S.Amdt. 2687 to S.Amdt. 2686 to S. 1637 (Grassley)

Section 514 of this amendment would extend the renewable energy production tax credit, retroactively, from January 1, 2004, though December 31, 2004. Also, Section 520 would eliminate the electric vehicle tax credit phase-out, and Section 521 would eliminate the clean-fuel vehicle tax deduction phase-out. Introduced March 4, 2004 (Congressional Record p. S2250).

CONGRESSIONAL HEARINGS, REPORTS, AND DOCUMENTS

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U.S. Congress. Senate. Committee on Appropriations. Subcommittee on Energy and Water. *FY2005 Budget Request for DOE Office of Energy Efficiency and Renewable Energy*. Hearing held March 3, 2004.

U.S. Congress. House. Committee on Science. *Reviewing the Hydrogen Fuel and Freedom Car Initiatives*. Hearing held March 3, 2004.

U.S. Congress. Joint Committee on Taxation. *Description of Revenue Provisions Contained in the President's Fiscal Year 2005 Budget Proposal*. (Energy Provisions) [<http://www.house.gov/jct/s-3-04.pdf>]. February 2004. p. 122-153.

U.S. Congress. House. Committee on Science. Subcommittee on Energy. *What Are the Administration Priorities for Climate Change Technology?* Hearing held November 6, 2003.

U.S. Congress. House. Committee on Energy and Commerce. Subcommittee on Energy and Air Quality. *The Hydrogen Energy Economy*. Hearing held May 20, 2003.

CRS Reports

CRS Issue Brief IB10116. *Energy Policy: The Continuing Debate*, by Rob Bamberger.

CRS Report RS21673. *Selected Environmental Provisions in the Energy Bill (H.R. 6)*, by Brent Yacobucci.

CRS Memorandum. *Renewable Energy Portfolio Standard (RPS)*, by Fred Sissine.

CRS Report RL31033. *Energy Efficiency and Renewable Energy Fuel Equivalents to Potential Oil Production from the Arctic National Wildlife Refuge (ANWR)*, by Fred Sissine.

CRS Report RS20270. *Renewable Energy and Electricity Restructuring*, by Fred Sissine.

CRS Electronic Briefing Book, *Electric Utility Restructuring*, page on "Reliability," by Amy Abel. At [<http://www.congress.gov/brbk/html/ebele16.html>].

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

CRS Issue Brief IB10054. *Energy Tax Policy*, by Salvatore Lazzari.

CRS Report RL30369. *Fuel Ethanol: Background and Public Policy Issues*, by Brent Yacobucci.

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 3. DOE Renewable Energy Budget for FY2003-FY2005
(selected programs, \$ millions)

OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY	FY2003 App.	FY2004 App.	FY2005 Request	FY2005 - FY2004	Percent Change
BIOMASS / BIOFUELS	85.3	86.5	72.6	-13.9	-16%
R&D / Feedstock	47.2	43.7	45.0	1.3	3%
Utilization	38.0	42.8	27.6	-15.2	-35%
GEOTHERMAL	28.4	25.5	25.8	0.3	1%
HYDROGEN	38.1	82.0	95.3	13.3	16%
HYDROPOWER	5.0	4.9	6.0	1.1	22%
SOLAR ENERGY	82.3	83.4	80.3	-3.1	-4%
Concentrating Solar	5.3	5.4	2.0	-3.4	-63%
Photovoltaics	73.2	75.1	75.4	0.4	1%
Solar Heating & Lighting	3.8	2.9	2.9	0.0	-1%
ZERO-ENERGY BUILDINGS	7.6	0.0	0.0	0.0	—
WIND	41.6	41.3	41.6	0.3	1%
INTERGOV. / RENEW. SUPPORT ¹	15.9	21.6	18.0	-3.6	-17%
Dept. Energy Management	1.4	2.0	2.0	0.0	0%
International Renewables	3.9	5.9	6.5	0.6	10%
Production Incentive	4.8	3.9	4.0	0.1	2%
Tribal Energy	5.8	4.9	5.5	0.6	12%
Program Support	0.0	4.9	0.0	-4.9	-100%
NAT. CLIMATE CHANGE INIT.	—	0.0	3.0	3.0	—
FACILITIES & INFRASTRUCTURE	5.3	13.0	11.5	-1.5	-11%
PROGRAM DIRECTION	12.6	12.4	20.7	8.3	68%
RENEWABLES, SUBTOTAL	322.2	370.5	374.8	4.3	1%
Prior Year Balances	0.0	-13.0	0.0	13.0	-100%
Transfers	0.0	0.0	0.0	0.0	—
RENEWABLES, TOTAL	322.2	357.5	374.8	17.3	5%
Office of Electricity T&D (OETD) ²	88.4	80.8	90.9	10.1	12%
RENEWABLES + OETD, Total	410.5	438.3	465.7	27.4	6%

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

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

Source: DOE FY2005 Cong. Budget Request, v. 3; Feb. 2004 (p. 15-16, 49, 87, 169, 193, 211, 215, 231, 275).