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

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Renewable Energy: Tax Credit, Budget, and Electricity Restructuring 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, led to heightened concern about energy security and the vulnerability of energy infrastructure Further, the 2001 electricity shortages in California brought a new emphasis to the role that renewable energy may play in electricity supply.

In the 107th Congress, debate over renewable energy programs focused on tax credits, incentives, budget, and provisions of the omnibus energy policy bill, H.R. 4.

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

For DOE's FY2003 Renewable Energy Program, the Bush Administration sought $407.0 million, an $11.3 million (3%) increase relative to the FY2002 appropriation, not accounting for inflation.

In the 107th Congress, the House Appropriations Committee recommended $396.0 million for the FY2003 Program, which is $11.0 million less than the request. In contrast, the Senate-passed version of the FY2003 Omnibus Appropriations Bill (H.J.Res. 2) recommends $448.1 million (excluding $15.0 million in prior year balances), which is identical to the level recommend by the Senate Appropriations Committee in the 107th Congress. This level is $52.0 million, or 13%, more than the House Appropriations Committee recommended in the 107th Congress. It includes increases of $10.5 million for Geothermal, $9.5 million for Hydrogen, $6.0 million for Wind, $4.1 million for Concentrating Solar, $4.0 million for Program Support, $3.3 million for Photovoltaics, and $3.0 million for Renewable American Indian Resources.

The FY2004 budget request for DOE's Renewable Energy Program seeks $444.2 million (excluding a general reduction), which is $37.2 million more than the FY2003 request and is $3.9 million lower than the Senate-passed version of H.J.Res. 2, which would make appropriations for FY2003. The request presents a new budget structure.

Both the House and Senate versions of H.R. 4 would have extended the renewable energy production tax credit (for 2 years), expanded the renewable energy production incentive, and created a residential tax credit for some renewable energy equipment. The Senate version also had a renewable energy portfolio standard (RPS) that set a target for future electricity production. This provision stimulated intense negotiations in the conference committee on H.R. 4, which did not resolve some concern about the "feasibility" of reaching target percentages. Further, the Senate version proposed a renewable energy fuel standard, which was subject to a debate about whether to eliminate the federal ban on methyl tertiary-butyl ether (MTBE).

MOST RECENT DEVELOPMENTS

On February 3, 2003, the Bush Administration issued its FY2004 budget request. For DOE's Renewable Energy Program, it seeks $444.2 million (excluding a general reduction), which is $37.2 million more than the FY2003 request and includes $48.1 million more for Hydrogen (as part of the Freedom Fuel Initiative) and $15 million more for a National Climate Change Technology Initiative. It would also would terminate the Concentrating Solar Power Program and cut Biomass by $16.3 million, Solar Buildings by $5 million, and Renewable American Indian Renewables by $2.3 million. The request is $3.9 million lower than the Senate-passed version of H.J.Res 2, which would make appropriations for FY2003. The request presents a new budget structure.

On January 29, 2003, the House disagreed to the Senate amendment for H.J.Res 2 and appointed conferees. On January 23, 2003, the Senate passed the Omnibus Appropriations bill for FY2003 (H.J.Res. 2), which includes the Energy and Water Appropriations bill (Congressional Record of January 15, 2003, p. S492). For the DOE Renewable Energy Program, it contains $448.1 million (excluding $15.0 million in prior year balances). This is identical to the amount that the Senate Appropriations Committee had recommended in the 107th Congress. Compared to the Administration's request of $407.0 million, the Senate level would add $41.1 million, or 10%, excluding inflation. Compared to FY2002, the Senate level would add $52.1 million, or 13%, excluding inflation. The House Appropriations Committee recommendation in the 107th Congress was the same as the FY2002 level.

In the 107th Congress, conference committee negotiations over the omnibus energy bill, H.R. 4, were not completed. Key renewables provisions that reportedly (Inside Energy, October 21, p. 1-5) were not agreed to included the renewable energy portfolio standard (RPS), renewable energy fuel standard, the renewable energy production tax credit, a residential tax credit, and several incentives for alternative fuels and vehicles.

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

BACKGROUND AND ANALYSIS

Renewable Energy Concept

Renewable energy is derived from resources that are generally not depleted by human use, such as the sun, wind, and water movement. These primary sources of energy can be converted into heat, electricity and mechanical energy in several ways. There are some mature technologies for conversion of renewable energy such as hydropower, biomass, and waste combustion. Other conversion technologies, such as wind turbines and photovoltaics, are already well-developed, but have not achieved the technological efficiency and market penetration which many expect they will ultimately reach. Although geothermal energy is produced from geological rather than solar sources, it is often included as a renewable energy

resource and this brief treats it as one. Commercial nuclear power is not generally considered to be a renewable energy resource. (For further definitions of renewable energy, see the National Renewable Energy Laboratory's web site information on "Clean Energy 101" [http://www.nrel.gov/clean_energy/].)

Contribution to National Energy Supply

According to the Energy Information Administration's (EIA's) *Annual Energy Outlook 2002*, renewable energy resources supplied about 6.5 Q (quadrillion Btu's or quads) of the 99.3 Q the nation used in 2000, or about 6.6% 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 2000, declining hydroelectric availability led to a slight 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 2002* projects that current policies would yield a 1.6% average annual increase in renewable energy production through 2020, resulting in a 38% total increase. This would amount to about 6.8% of the projected 131 Q total demand in 2020. (Detailed breakdowns of renewable energy use appear in EIA's *Renewable Energy Annual 2000* 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." Although many renewable energy systems are in a relatively early stage of development, they offer the world "a potentially huge primary energy source, sustainable in perpetuity and available in various forms to every nation on Earth." It suggested that a Research, Development, and Demonstration (R,D&D) program of renewable energy projects is required to attain the same level of primary energy that is now obtained from a mix of fossil, nuclear, and renewable energy resources.

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

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

History

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

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

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

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

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

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

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

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

DOE's Office of Energy Efficiency and Renewable Energy (EERE). This office is led by the Assistant Secretary for Energy Efficiency and Renewable Energy. In 2002, Assistant Secretary David Garman completed a major reorganization of EERE. The new management strategy is described in *Focused on Results: A New Government Business Model*, available at [http://www.eren.doe.gov/eere/pdfs/eere_reorg.pdf]. More information about EERE is available on the DOE web site [http://www.eren.doe.gov/eere/organization.html].

Renewables Provisions in Omnibus Energy Bills

In the 107th Congress, most legislative action on renewables has focused on the House and Senate versions of the omnibus energy policy bill, H.R. 4. The renewables provisions in the House version were taken directly from H.R. 2436, H.R. 2460, H.R. 2511, and H.R.

2587 and contained many, if not most, of the renewable energy recommendations in the Bush Administration's *National Energy Policy* report. The Senate version of H.R. 4 incorporated S.Amdt. 2917 to S. 517, which, in turn, replaced S. 1766. Many renewables provisions of the Senate version were taken directly from S. 388, S. 389, S. 596, and S. 597. The Conference Committee reportedly had reached agreement on three renewables provisions: an annual DOE assessment of renewable energy potential (H601/S262, House recedes), a DOE report on renewable energy potential for American Indian lands (S406, House recedes with amendment), and a wind/hydro study (S408, House recedes with amendment). Other key renewables provisions included the renewable energy portfolio standard, the renewable fuel standard, and a few tax credits and other incentives.

Renewable Energy Portfolio Standard (RPS). *Inside Energy* (October 21, 2002, p. 1-5) reported that a "number of changes" from the Senate's RPS language had been negotiated and that the changes were being "evaluated by DOE to make sure they are feasible." The changes reportedly included "more borrowing and averaging" of credits and may include a provision "allowing states to opt out of the federal RPS under certain conditions." Yet, some conferees still saw the RPS target percentage as "an unachievable level."

Section 264 of the Senate version of H.R. 4 (S. 517) proposed that retail electricity suppliers (utilities, except for municipal and cooperative utilities) be required to obtain a minimum percentage of their power production from a portfolio of new renewable energy resources. The minimum energy target or "standard" would start at 1% in 2005, rise at a rate of about 1.2% every two years, and peak at 10% in 2019.

Eligible resources include solar, wind, ocean, and geothermal energy, most forms of biomass, landfill gas, and incremental hydropower. A generation offset from renewables used on site to reduce the measured demand from the grid is also eligible. The base for calculating the target production level excludes power from eligible renewables, hydropower, and municipal solid waste. Thus, states with a large amount of existing biomass, hydro, or other renewable power generation will have a proportionately lower target for new generation.

Tradable credits are created, which can be purchased in place of power from other suppliers, to help retailers meet the target at the lowest cost. The credits would function like the Clean Air Act emission allowance trading system, which has lowered compliance cost for air pollution regulations. The bill's credit trading provision is made flexible by allowing a supplier to "borrow" from expected future credits to fill a present shortfall or to "carry forward" surplus credits to future years.

A cost cap for the credits was set as the lesser of 1.5 cents/kwh (Section 271) or 200% of the average market value of the credits. The lower the cost cap, the more it may restrict portfolio diversity and deter generation from solar and other higher-cost renewable resources. Utilities sought a cost cap near 1 cent/kwh, while environmental groups sought a cap near 4 to 5 cents/kwh. State experience suggests that a cost cap is key to compliance cost control and may also allow compliance cost to flow through to customers as a business cost.

Some see a federal RPS as a way to substitute a more market-oriented mechanism for the PURPA Section 210 requirement that utilities purchase power from renewables at an

administratively determined "avoided cost." More than ten states, including Texas, and a few foreign governments, have an RPS that provides a base of experience for the federal proposal. In September 2002, California enacted an RPS (SB1078) that requires a 1% annual increase, ties renewables cost to natural gas prices, and aims to reach 20% by 2017. (For information about RPS policies in the states, see [http://www.dsireusa.org/dsire/summarytables/reg1.cfm?&CurrentPageID=7]. For more general information on RPS, see [http://www.congress.gov/brbk/pdf/ebele27.pdf].)

Renewable Energy Fuel Standard (RFS). According to *Inside Fuels and Vehicles* (October 10, 2002, p. 6-7), one major RFS issue for the H.R. 4 Conference Committee was whether to include elimination of the federal ban on methyl tertiary-butyl ether (MTBE), as proposed by the House. Section 820 of the Senate version proposed to increase the renewable energy content of motor fuel, starting in 2003. There was no comparable provision in the House version. (For more on the Renewable Energy Fuel Standard, see CRS Report RL31276.)

Production Tax Credit and Production Incentive. The H.R. 4 Conference Committee did not address tax provisions. Both the House version of H.R. 4 (Section 3102) and the Senate version (Section 1901-1906) would expand and further extend the renewable energy production tax credit that was extended by P.L. 107-147 (H.R. 3090). Also, both versions (House, Section 602; Senate, Section 261) would expand and extend a parallel renewable energy production "incentive" for state and local governments. This 1.5 cent/kwh renewable energy production incentive (REPI) was created by EPACT Section 1212. It is funded through direct appropriations to DOE.

Residential Tax Credit. Section 2103 of the Senate version and Section 3101 of the House version created a 15% residential tax credit worth up to $2,000 for homeowners who purchase photovoltaics and solar water heating equipment. The Senate version also provided a 30% credit worth up to $1,000 for wind energy equipment.

Alternative Fuels Incentives. In the House version of H.R. 4, Sections 2101-2105 call for grants to support alternative fuels and fueling stations and Sections 3104-3106 provide other incentives for alternative fuels and vehicles. Titles XIX, XX, and XXI of the Senate version had tax credits for alternative fuels, vehicles, and fueling stations.

Renewable Energy Labels. The House version (Section 141A) would have created an "Energy Sun" label for renewable energy equipment that could serve in a role parallel to that for the "Energy Star" label for energy-efficient equipment. (The renewables provisions in the House version are summarized in CRS Report RL31153 and the provisions of the Senate version are summarized in CRS Report RL31276.)

FY2004 DOE Budget

The FY2004 request for DOE finds that hydrogen energy is the "most promising long-term revolution in energy use that can help the nation "liberate itself from dependence on imported oil," according to the Budget of the U.S. Government FY2004 (p 105). The FY2004 request for DOE's Renewable Energy Program elaborates that its aim is to "accelerate progress" and make hydrogen technologies "cleaner, safer, and lower in cost."

Further, it stresses that the new National Climate Change Technology Initiative will create "competitive solicitations" in applied research that aims to reduce greenhouse gas emission and will "complement" existing R&D programs.

FY2003 DOE Budget

On September 5, 2002, the House Appropriations Committee reported (H.R. 5431, H.Rept. 107-681) the FY2003 Energy and Water Appropriations (E&W) Bill, which recommends $396.0 million for the DOE Renewable Energy Program. This is the same amount, not accounting for inflation, as the FY2002 appropriation.

As shown in Table 2, the Senate Appropriations Committee (S. 2784, S.Rept. 107-220) FY2003 recommendation of $448.0 million (excluding $15.0 million in prior year balances) would provide $52.0 million, or 13%, more for the DOE Renewable Energy Program than the House Appropriations Committee's recommendation. This includes $10.5 million more for Geothermal, $9.5 million more for Hydrogen, $6.0 million more for Wind, $4.1 million more for Concentrating Solar, $4.0 million more for Program Support, $3.3 million more for Photovoltaics, and $3.0 million more for Renewable American Indian Resources.

The Senate report on FY2003 Energy and Water Appropriations found that DOE had not adequately implemented "congressionally-directed activities" set out in the FY2002 conference report and called for a DOE response "before the Conference Committee completes action on the final [FY2003] bill." The House report (H.Rept. 107-681) echoed this concern and it "renewed" an FY2002 directive that DOE provide Congress with "quantitative measures that can be used to evaluate the potential costs and benefits of various renewable energy technologies," to show a basis for its FY2003 budget proposal.

The FY2003 request (as revised by the House Appropriations Committee on March 18, 2002) for DOE's Renewable Energy Program sought "to meet the growing need for clean and affordable energy," according to the Appendix to the U.S. Government's FY2003 Budget (p. 397). To fulfill this policy, DOE proposed to lift funding from $396.0 million in FY2002 to $407.0 million in FY2003, an increase of $11.0 million (3%) above the FY2002 level.

FY2003 USDA Budget

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 1 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

Table 1. USDA Funding for Renewable Energy Programs
($ millions)

	FY2001	FY2002	FY2003*
Biobased Products and Bioenergy Programs			
Agricultural Research Service	48.9	64.2	67.4
Commodity Credit Corporation (CCC)*	40.7	150.0	-----
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*	133.0	247.2	102.5
Substitution: Solar and Wind Energy Programs	0.4	0.4	0.4
Farm Security Act, Title IX (mandatory appropriations)	-----	-----	39.0
Total*	133.4	247.6	141.9
*The appropriations for the FY2003 CCC Bioenergy Incentives Program have not yet been set. The Senate has recommended $50 million and the House has recommended $150 million.			

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

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]).

Electricity from Renewable Energy

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. As part of federal restructuring proposals, some bills have included a 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. The Senate version of H.R. 4 had an RPS (see above under "Renewable Energy Portfolio Standard").

Green Power. The spread of competition in the electric industry has been accompanied by growth in the market for green power services. The term "green power" generally refers to electricity supplied in whole or in part from renewable energy sources. 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. More than 80 utilities have implemented green pricing programs that can reach more than one-third of the nation's consumers. Green power marketing, the selling of green power programs in either the retail or wholesale competitive marketplace, is underway in the newly competitive electricity markets of California, Connecticut, Illinois, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island, and Texas. The growth of green power has led to market information needs for disclosure and certification, which are discussed in CRS Report RS20270 on *Renewable Energy and Electricity Restructuring*. (For more on green power see the web site [http://www.eren.doe.gov/greenpower/home.shtml].)

Distributed Generation. Distributed generation involves the use of small, modular electricity generators sited close to the customer load that can enable utilities to defer or eliminate costly investments in transmission and distribution (T&D) 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. For example, DOE's R&D program is developing systems under five megawatts in size that would primarily use agricultural or industrial biomass wastes to supply energy to use on-site or to sell to the grid. As another example, photovoltaic (PV) systems ranging from one kilowatt to one megawatt are commercially available. PV has the advantages of being modular and easy to site near the use, it has low operating and maintenance costs, and its power output curve follows the peak electrical demand. Its main disadvantage is its initial capital cost. (More information about DOE's Distributed Power Program is available at [http://www.eren.doe.gov/distributedpower/]).

During the 2001 electricity crisis in California, FERC waived (EL01-47/000, [http://www.ferc.fed.us/electric/bulkpower/el01-47-000.pdf]) its prior notice requirements for businesses with on-site power generators that sell wholesale power to the grid, to help increase electricity supplies in the Western states. This action tends to encourage more generation from distributed renewable energy power sources. Also, the House version of H.R. 4 (Sections 2121-2128) and Senate version of H.R. 4 (Sections 102, 242, 1211) had provisions for distributed generation.

Net Metering. Net metering allows customers with generating facilities to "turn their electric meters backwards" when they are feeding power into the grid, so that 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. Further, the California Public Utilities Commission approved $138 million annually over four years for programs that reduce peak demand, including a provision for up to 50% of system cost to customers that install PV, wind, or fuel cells that use renewable fuels ranging in size from 30 kw to 1 MW. Also, the Senate version of H.R. 4 (Section 245) provided for net metering.

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 can substitute for fossil energy sources used to produce vehicle fuels and electricity. The percentage of renewable energy substitution depends on technology cost, market penetration, and the use of energy efficiency measures to control energy prices and demand. DOE's 2000 report, *Scenarios for a Clean Energy Future*, estimates that new policies could triple non-hydro renewables electricity production in 2010 from a projected business-as-usual 86 billion kilowatt-hours (Bkwh) to 265 Bkwh. EPA's *Climate Action Report-2002* describes federal renewable energy programs aimed at reducing greenhouse gas emissions. In *Climate Change 2001: Mitigation*, the Intergovernmental Panel on Climate Change looks at the role that renewables can play in curbing global 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. (For more details, see the CRS electronic briefing book on Global Climate Change at [http://www.congress.gov/brbk/html/ebgcc1.html].)

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 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

H.J. Res. 2

Omnibus Appropriations Bill for FY2003. The Energy and Water Appropriations Bill is part of the Omnibus Bill. It makes appropriations for DOE's Renewable Energy program. House passed as a continuing resolution, January 8, 2003. Senate inserted its amendment (S.Amdt 1) and issued an unnumbered committee print (*Congressional Record*, p. S492) January 15, 2003. Passed Senate, amended, January 23, 2003. Senate conferees appointed

January 23, 2003. House disagreed to Senate amendment and appointed conferees January 29, 2003.

Legislation in the 107th Congress

P.L. 107-147 (H.R. 3090)

Job Creation and Worker Assistance Act of 2002. Section 603 extends the renewable energy production tax credit for 2 years, retrospectively from December 31, 2001, to December 31, 2003. Also, Section 602 extends a credit for electric vehicles and Section 606 extends a deduction for clean fuel vehicle property. House Committee on Ways and Means reported (H.Rept. 107-251) bill on October 17, 2001, with two-year extension of renewables production tax credit. Passed House October 24, 2001. Senate Finance Committee reported (Committee Print 107-49) an amendment in the nature of a substitute with an amendment to the title on November 9, 2001. Section 404 of the Senate version proposed one-year extension of renewables production tax credit. Brought to the floor November 13, 2001. Amended in Senate (S.Amdt. 2896) and passed Senate February 14, 2002. House agreed to Senate amendment March 7, 2002. Signed into law March 9, 2002.

P.L. 107-171 (H.R. 2646)

Farm Security Act. Section 6013 provides loan guarantees for renewable energy equipment and broadens the range of renewable energy equipment available for loans. Title IX (p. 347-358) has several renewable energy provisions. Section 902 requires federal purchases of biobased products, biofuels development, and biodiesel education. It also provides renewable energy loans (up to $10 million) and grants (up to $200,000). Section 903 extends the Biomass R&D Act of 2000 (P.L. 106-224) through FY2006 and mandates a $15 million per year appropriation for each year from FY2002 through FY2006. Section 904 provides technical and financial assistance, loans, and loan guarantees for renewable energy development by rural electric cooperatives. Section 905 addresses measures to sequester carbon and reduce greenhouse gas emissions. Section 906 directs the Department of Agriculture to promote renewable fuels production. Section 907 continues and expands the bioenergy program at the Department of Agriculture. House bill introduced July 26, 2001; referred to Committee on Agriculture. Reported (H.Rept. 107-191, Parts I, II, and III) August 2, 2001. Passed House October 5, 2001. Senate bill reported in lieu of S. 1628 on November 27, 2001. Committee on Agriculture, Nutrition, and Forestry filed written report (S.Rept. 107-117) on December 7, 2001. Amended, incorporated into H.R. 2646 as an amendment in the nature of a substitute, and passed Senate, February 13, 2002. Conference report (H.Rept. 107-424) issued May 2, 2002. Signed into law May 13, 2002.

H.R. 4 (House Version)

Securing America's Future Energy (SAFE) Act of 2001. Incorporates certain renewable energy provisions from H.R. 2436, H.R. 2460, H.R. 2511, and H.R. 2587. It provides for biomass on federal lands and geothermal leasing; authorizes R&D funding; creates tax credits for residential solar and alternative fuel vehicles, and renewable power production; and modifies hydropower development and licensing. Introduced July 27, 2001; referred to Committee on Energy and Commerce, and to the Committees on Science, Ways and Means, Resources, Education and the Workforce, Transportation and Infrastructure, the Budget, and Financial Services. Passed House, amended, August 2, 2001.

H.R. 4 (Senate Version)

Energy Policy Act. There are several major renewable energy provisions in this bill, including a renewable energy portfolio standard and a renewable fuel standard. S. 1766 was replaced by S. 517 which, in turn, was incorporated into the Senate version of H.R. 4 as an amendment in the nature of a substitute (S.Amdt 2917) and passed the Senate April 25, 2002. S.Amdt 3286 added the text of S. 1979 on energy tax measures to the bill.

H.R. 5263 (Bonilla)/S. 2801 (Kohl)

Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Bill, FY2003. Appropriates funding under USDA's Commodity Credit Corporation for the Bioenergy Incentives Program. House Appropriations Committee reported (H.Rept. 107-623) July 11, 2002. Set as Calendar No. 374. Senate Appropriations Committee reported (S.Rept. 107-223) July 25, 2002. Set as Calendar No. 250.

H.R. 5410 (Kolbe)/S. 2779 (Leahy)

Foreign Operations, Export Financing, and Related Programs Appropriations Bill, FY2003. Appropriates funding for renewable energy and energy efficiency under programs of the Global Environment Facility (GEF), U.S. Agency for International Development (AID), Overseas Private Investment Corporation (OPIC), and other bilateral and multilateral programs. Senate Appropriations Committee reported (S.Rept. 107-219) July 24, 2002. Under Development Assistance, includes $175 million in a new account (Sec. 554) to create a fund for "energy conservation, energy efficiency, and clean energy" in developing countries. House Appropriations Committee reported (H.Rept. 107-663) September 19, 2002. Under Development Assistance, includes $3 million for clean energy.

H.R. 5431(Callahan)/S. 2784 (Reid)

Energy and Water Development Appropriations Bill, FY2003. Makes appropriations for DOE's Renewable Energy Program. Senate bill reported (S.Rept. 107-220) July 24, 2002. Assigned calendar number 514. House bill reported (H.Rept. 107-681) September 5, 2002. Assigned calendar number 423.

CONGRESSIONAL HEARINGS, REPORTS, AND DOCUMENTS

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FOR ADDITIONAL READING

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

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Table 2. DOE Renewable Energy Budget for FY2001-FY2004

($ millions)

OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY	FY2002 App.	FY2003 Request	FY2003 H.App.C.	FY2003 Senate	House-Senate	Pct. Diff.	FY2004 Request
Biofuels - Total	93.0	86.0	86.0	100.0	-14.0	-16%	69.8
Biofuels/Utility Power	-----	-----	33.0	-----	-----	-----	-----
Biofuels/Transportation	-----	-----	53.0	-----	-----	-----	-----
Geothermal	29.0	26.5	26.5	37.0	-10.5	-40%	25.5
Hydrogen	31.0	39.9	35.5	45.0	-9.5	-27%	88.0
Small Hydro	5.3	7.5	6.5	7.5	-1.0	-15%	7.5
Solar Energy	95.0	87.6	87.6	95.0	-7.4	-8%	83.7
Concentrating Solar Power	-----	1.9	1.9	6.0	-4.1	-211%	0.0
Photovoltaics	-----	73.7	73.7	77.0	-3.3	-4%	76.7
Solar Buildings	-----	12.0	12.0	12.0	0.0	0%	7.0
Wind	41.0	44.0	44.0	50.0	-6.0	-14%	41.6
TECHNOLOGIES SUBTOTAL	294.3	291.5	286.1	334.5	-48.4	-17%	316.0
Electric/Storage	63.0	70.4	70.4	75.0	-4.6	-6%	70.8
Superconductivity	-----	47.8	47.8	50.0	-2.2	-5%	47.8
Other	-----	22.6	22.6	25.0	-2.4	-11%	23.0
Renewable Support & Implementation	14.5	23.9	19.9	29.9	-10.0	-50%	20.9
Dept. Energy Management	1.5	3.0	1.5	3.0	-1.5	-100%	2.3
International Renewables	3.0	6.5	4.0	6.5	-2.5	-63%	6.5
Production Incentive	4.0	4.0	6.0	5.0	1.0	17%	4.0
Renew. Amer. Indian Res.	3.0	8.3	6.3	9.3	-3.0	-48%	6.0
Program Support	3.0	2.1	2.1	6.1	-4.0	-194%	2.1
NREL (incl. construction)	5.0	5.0	5.0	6.8	-1.8	-36%	5.0
Program Direction	19.2	16.2	14.6	16.9	-2.3	-16%	16.6
RENEWABLES, Subtotal	396.0	407.0	396.0	463.1	-67.1	-17%	444.2
Prior Year Balances	-----	-----	-----	-15.0	15.0	-----	-----
RENEWABLES, Total	396.0	407.0	396.0	448.1	-52.1	-13%	444.2

Source: DOE FY2004 Cong. Budget Request, v. 3; Feb. 2003 (p. 244-247); H. Appropriations Committee Revisions, March 18, 2002; S.Rept. 107-220; H.Rept. 107-681; DOE FY2003 Cong. Budget Request, v. 3; Feb. 2002.