

CRS Issue Brief for Congress

Received through the CRS Web

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

Updated December 1, 2004

Fred Sissine
Resources, Science, and Industry Division

CONTENTS

SUMMARY

MOST RECENT DEVELOPMENTS

BACKGROUND AND ANALYSIS

Renewable Energy Concept

Contribution to National Energy Supply

Role in Long-Term Energy Supply

History

Tax Credits

Public Utility Regulatory Policies Act

State and Local Government Roles

Renewables in Omnibus Energy Bills (S. 1637, S. 2095, and H.R. 6)

Production Tax Credit (PTC) and Production Incentive (REPI)

Renewable Fuel Standard (RFS)

Renewable Hydrogen

Residential Tax Credit

Other Non-Tax Provisions

Renewables Tax Revenue Effect

FY2005 DOE Budget

FY2005 USDA Budget

Using Renewable Energy to Produce Electricity

Renewables Under Electric Industry Restructuring

Green Power

Distributed Generation

Net Metering

Natural Gas and Renewables

Biomass-Generated Synthetic Natural Gas

Substituting Electricity from Renewables for Gas-Fired Generation

Climate Change and Renewables

LEGISLATION

CONGRESSIONAL HEARINGS, REPORTS, AND DOCUMENTS

CRS Reports

FOR ADDITIONAL READING

Websites

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 the Department of Energy's (DOE's) Renewable Energy Program sought \$374.8 million (excluding \$90.9 million for the new Office of Electricity Transmission and Distribution [OETD]).

Congress approved the Consolidated Appropriations Act (CAA: H.R. 4818, H.Rept. 108-792). Division C, the Energy and Water appropriations bill, provides \$389.1 million for DOE's Renewable Energy pro-

gram and \$121.2 million for OETD. For renewables, this is \$14.3 million more than the request and \$31.6 million more than the FY2004 appropriation. Compared to FY2004, this includes \$13.3 million more for Hydrogen, \$6.8 million more for Program Direction, and \$4.3 million less for Biomass/Bio-refineries. Also, the CAA bill has \$23.0 million for renewables at USDA and \$180 million for clean energy (renewables) and energy efficiency in developing countries.

In the first session, the conference version of the omnibus energy bill (H.R. 6) 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 and H.R. 4503. This includes a three-year extension of the renewable energy production tax credit (PTC) and a residential solar energy tax credit. The House has passed H.R. 4503. The Working Families Tax Relief Act (P.L. 108-311) extends the previous PTC through December 31, 2005. The American Jobs Creation Act (P.L. 108-357) expands the PTC to solar and geothermal; adds a half-credit for open-loop biomass, municipal waste, and small irrigation hydro; and creates a credit for producers of refined coal. Also, tax incentives are created for ethanol and biodiesel, and tax exempt bonds are authorized for green buildings (including solar).



MOST RECENT DEVELOPMENTS

On November 20, 2004, Congress approved H.R. 4818 (H.Rept. 108-792), the Consolidated Appropriations Act, 2005. Division A provides \$23 million for renewable energy programs at the Department of Agriculture (USDA). Division C, the Energy and Water Development appropriations bill (H.R. 4614) has \$389.1 million for DOE's Renewable Energy program. (For more details, see "FY2005 DOE Budget" and **Table 3**.) Also, Section 576 of Division D, the Foreign Operations appropriations bill, has \$180 million for clean (renewable) energy and energy efficiency in developing countries. However, Section 122 of Division J has a general reduction of 0.83%. H.R. 4818 is being held over for H.Con.Res. 528, which would change the general reduction to 0.80%.

On October 22, 2004, the President signed the American Jobs Creation Act (P.L. 108-357, H.R. 4520). It expands the renewable energy production tax credit (PTC) extended earlier by P.L. 108-311 to include solar and geothermal over five years and a half-credit over five years for open-loop biomass, landfill gas, trash combustion, and small hydro used for irrigation. Further, there is a weight-based credit for refined-coal producers. Also, the law provides excise and income tax credits for ethanol and biodiesel, enables small ethanol producers to pass credits to patrons, and creates tax exempt bonds for green buildings at brownfield sites. Omnibus energy legislation has otherwise stalled since mid-June, when the House passed H.R. 4503 (Energy Policy Act of 2004), which is nearly identical to the conference version of H.R. 6. (For a summary of provisions in S. 2095 and H.R. 6, see "Renewables in Omnibus Energy Bills," 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 used 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 Trends 2003* 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 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.

DOE's FY2004 renewable energy R&D funding totaled \$439.4 million, or about 19% of DOE's energy R&D appropriation. Energy conservation received \$559.7 million (24%), fossil energy received \$672.8 million (29%), and fission and fusion were appropriated \$667.4 million (29%).

Tax Credits. The Energy Tax Act of 1978 (P.L. 95-618) created residential solar credits and 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). 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 extended 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 at [<http://www.dsireusa.org/>].)

Renewables in Omnibus Energy Bills (S. 1637, S. 2095, and H.R. 6)

In the 108th Congress, most legislative action on renewables has focused on the omnibus energy policy bills, S. 1637, 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. The conference version of H.R. 6 excluded the renewable portfolio standard (RPS) proposed in the Senate bill, but the production tax credit and the renewable fuel standard (RFS) for cellulosic ethanol and biodiesel remain in S. 2095. Other renewables provisions in the H.R. 6 conference report 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). P.L. 108-311 and P.L. 108-357 extend and expand the PTC. (See “Legislation” below.)

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 EPACK §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 MTBE. While H.R. 6 conference report (§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), requiring 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. S. 1637 (§823), S. 2095 (§1323) and H.R. 6 (§1323) 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. S. 2095 and H.R. 6, Tax Revenue Effect
(\$ billions)

| | S. 2095 | H.R. 6 |
|--|----------------|---------------|
| 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 | \$14.80 | \$23.51 |
| Renewables Share of Total | 37.6% | 23.7% |

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 House-passed FY2005 Energy and Water Development appropriations bill (H.R. 4614, H.Rept. 108-554) has \$343.2 million for DOE’s Renewable Energy program, which is \$31.6 million, or 8%, less than the request. This reduction includes a cut of \$31.0 million from the Hydrogen program to eliminate hydrogen storage “centers of excellence,” which the Committee states DOE awarded “without full and open competition.” The hydrogen

education initiative would be cut by \$7.0 million (zero appropriation) and the National Climate Change Technology Initiative would be cut by \$3.0 million (zero appropriation). Concentrating Solar Power would increase by \$3.4 million.

The FY2005 budget request aims to promote “breakthroughs in hydrogen fuel cells,” develop advanced technologies for cellulosic biomass as an energy source, and generally reduce costs 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.

As **Table 3** shows, DOE’s FY2005 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). Also, the request includes \$90.9 million for the Office of Electricity Transmission and Distribution (OETD), an increase of \$10.1 million, mainly 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 renewable energy grants (created by Section 9006 of the Farm Security Act) from \$22.9 million in FY2004 to \$10.8 million in FY2005.

On July 13, 2004, the House passed H.R. 4766 (H.Rept. 108-584), the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies appropriations bill for FY2005. It has \$15.0 million for renewable energy grants (Section 9006). This is \$7.9 million less than the FY2004 appropriation and \$4.2 million more than the request. Section 737 of the bill restricts renewables funds from use for salaries and personnel.

USDA’s 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 CRS Report RL32728, *Electric Utility Regulatory Reform: Issues for the 109th Congress*.)

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.eere.energy.gov/greenpower/>].)

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. A DOE study, *Structural Vulnerability of the North American Power Grid*, suggests that adding more distributed generation could help reduce grid vulnerability. Another DOE study, *Homeland Security: Safeguarding America's Future with Energy Efficiency and Renewable Energy Technologies*, provides a broad look at the potential to address vulnerabilities. (More information about DOE's Distributed Power Program is available at [<http://www.eere.energy.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 kilowatts to 1 megawatt. 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 reach the equivalent of 1.1 trillion cubic feet 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 the American Council for an Energy Efficient Economy's 2003 report, *Impacts of Energy Efficiency and Renewable Energy on Natural Gas Markets* and the Union of Concerned Scientists fact sheet, *Renewable Energy Can Help Ease Natural Gas Crunch*.)

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 could 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.

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 could 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, 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 Office of Electricity Transmission and Distribution (OETD). Signed into law December 1, 2003.

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 OETD. Signed into law 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. Section 555

on Environment Programs includes \$180 million for “energy conservation, energy efficiency, and clean energy” in developing countries to reduce greenhouse gases.

P.L. 108-311 (H.R. 1308, Section 313)

Working Families Tax Relief Act of 2004. Section 313 extends the previous renewable energy production tax credit (PTC) of 1.8 cents/kwh over 10 years (adjusted for inflation) for wind, closed-loop biomass, and poultry waste projects installed by December 31, 2005. Also, Section 318 extends a credit for electric vehicles, and Section 319 extends a deduction for clean fuel vehicles. The Joint Tax Committee scored the PTC at \$1.2 billion over 10 years. PTC provision originated in Senate version (S.Amdt. 862). House and Senate approved the conference report (H.Rept. 108-696) September 23, 2004. Signed into law October 4, 2004.

P.L. 108-357 (H.R. 4520)

American Jobs Creation Act. Section 710 expands the renewable energy production tax credit (PTC) in P.L. 108-311 to include 1.8 cents/kwh over five years (adjusted for inflation) for geothermal and solar, and 0.9 cents/kwh over five years (adjusted for inflation) for a broad range of “open-loop” biomass, municipal solid waste (landfill gas and trash combustion), and hydropower at small irrigation projects installed by December 31, 2005. Also, a \$4.38/ton credit over 10 years is created for “refined coal producers” through December 31, 2008. Section 301 extends the income tax credit for ethanol fuels and creates a volumetric excise tax credit for ethanol (VEETC) and biodiesel. Section 302 creates an income tax credit for biodiesel. Section 313 allows a coop to allocate the small ethanol producer credit to its patrons. Section 701 creates a \$2 billion tax-exempt bond program for green building demonstrations at brownfields, which includes goals for solar photovoltaics. Introduced in House June 4, 2004. Reported (H.Rept. 108-548, Part 1) June 16. Passed House June 17. In Senate, S. 1637 reported (S.Rept. 108-192) November 3, 2003. S.Amdt. 3562 incorporated S. 1637 into H.R. 4520 and passed Senate July 15, 2004. Conference Report (H.Rept. 108-755) approved in House October 7 and in Senate October 11. President signed October 22, 2004.

H.R. 4818, Consolidated Appropriations Act 2005

The Agriculture Appropriations Act (Division A; p. H10241, H10423) includes \$23.0 million for the USDA Renewable Energy Program. The Energy and Water Development Appropriations Act (Division C, H10552-10553) provides \$389.1 million for the DOE Renewable Energy Program and \$121.2 million for Office of Electricity Transmission and Distribution (OETD). The Foreign Operations Appropriations Act (Division D, Section 576, p. H10587) includes \$180.0 million for “clean energy and other climate change policies in developing countries,” of which \$100.0 million is targeted for renewable energy and energy efficiency. Section 122 of Division J has a general reduction of 0.83%. Reported (H.Rept. 108-792), House passed, and Senate passed November 20, 2004. Held over for H.Con.Res. 528, which would change the cut to 0.80%.

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. 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.

H.R. 4503 (Barton)

Energy Policy Act of 2004. Omnibus energy policy bill, nearly identical to conference version of H.R. 6. Introduced June 3, 2004; referred to Committee on Energy and Commerce. Passed House (244-178) June 15, 2004.

H.R. 4614 (Hobson)

Energy and Water Appropriations Act, FY2005. Includes funding for the DOE Renewable Energy Program and the Office of Electricity Transmission and Distribution (OETD). Reported (H.Rept. 108-554) June 18. Passed House (370-16) June 25. Incorporated into Consolidated Appropriations Act FY2005 (H.R. 4818).

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. Incorporated into S.Amdt. 1530 to S. 14, but action stopped when the Senate substituted H.R. 4 that it sent to conference in the 107th Congress.

S. 2095 (Domenici)

Omnibus energy legislation. This bill is a pared-down version of the conference report on H.R. 6. 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.

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.

CONGRESSIONAL HEARINGS, REPORTS, AND DOCUMENTS

U.S. Congress. House. Committee on Appropriations. *FY2005 DOE Budget Request*. Hearing held March 10, 2004.

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

CRS Reports

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

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 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 trends back to FY1974 (current and constant) are available from the author of this issue brief.

American Solar Energy Society. *Renewable Hydrogen Forum*. Apr. 10-11, 2003. 50 p.

Barry, Courtney. "Winds of Change in Texas." *Public Utilities Fortnightly*, v. 141, no. 7, Apr. 1, 2003. p. 27-31.

Blankinship, Steve. "A Sunny Outlook for Grid-Connected PV." *Power Engineering*, v. 107, no. 1, May 2003. p. 32-40.

Cato Institute. Policy Analysis. *Evaluating the Case for Renewable Energy: Is Government Support Warranted?* Jan. 10, 2002. 16 p.

Energy Future Coalition. *Challenge and Opportunity: Charting a New Energy Future, Report of the Bioenergy and Agriculture Working Group*. 2003. 13 p.
[<http://www.energyfuturecoalition.com/>]

International Energy Agency. *Renewables Information 2004*. Sept. 2004. 204 p.
[<http://library.iea.org/dbtw-wpd/bookshop/add.aspx?id=68>]

National Research Council. *The Hydrogen Economy: Opportunities, Costs, Barriers, and R&D Needs*. February 2004. 200 p.

Owens, Brandon. "Does the PTC Work?" *Standard and Poor's*. Sept. 2004.

- Wind Power Reconsidered. *Popular Science*. November 2004. p. 43-44. [http://www.popsci.com/popsci/generaltech/article/0,20967,714431,00.html]
- Schimmoller, Brian K. “Renewables Get Into the Mix” *Power Engineering*, Jan. 2004. p. 22-30.
- Sklar, Scott and Sheinkopf, Kenneth. *Consumer Guide to Solar Energy: New Ways to Lower Utility Costs, Cut Taxes, and Take Control of Your Energy Needs*. 2002. 195 p.
- U.S. Department of Interior. Bureau of Land Management. *Solar Energy Development Policy*. [Instruction Memo No. 2005-006] October 20, 2004. 10 p. [http://www.blm.gov/nhp/efoia/wo/fy05/im2005-006.htm]
- U.S. Department of Energy. Interlaboratory Working Group. *Scenarios for a Clean Energy Future*. Nov. 2000. 350 p. [http://www.ornl.gov/sci/eere/cef/]
- . Energy Information Administration. *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*. (SR/OIAF/99-03). 1999.
- . National Renewable Energy Laboratory. *Domestic Energy Scenarios*. 2003. 25 p. [http://www.nrel.gov/docs/fy03osti/32742.pdf]
- . *Enhancing Homeland Security Through Renewable Energy — Richard Truly’s Remarks to the National Press Club*. Mar. 14, 2002. 7 p.
- . *Status Report to Congress on Current and Proposed Activities under the Clean Energy Technology Exports (CETE) Initiative*. 2001. 58 p. [http://www.pi.energy.gov/library/cete2001statusreport.html#pdf]
- . *The Clean Air Act and Renewable Energy: Opportunities, Barriers, and Options*. (NREL/CP-620-29654). 2001.
- U.S. Environmental Protection Agency. *Climate Action Report: The United States of America’s Third National Communication under the United Nations Framework Convention on Climate Change*. June 2002. 260 p. [http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsUSClimateActionReport.html]
- U.S. Government Accountability Office (GAO). *Renewable Energy: Wind Power’s Contribution to Electric Power Generation and Impact on Farms and Rural Communities*. [GAO-04-756] September 3, 2004. 107 p. [http://www.gao.gov/docsearch/abstract.php?rptno=GAO-04-756]
- Worldwatch Institute. *Mainstreaming Renewable Energy in the 21st Century*. May 2004. 76 p. [http://www.worldwatch.org/pubs/paper/169/]

Websites

- American Council for Renewable Energy. [http://www.americanrenewables.org/]

American Solar Energy Society. [<http://www.ases.org/>]

American Wind Energy Association (AWEA). [<http://www.awea.org/>]

California Energy Commission. [<http://www.energy.ca.gov/renewables/index.html>]

Database of State Incentives for Renewable Energy (IREC). [<http://www.dsireusa.org/>]

Databook of Renewable Energy Power Technologies.
[http://www.nrel.gov/analysis/power_databook/chapters.asp]

Earthtrack (Database of Energy Subsidies). [<http://www.earthtrack.net/>]

Edison Electric Institute. [<http://www.eei.org/>]

Electric Power Research Institute (EPRI) and EPRI Journal Online. [<http://www.epri.com/>]

National Association of Regulatory Utility Commissioners. [<http://www.naruc.org/>]

Ninth Session of the Conference of Parties to the United Nations Framework Convention on Climate Change (Milan, COP-9). December 1-12, 2003.
[<http://www.cop9.info/news/news.html>]

Renewable Energy Policy Project. [<http://solstice.crest.org/>]

Renewable Energy Website. International Energy Agency (IEA).
[<http://library.iea.org/renewables/index.asp>]

Solar Electric Power Association (SEPA). [<http://www.solarelectricpower.org/>]

Solar Energy Industries Association (SEIA). [<http://www.seia.org/>]

U.S. Department of Energy. Energy Efficiency and Renewable Energy Network.
[<http://www.eere.energy.gov/>]

U.S. Department of Energy. Green Power Network Clearinghouse.
[<http://www.eere.energy.gov/greenpower/>]

U.S. Department of Energy. National Renewable Energy Laboratory (NREL).
[<http://www.nrel.gov/>]

U.S. Department of Energy. Alternative Fuels Data Center. [<http://www.eere.energy.gov/afdc/index.html>]

U.S. Environmental Protection Agency. Clean Energy Site.
[<http://www.epa.gov/cleanenergy/>]

Vote Solar Initiative. San Francisco's \$100 Million Solar Revenue Bond Initiative.
[<http://www.votesolar.org/sf.html>].

Table 3. DOE Renewable Energy Budget for FY2004-FY2005
(selected programs, \$ millions)

| OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY | FY2004 App. | FY2005 Request | FY2005 House | FY2005 Conf. | Conf.-FY2004 | Percent Change |
|--|-------------|----------------|--------------|--------------|--------------|----------------|
| BIOMASS / BIOREFINERIES | 86.5 | 72.6 | 72.6 | 82.1 | -4.3 | -5% |
| R&D / Feedstock | 43.7 | 45.0 | — | — | — | — |
| Utilization | 42.8 | 27.6 | — | — | — | — |
| GEOTHERMAL | 25.5 | 25.8 | 25.8 | 25.8 | 0.3 | 1% |
| HYDROGEN | 82.0 | 95.3 | 64.3 | 95.3 | 13.3 | 16% |
| HYDROPOWER | 4.9 | 6.0 | 5.0 | 5.0 | 0.1 | 2% |
| SOLAR ENERGY | 83.4 | 80.3 | 82.7 | 86.5 | 3.1 | 4% |
| Concentrating Solar | 5.4 | 2.0 | 4.4 | 6.0 | 0.6 | 11% |
| Photovoltaics | 75.1 | 75.4 | 75.4 | — | — | — |
| Solar Heating & Lighting | 2.9 | 2.9 | 2.9 | — | — | — |
| ZERO-ENERGY BUILDINGS | 0.0 | 0.0 | — | — | — | — |
| WIND | 41.3 | 41.6 | 41.6 | 41.6 | 0.3 | 1% |
| INTERGOV. / RENEW. SUPPORT ¹ | 21.6 | 18.0 | 19.0 | 22.0 | 0.4 | 2% |
| Dept. Energy Management | 2.0 | 2.0 | 2.0 | 2.0 | 0.0 | 0% |
| International Renewables | 5.9 | 6.5 | 6.5 | 6.5 | 0.6 | 10% |
| Production Incentive | 3.9 | 4.0 | 5.0 | 5.0 | 1.1 | 27% |
| Tribal Energy | 4.9 | 5.5 | 5.5 | 5.5 | 0.6 | 12% |
| Program Support | 4.9 | 0.0 | — | 3.0 | -1.9 | -39% |
| NAT. CLIMATE CHANGE INIT. | 0.0 | 3.0 | — | — | — | — |
| FACILITIES & INFRASTRUCTURE | 13.0 | 11.5 | 11.5 | 11.5 | -1.5 | -11% |
| PROGRAM DIRECTION | 12.4 | 20.7 | 20.7 | 19.2 | 6.8 | 55% |
| RENEWABLES, SUBTOTAL | 370.5 | 374.8 | 343.2 | 389.1 | 18.6 | 5% |
| Prior Year Balances | -13.0 | 0.0 | — | — | 13.0 | 100% |
| Transfers | 0.0 | 0.0 | — | — | — | — |
| RENEWABLES, TOTAL | 357.5 | 374.8 | 343.2 | 389.1 | 31.6 | 9% |
| Office of Electricity T&D (OETD) ² | 81.9 | 90.9 | 75.4 | 121.2 | 39.3 | 48% |
| RENEWABLES + OETD, Total | 439.4 | 465.7 | 418.5 | 510.2 | 70.8 | 16% |

Source: DOE FY2005 Cong. Budget Request, v. 3; Feb. 2004 (p. 15-16, 49, 87, 169, 193, 211, 215, 231, 275); H.Rept. 108-554 (pp. 85-89, 143); H.Rept. 108-792, Division C.

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

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