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

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CONTENTS

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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 in 2001 and the Iraq war 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 northeast-midwest blackout of 2003, and continuing high natural gas prices have 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.

The Bush Administration's FY2006 budget request for the Department of Energy's (DOE's) Renewable Energy Program seeks $353.6 million, which is $32.4 million less than the FY2005 appropriation.

Thus far in the 109th Congress, the House has passed H.R. 6, the Energy Policy Act of 2005. H.R. 6 contains many non-tax renewable energy provisions similar to those of H.R. 6 in the 108th Congress. Further, Section 1311 has an $18 million residential solar tax credit. In an April 20 statement, the Bush Administration expressed concern that H.R. 6 did not include an extension of the renewable energy production tax credit (PTC). The most controversial provisions in H.R. 6 are a liability exemption for producers of methyl tertiary butyl ether (MTBE, §1502) and an authorization to begin oil development in the Arctic National Wildlife Refuge (ANWR, §2203).

Senate bills have been introduced to establish a renewable portfolio standard (S. 427), extend the renewable energy production tax credit (S. 727), increase the renewable fuel standard (S. 606, S. 650), and create several other tax and non-tax renewable energy measures.

In the 108th Congress, the conference version of the omnibus energy bill (H.R. 6) left out the Senate-proposed renewable portfolio standard (RPS) but provided a renewable energy production tax credit (PTC), renewable energy fuel standard (RFS), and several other tax and non-tax measures. The bill did not pass, in part due to concerns about the bill's cost and the controversial MTBE "safe harbor" provision.

The Working Families Tax Relief Act (P.L. 108-311) extended the previous PTC through December 31, 2005. The American Jobs Creation Act (P.L. 108-357) expanded the PTC to solar and geothermal; added a half-credit for open-loop biomass, municipal waste, and small irrigation hydro; and created a credit for producers of refined coal. Also, tax incentives were created for ethanol and biodiesel, and tax-exempt bonds were authorized for green buildings (including solar).

MOST RECENT DEVELOPMENTS

On April 21, 2005, the House passed (249-183) H.R. 6, the Energy Policy Act of 2005, incorporating titles from a House Resources committee print (Domestic Energy Security Act) and a tax title (Title XIII) from H.R. 1541, which had been approved by the Committee on Ways and Means. H.R. 6 contains many non-tax renewable energy provisions similar to those of H.R. 6 in the 108th Congress. Further, Section 1311 has an $18 million residential solar tax credit. In an April 20 statement, the Bush Administration expressed concern that H.R. 6 did not include an extension of the renewable energy production tax credit (PTC). The most controversial provisions in H.R. 6 are a liability exemption for producers of methyl tertiary butyl ether (MTBE, §1502) and an authorization to begin oil development in the Arctic National Wildlife Refuge (ANWR, §2203). (The main provisions of H.R. 6 are described in CRS Issue Brief IB10143, *Energy Policy: Comprehensive Energy Legislation (H.R. 6) in the 109th Congress*; the renewable energy provisions in H.R. 6 and other bills of the 109th Congress are discussed in "Renewables in the 109th Congress," below; and the provisions in H.R. 6 and S. 2095 from the 108th Congress are described in "Renewables in 108th Congress Omnibus Energy Bills," below.)

On March 8, 2005, the Senate Committee on Energy and Natural Resources held a hearing on the renewable energy portfolio standard.

On February 7, 2005, President Bush issued the Administration's budget request for FY2006. The Department of Energy (DOE) request seeks $353.6 million for renewables, which is $32.4 million, or 8%, less than the FY2005 appropriation (excluding inflation). The main increases are for Hydrogen ($5.1 million) and Facilities ($4.9 million). The main cuts are for Biofuels (-$30.5 million), Small Hydro (-$4.4 million), International Renewables (-$3.4 million), and Tribal Energy (-$1.5 million). Further, at least $75.9 million in congressional earmarks would be reprogrammed or eliminated, including Hydrogen ($37.6 million), Biofuels ($35.3), and Intergovernmental ($3.0 million). (For more details, see "FY2006 DOE Budget" and **Table 2**.)

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 2005*, renewable energy resources (excluding wood used for home heating) supplied about 5.9 Q (quadrillion Btu's or quads) of the 98.2 Q the nation used in 2003, 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 2005* projects that current policies would yield a 1.5% average annual increase in renewable energy production to 8.1 Q through 2025, resulting in a 38% total increase. This would amount to about 6.1% of the projected 133 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* (see [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 (see [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 *FY2006 Congressional Budget Request*, DOE/ME-0053, v. 3, February 2005.)

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 kwh, 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 the 109th Congress

Renewable Portfolio Standard (RPS). For retail electricity suppliers, an RPS sets a minimum requirement (often a percentage) for electricity production from renewable energy resources or for the purchase of tradable credits that represent an equivalent amount of production. In the 107th Congress, a 10% RPS provision was included in the Senate version of the omnibus energy bill (H.R. 4). In the 108th Congress, the Senate adopted the

same provision in its version of H.R. 6, but it was dropped in conference. Meanwhile several more states have enacted an RPS, bringing the total to 18 states and the District of Columbia.

In the 109th Congress, two bills (H.R. 983 and S. 427) would establish an RPS. The Senate Committee on Energy and Natural Resources held a hearing on RPS on March 8, 2005. Regional differences in the availability of renewable resources, particularly resource availability in the southeastern United States, was a key issue of the discussion. In the April 12 markup of a committee print (to be incorporated into H.R. 6) by the House Committee on Energy and Commerce, an amendment to add an RPS (1% in 2008, increasing by 1% annually through 2027) was rejected (17-30). Proponents noted a growing number of states with an RPS and that EIA reports show an RPS could reduce electricity bills. Opponents raised concerns about the exclusion of existing hydropower facilities and resource limits for the southeastern United States. There is no RPS provision in the House-passed version of H.R. 6. (For more background information on how the RPS works, a *CRS Memorandum on Renewable Energy Portfolio Standard* is available from the author. For current status of RPS policies in the states, see Database of State Incentives for Renewable Energy at [http://www.dsireusa.org/library/includes/type.cfm].)

Renewable Energy Production Tax Credit (PTC) and Renewable Energy Production Incentive (REPI). In the 108th Congress, the JOBS Act (P.L. 108-357) expanded the PTC (adding solar, geothermal, and open-loop biomass, landfill gas, trash combustion, and certain small hydro) and extended it through the end of 2005. In the 109th Congress, there is no PTC extension in the House-passed version of H.R. 6. However, several bills (H.R. 141, H.R. 1511, S. 35, S. 387, S. 542, S. 727) would extend the PTC in some form. (A detailed description of the PTC appears in the report *Description and Analysis of Certain Federal Tax Provisions Expiring in 2005 and 2006*, by the Joint Tax Committee at [http://www.house.gov/jct/x-12-05.pdf].)

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 the Energy Policy Act of 1992 (EPACT) §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. In the 109th Congress, some bills (H.R. 6 [§202], H.R. 622/S. 326, H.R. 1127) would modify the incentive.

Renewable Fuel Standard (RFS). In the 108th Congress, the proposals for a renewable fuel standard (RFS) would have been linked with other provisions involving the fuel additive MTBE. The energy bill conference report (H.R. 6, §1502) would have provided a "safe harbor" from product liability lawsuits for producers of MTBE and certain renewable fuels. 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. H.R. 6 would have put a qualified ban on the use of MTBE as a fuel additive and would have replaced the RFG requirement with a renewable fuel standard (RFS), requiring that the annual production of gasoline in 2012 contain at least 5 billion gallons of "renewable fuel."

In the 109th Congress, H.R. 6 (§1501) defines "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 2003, about 2.8 billion gallons of ethanol were blended with gasoline. Biodiesel is used at a rate of about 50 million gallons per year. The RFS provision would call for renewable fuels (primarily ethanol) production to grow to 3.1 billion gallons a year in 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 to 2.5 gallons of renewable fuel.

In the Senate, S. 606 would set an RFS of 3.8 billion gallons in 2006, rising to 6.0 billion gallons in 2012. Further, S. 650 would put the RFS at 4.0 billion gallons in 2006, rising to 8.0 billion gallons in 2012.

For more information on the bills' provisions for renewable fuels and MTBE, see CRS Report RL32865, *Renewable Fuels and MTBE: A Comparison of Selected Legislative Initiatives*; CRS Report RS21676, *The Safe-Harbor Provision for Methyl Tertiary Butyl Ether (MTBE)*; and CRS Report RL32787, *MTBE in Gasoline: Clean Air and Drinking Water Issues*.

Renewable Hydrogen. In the 109th Congress, H.R. 6 (§803) 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. In the Senate, several bills (S. 373, S. 665, S. 726) would create programs to produce hydrogen from renewable energy.

Residential Tax Credit. In the 109th Congress, some bills (H.R. 1541 [§201], S. 680 and S. 727 would create an investment tax credit or tax deduction for homeowners who purchase photovoltaics, wind energy, or solar water heating equipment.

Renewables Tax Revenue Effect. **Table 1** shows the estimated 10-year revenue effect of renewable energy tax provisions in H.R. 1541.

Table 1. H.R. 1541, Tax Revenue Effect

($ billions)

	H.R. 1541
Residential Solar Tax Credit (includes fuel cells)	$0.018
Net Total, All Tax Provisions	$8.090
Renewables Share of Total	0.2%

Source: Joint Committee on Taxation (JCX). *Estimated Revenue Effects of the Chairman's Amendment in the Nature of a Substitute to H.R. 1541, Scheduled for Markup by the Committee on Ways and Means, April 13, 2005*. (JCX-17-05)

Other Renewables Provisions. The above-mentioned bills, and others, cover additional areas of renewable energy policy, resources, and technology including distributed generation, federal purchases, federal lands, Indian energy, net metering, alternative fuels

(alcohol, biofuel, biodiesel), biopower/biomass, geothermal, hydropower, solar, and wind. (These bills and provisions are identified in CRS Report RL32860, *Energy Efficiency and Renewable Energy Legislation in the 109th Congress*.)

Renewables in 108th Congress Omnibus Energy Bills (H.R. 6, S. 2095, and S. 1637)

In the 108th Congress, the American Jobs Creation Act (P.L. 108-357) extended the renewable energy production tax credit (PTC) through the end of 2005 and expanded it to include solar, geothermal, open-loop biomass, landfill gas, trash combustion, small hydro used for irrigation, and refined coal. Also, it 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 otherwise stalled in the 108th Congress.

In the 108th Congress, most legislative action on renewables 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 remained in S. 2095. Other renewables provisions in the H.R. 6 conference report included a renewable energy production incentive, a residential solar tax credit, and other tax and authorization measures. S. 2095 and H.R. 6 also included 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].)

FY2006 DOE Budget

The FY2006 budget request aims to "accelerate" the development of hydrogen-powered fuel cell vehicles. The Hydrogen program aims to facilitate industry commercialization of infrastructure for those vehicles by 2015. Goals for other renewable energy technologies generally seek to improve energy production performance while reducing costs. The request also proposes funding tax credits, including an extension of the PTC for wind, biomass, and landfill gas through the end of 2007 and an investment tax credit for residential solar systems through the end of 2009.

For FY2005, the 108th Congress approved the Consolidated Appropriations Act for FY2005, P.L. 108-447 (H.R. 4818, H.Rept. 108-792). Division C, the Energy and Water appropriations bill, provides $389.1 million for DOE's Renewable Energy program and

$121.2 million for OETD. Also, the act has $23.0 million for renewables at USDA and $180 million for clean energy (renewables) and energy efficiency in developing countries.

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. In the 109th Congress, H.R. 6 (§1253) includes 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 109th Congress, H.R. 983 and S. 427 have an RPS. A proposed RPS amendment to H.R. 6 was rejected in Energy and Commerce Committee markup.

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 [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. About 40 states have some form of net metering in place. In the 109th Congress, H.R. 6 (§1251) provides for net metering.

Natural Gas and Renewables

On January 24, 2005, the Senate Energy and Natural Resources Committee held a natural gas conference. Some participants described the potential for renewable energy to augment gas supplies, reduce gas demand, and thereby help reduce natural gas prices; see [http://energy.senate.gov/conference/conference.cfm]. Some of these statements referred to a 2005 Department of Energy (DOE) study, *Easing the Natural Gas Crisis: Reducing Natural Gas Prices through Increased Deployment of Renewable Energy and Energy Efficiency*, available at [http://eetd.lbl.gov/ea/ems/reports/56756.pdf].

Biomass-Generated Synthetic Natural Gas (Syngas). Continuing high natural gas prices have created interest in using renewables to dampen natural gas demand. Renewable energy (mainly biomass) can be used to produce methane (the main component of natural gas), which could possibly substitute directly for natural gas. DOE projects that, by 2020, biomass and energy crops could produce 15% of natural gas needs. A 2005 Harvard University study, *The National Gasification Strategy*, cites a Princeton University study (*A Cost-Benefit Assessment of Biomass Gasification Power Generation in the Pulp and Paper Industry*) that says that biomass-generated "black liquor" and wood waste could produce enough syngas to support 25 billion watts (gigawatts) of natural gas-fired power plant capacity by 2020.

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. For many utilities the peak demand (often supported with natural gas peak-load plants) occurs during hot summer afternoons. In many regions, solar and wind energy reach high levels during summer peak periods. The American Wind Energy Association (AWEA) says that by the end of 2005, wind farms will be saving more than 0.5 billion cubic feet (Bcf) of natural gas per day. DOE's report *Scenarios for a Clean Energy Future* (Table 7.11) projects that, with some federal policy changes, biomass-based power production could be greatly accelerated through 2010. (Also see the 2005 DOE study noted above, and the American Council for an Energy Efficient Economy's 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 (CO_2), 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 CO_2 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 (CO_2) 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 CO_2 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 (CO_2) 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 CO_2 at an intensity that may rival or exceed that for natural gas. However, the growth of biomass material, which absorbs CO_2, 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 CO_2 emissions.

LEGISLATION

109th Congress

H.R. 6 (Barton)

Energy Policy Act of 2005. Reauthorizes REPI, authorizes increased hydropower at existing dams, sets renewables goal for federal facilities, and establishes residential rebate program. Committee on Energy and Commerce ordered committee print reported, as amended, April 13. Incorporated Domestic Energy Security Act and H.R. 1541 (as Title XIII). Referred to Committees on Energy and Commerce, Resources, Ways and Means, Science, and others April 18. Passed House, amended, April 21.

H.R. 1541 (Thomas)

Provides $18 million in residential investment tax credits over three years for solar hot water, phontovoltaics, and fuel cell equipment. Committee on Ways and Means ordered bill reported, April 13. Incorporated into H.R. 6.

S. 427 (Jeffords)

Renewable Energy Investment Act of 2005. Creates a federal renewable energy portfolio standard, starting at 5% in 2006 and reaching 20% in 2020 Introduced February 17, 2005; referred to Committee on Energy and Natural Resources.

S. 726 (Alexander)

Natural Gas Price Reduction Act of 2005. Section 103 authorizes funding for distributed generation, solar energy, and biomass technologies. Section 104 authorizes funding to accelerate hydrogen and fuel cell development. Section 105 would, under certain conditions, repeal PURPA Section 210 requirements for cogeneration and small power facilities. Section 106 calls for a study of cogeneration and small power. Section 108 directs states to consider requiring net metering services for electric utility customers. Section 113 provides financial incentives to industry to encourage use of gasification equipment that uses biomass and other fuels. Introduced April 6, 2005; referred to Committee on Energy and Natural Resources.

S. 727 (Alexander)

Tax Incentives for the Natural Gas Price Reduction Act of 2005. Section 3(a) increases the business investment tax credit for solar energy equipment from 10% to 30% for five years. Section 3(b) establishes a 30% tax credit ($7,500 maximum) over five years for installation (including labor) of residential solar heating equipment. Section 4(a) has a 15% investment tax credit ($2,000 maximum) for residential solar electric (3-year), solar water heating (1-year), and wind energy (1-year) equipment. Section 3(c) extends the renewable energy electricity production tax credit (PTC) for solar and geothermal energy for five years. For other equipment under the PTC, Section 4(b) extends the credit for one year. Introduced April 6, 2005; referred to Committee on Finance.

(A more extensive list of over 50 bills appears in CRS Report RL32860, *Energy Efficiency and Renewable Energy Legislation in the 109th Congress*.)

108th Congress

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 301extends 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.

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(A more extensive list appears in CRS Report RL32860, *Energy Efficiency and Renewable Energy Legislation in the 109th Congress*.)

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.

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Table 2. DOE Renewable Energy Budget for FY2004-FY2006

(selected programs, $ millions)

OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY	FY2004 App.	FY2005 App.	FY2006 Req.	FY2006-FY2005	Percent Change
HYDROGEN	80.4	94.0	99.1	5.1	5%
Production R&D	10.1	14.3	32.2	17.8	124%
Storage	13.2	23.8	29.9	6.0	25%
Other Program	15.2	18.2	37.0	18.8	103%
Congressionally Directed	42.0	37.6	0.0	-37.6	-100%
SOLAR ENERGY	80.7	85.1	84.0	-1.1	-1%
Photovoltaics	72.5	76.3	75.0	-1.3	-2%
Concentrating	5.3	6.0	6.0	0.0	1%
Solar Heating & Lighting	2.9	2.8	3.0	0.1	5%
WIND	39.8	40.8	44.2	3.4	8%
SMALL HYDRO	4.7	4.9	0.5	-4.4	-90%
GEOTHERMAL	24.6	25.3	23.3	-2.0	-8%
BIOFUELS/BIOREFINERY	80.4	80.8	50.4	-30.5	-38%
R&D / Feedstock	29.9	32.1	44.4	12.3	38%
Utilization	13.5	13.5	6.0	-7.5	-55%
Congressionally Directed	41.2	35.3	0.0	-35.3	-100%
INTERGOV. / RENEW. SUPPORT [a]	21.6	24.7	16.8	-7.9	-32%
Dept. Energy Management	2.0	2.0	2.0	0.1	3%
International Renewables	5.8	6.4	2.9	-3.4	-54%
Production Incentive	3.9	5.0	5.0	0.0	1%
Tribal Energy	4.9	5.5	4.0	-1.5	-27%
Program Support	3.6	3.0	2.9	-0.1	-3%
Congressionally Directed	4.9	3.0	0.0	-3.0	-100%
FACILITIES & INFRASTRUCTURE	13.0	11.4	16.3	4.9	43%
PROGRAM DIRECTION	16.5	19.1	19.0	0.0	0%
RENEWABLES, SUBTOTAL	370.5	386.0	353.6	-32.4	-8%
Prior Year Balances	-13.0	—	—	—	—
RENEWABLES, TOTAL	357.5	386.0	353.6	-32.4	-8%
Office of Electricity T&D (OETD)	101.2	120.2	95.6	-24.6	-20%
RENEWABLES + OETD, Total	439.4	506.2	449.2	-56.9	-11%

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.

[a] Combines “Intergovernmental Activities” and “Renewable Support and Implementation.”