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

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Fred Sissine
Resources, Science, and Industry Division

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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. Also, the electricity shortages in California have brought a new emphasis to the role that renewable energy may play in electricity supply.

In the 107th Congress, debate over renewable energy programs appears to be taking a focus on tax credits, incentives, and the Bush Administration's National Energy Policy report, *Reliable, Affordable, and Environmentally Sound Energy for America's Future.*

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 remain a factor in debate.

P.L. 107-66 (Energy and Water Appropriations Bill) appropriates $396.0 million in FY2002 for DOE's Renewable Energy Program. To recap, the Administration requested $276.7 million, the House recommended $376.8 million, and the Senate recommended $435.6 million. The $396.0 million enacted is $20.3 million (5%) more than the FY2001 appropriation. (See Table 2 at the end of this brief.) However, the law includes nearly $80 million in earmarks, which may affect DOE's ability to fund its core programs.

An omnibus House energy bill (H.R. 4, Securing America's Future Energy Act of 2001), includes many, if not most, of the recommendations from Bush Administration's National Energy Policy Development Group report. It incorporates many renewable energy provisions including authorizations for R&D appropriations, incentives for alternative fuel vehicles, biomass development on federal lands, expedited geothermal leasing, and investment and production tax credits for various renewable energy sources.

In response to H.R. 4, the Chairman of the Senate Energy and Natural Resources Committee issued a "Chairman's mark" that outlines an omnibus energy bill for the Senate. It includes a renewable portfolio standard and other renewable energy policy proposals.

The Economic Recovery and Assistance for American Workers Act (H.R. 3090) was brought to the Senate floor in mid-November. Section 404 of the Senate version would extend the renewable energy production tax credit from January 1, 2002 to January 1, 2003. The House version of the bill would extend the credit for 2 years, to January 1, 2004.

MOST RECENT DEVELOPMENTS

On November 13, 2001, the Economic Recovery and Assistance for American Workers Act (H.R. 3090) was brought to the Senate floor. Section 404 would extend the renewable energy production tax credit from January 1, 2002 to January 1, 2003. The House version of the bill would extend the credit for 2 years, to January 1, 2004.

On November 12, the President signed the Energy and Water Appropriations Bill (H.R. 2311), which provides $396 million in FY2002 for the DOE Renewable Energy Program. This is $20.3 million, or 5%, more than the FY2001 appropriation. However, the law includes nearly $80 million in earmarks, especially for Biomass/Biofuels and for Electric/Storage programs. The relatively large amount of funding earmarks may affect DOE's ability to fund its core programs.

On September 6, 2001, the Senate Energy Committee Chairman issued a "Chairman's Mark" for a forthcoming omnibus Senate energy bill that says the bill would include renewable portfolio standard and other renewable energy provisions. On August 2, 2001, the omnibus House energy bill (H.R. 4, Securing America's Future Energy Act of 2001), passed the House with some renewable energy provisions, including many that were proposed in the Bush Administration's National Energy Policy (NEP) report.

(The FY2002 Conference Report is available on the Thomas web site at [ftp://ftp.loc.gov/pub/thomas/cp107/hr258.txt]. The DOE FY2002 Budget Request is available on the DOE web site [http://www.cfo.doe.gov/budget/02budget/es/solar.pdf]. The National Energy Policy report is available on the White House web site [http://www.whitehouse.gov/energy/].)

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 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 2001*, renewable energy resources supplied about 6.6 Q (quadrillion Btu's or quads) of the 96.1 Q the nation used in 1999, or about 6.9% 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, in 1998 and 1999, 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 20 years of federal support, some note that renewable energy has neither achieved 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 2001* projects that current policies would yield an 1.1% average annual increase through 2020, resulting in a 26% total increase in renewable energy production. This would amount to about 6.5% of the projected 127 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 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, global warming, and climate change — requires an emphasis on "clean and renewable energy sources."

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. Lacking a sustained, long-range policy from the Administration, Congress first took a major initiative in 1974. 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 *FY2001 Congressional Budget Request*, DOE/CR-0068, v. 3, February 2000.)

From FY1973 through FY1998, the federal government spent about $11.7 billion (in 1999 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 $1.3 billion in FY1979 and FY1980, then declined steadily to $136 million in FY1990. Spending rose from FY1991 to FY1995, declined in FY1996 and FY1997, then rose again in FY1998, reaching $275 million in 1999 constant dollars.

This spending history can be viewed within the context of DOE spending for the three other major energy R&D programs: nuclear, fossil, and energy efficiency R&D. From FY1948 through FY1972, in 1999 constant dollars, the federal government spent about $22.4 billion for nuclear (fission and fusion) energy R&D and about $5.1 billion for fossil energy R&D. From FY1973 through FY1998, in 1999 constant dollars, the federal government spent $43.2 billion for nuclear, $21.1 billion for fossil, $11.7 billion for renewables, and $8 billion for energy efficiency. Total energy R&D spending from FY1948-FY1998 reached $111.5 billion, including $66 billion, or 59% for nuclear, $26 billion, or 23%, for fossil, $12 billion, or 11%, for renewables, and $8 billion, or 7%, 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 systems. P.L. 106-170 expanded this credit to include poultry waste and extended it through December 31, 2001.

Public Utility Regulatory Policies Act. The Public Utilities Regulatory Policies Act (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 1998: Issues and Trends* (p. 4-5) reports that, by the end of 1996, nonutility renewable power capacity reached 17,200 MW, of which 12,600 MW came from QFs, including 3,420 MW of small hydropower facilities. These renewable power facilities generated nearly 90 billion kwh, of which 69 billion kwh was produced by QFs, including about 12 billion kwh of small hydropower. Thus, in 1996, QFs accounted for about 73% of nonutility renewable power capacity and about 76% of nonutility renewable power generation. QFs provided about 1.8% of national electric capacity and about 2.2% of national electricity generation.

DOE's Strategic and Performance Goals

The Government Performance and Results Act (GPRA, P.L. 103-62) requires each federal agency to produce and update a strategic plan linked to annual performance plans. In September 2000, DOE issued a new *Strategic Plan*. Renewable energy objectives and strategies appear under general goal #1 "Energy Resources." On March 30, 2000, DOE released its *Accountability Report*, which assesses the results of DOE's performance goals for FY1999. In the *DOE Annual Performance Plan for FY2001*, strategic objective ER2 aims to "Promote reliable, affordable electricity supplies that are generated with acceptable environmental impacts." Goals for 2010 include: triple non-hydro renewable generating capacity, increase distributed power to 20% of new annual capacity additions, and complete one million solar roofs. Two related performance goals for FY2001 are: increase non-hydro generating capacity to 9.3 million kilowatts, and install 20,000 solar roofs, bringing the total to 90,000 solar roofs installed. Six other FY2001 performance goals involve thin film photovoltaics, small dish concentrating power systems, a Kalina Cycle geothermal demonstration plant, testing of biomass gasification cofiring with coal, wind hybrid control technology, and demonstration of electric torch hydrogen production without carbon dioxide. Also, in April 2000, the Office of Energy Efficiency and Renewable Energy (EERE) released a strategic plan, *Clean Energy for the 21st Century*. Further, in early 2000, the National Academy of Public Administration issued *A Review of Management in the Office of Energy Efficiency and Renewable Energy* and the National Research Council issued *Renewable Power Pathways: A Review of the U.S. Department of Energy's Renewable Energy Programs*.

Tax Credits and Incentives

In the first session of the 107th Congress, a number of renewable energy tax credit bills have been introduced.

Production Tax Credit. This 1.5 cent/kwh production tax credit (PTC) was created by Section 1914 of the Energy Policy Act of 1992 (EPAct). It is currently available for wind, closed-loop biomass, and poultry waste. The 106th Congress extended the credit through December 31, 2001. Some bills in the 107th Congress would enhance this credit. some bills (S. 94/H.R. 876, S. 530) would extend the credit for five years, another bill (H.R. 269) calls

for a permanent extension of the credit, and still others (H.R. 983, H.R. 1657, S. 188, S. 756, S. 845) would broaden it to include a more extensive variety of biomass sources.

Residential Tax Credit. Two bills (S. 207, S. 293/H.R. 778) amend the Internal Revenue Code of 1986 to create a refundable tax credit for up to 50% of increased residential energy costs, applicable to a variety of residential equipment, including solar water heaters and photovoltaics. Another bill (S. 465) establishes a 15% residential tax credit for homeowners who purchase photovoltaics and solar thermal equipment. S. 596 creates a credit for equipment and building design features in residential and commercial buildings. Also, in *A Blueprint for New Beginnings*, the Bush Administration calls for tax credits for rooftop solar equipment.

Other Incentives and Credits. A 1.5 cent/kwh renewable energy production incentive (REPI) was created by EPAct Section 1212. It is available to state and local government agencies and non-profit electrical cooperatives. One bill (S. 249) would expand the range of eligible renewable energy resources. It would add "incremental" hydropower from new capacity or improved efficiency, and it would broaden biomass resources to include forest wastes, agricultural sources, and certain forms of wood waste. Further, it would add 0.25 cent/kwh, or 17%, to the credit for a qualified facility located on Native American land and for a "co-production" facility that also produces useful heat, mechanical power, or minerals. Also, the National Energy Security Act of 2001 (S. 388/S. 389) proposes an infrastructure credit for alternatively-fueled vehicles operated by state and other fleets covered by EPAct. Credits for fuels are also set out in H.R. 377 and S. 760. H.R. 760 contains a credit for hydropower facilities. Further, in *A Blueprint for New Beginnings*, the Bush Administration calls for tax credits for renewable fuels to help open markets.

FY2002 DOE Budget

The Senate bill (S. 1171) has $59.3 million more than the FY2001 appropriation. Relative to the FY2001 level, the Senate bill has $5.8 million less for Photovoltaics, $2.6 million less for Renewable American Indian Resources, and $2.0 million less for International Renewables. However, it also includes $19.0 million more for Electric/Storage, $12.2 million more for Biomass Power, $8.0 million more for Hydrogen, and $8.0 million more for NREL. The funding for NREL includes $5.0 million to address electric power needs in the Southwest.

Relative to the FY2001 appropriation, the House recommendation includes some significant cuts. Under technology programs, there are cuts of $5.9 million for Concentrating Solar Power and $2.0 million for Small Hydro. A $9.1 million cut for support and implementation programs includes reductions of $6.6 million to eliminate the Renewable Energy Program for American Indians, $2.0 million for International Renewables, and $1 million for Program Support.

In May 2001, the Bush Administration issued its revised FY2002 budget request for Renewable Energy programs at the Department of Energy (DOE). Despite a "growing need for clean and affordable energy," it proposes to cut Renewable Energy funding from $375.7 million in FY2001 to $276.7 million (excluding funding for programs under the Office of Science) — a decrease of $99.0 million (26%) below the FY2001 level.

For the technology programs, the Administration's request would provide $36.8 million less for photovoltaics, $19.5 million less for wind, $13.1 million less for geothermal, and $11.8 million less for concentrating solar power. Also, for the support and implementation programs, it would eliminate the Renewable Energy Program for American Indians and cut $2.5 million from the International Renewable Energy Program.

Under photovoltaics, the $9.0 million decrease for fundamental R&D would reduce efforts to improve solar energy conversion efficiency. Also, the $5.9 million cut for advanced materials and devices would scale-down efforts to improve thin film and crystalline silicon efficiency and terminate the advanced manufacturing R&D program, which aims to reduce production costs. Further, the $21.2 million drop for technology development would eliminate other efforts to reduce manufacturing costs and reduce R&D for reliability, standards, certification, testing and verification.

Under wind programs, applied R&D would fall $6.6 million, cutting back research on structures, materials, and components for advanced wind technologies. Also, the $5.0 million cut for turbine R&D would greatly slow down work on the next generation turbines, low speed turbines, and small wind turbines. Further, the $7.5 million cut for cooperative research and testing would eliminate the wind Powering America initiative aimed at opportunities and barriers to development and reduce efforts to study the integration of wind power into utility grid systems.

However, House report language says the request has "no clear rationale to explain the selective budget cuts" and no "apparent coordination" with the *National Energy Policy* report. At the same time, the report cites a 2000 study by the National Academy of Public Administration that found an absence of clear goals, priorities, work program, and milestones. Further, the report stresses that DOE technology programs are designed for long-term energy solutions, not immediate relief to the energy crisis, which is better addressed by incentives other than appropriations. Thus, the House recommends $376.8 million which is $100.2 million (36%) above the request and $1.1 million (0%) above the FY2001 appropriation.

Relative to the FY2001 appropriation, the House recommendation includes some significant cuts. Under technology programs, there are cuts of $5.9 million for Concentrating Solar Power and $2.0 million for Small Hydro. A $9.1 million cut for support and implementation programs includes reductions of $6.6 million to eliminate the Renewable Energy Program for American Indians, $2.0 million for International Renewables, and $1 million for Program Support.

The above funding reductions are offset by proposed increases of $6.0 million for Photovoltaics and $8.0 million for Electric/Storage, which includes $4.0 million for the Transmission Reliability Program and $2.9 million for the Superconductivity Program.

In March 2001, the Bush Administration issued *A Blueprint for New Beginnings: A Responsible Budget for America's Priorities* which outlines the approach of the Administration's budget policy. In Chapter 10, the *Blueprint* states that solar and renewable energy cannot replace fossil fuels in the near-term, but will be an important part of the Nation's long-term energy supply. As part of creating a comprehensive energy policy, the *Blueprint* proposes to increase the "performance" of renewable energy R&D by "winnowing out" less promising projects; to use tax credits for rooftop solar equipment and renewable

fuels to help market penetration; and to use income from bonus bids for oil and gas leases in the Arctic National Wildlife Refuge to support development of solar and renewable energy (*Blueprint*, p. 69; *Budget Appendix*, p. 405).

The FY2002 request for DOE's Renewable Energy Program seeks "to meet the growing need for clean and affordable energy," according to the Appendix to the U.S. Government's FY2002 Budget (p. 404-405). In accordance with the above policy, DOE proposes to cut solar and renewables funding under DOE's Office of Energy Efficiency and Renewable Energy (EERE) from $373.2 million in FY2001 to $237.5 million (excluding funding for programs under the Office of Science) — an decrease of $135.7 million (36%) below the FY2001 level. However, the budget request states that a forthcoming budget amendment will add a total of $39.2 million for Biomass/Biofuels, Hydrogen, Small Hydropower, Electric/Storage, and Renewable Support (*DOE Budget Highlights*, p. 14). Vice President Cheney is chairing a task force on energy policy that is expected to release a report that could have further implications for the Renewable Energy budget.

The Administration's $237.5 million request would eliminate the International Renewable Energy Program and the Renewable Energy Program for American Indians. Further, it would include $36.1 million less for Photovoltaics, $19.1 million less for Wind, $17.8 million less for Superconductivity, $13.0 million less for Geothermal, $13.0 million less Hydrogen, and $11.8 million less for Concentrating Solar Power.

For Photovoltaics, the $36.1 million decrease would cut Fundamental R&D by $9 million, or 49%. This would mean large reductions in efforts to improve solar energy conversion efficiency Also, Advanced Materials and Devices would fall by $5.9 million, or 23%. This would mean a scale-down in efforts to improve efficiency for thin film and crystalline silicon technologies. It would also terminate the Advanced Manufacturing R&D Program, which aims to reduce production costs. Further, Technology Development would drop by $21.2 million, or 69%. This would eliminate other efforts to reduce manufacturing costs while scaling down R&D for reliability, standards, certification, testing and verification.

For Wind, the proposed cut would reduce Applied R&D by $6.6 million, or 44%. This would scale down research on structures, materials, and components for advanced wind technologies. Also, it would reduce Turbine R&D by $5.0 million, or 40%. This would greatly slow down work on the next generation turbine, low speed turbine, and small wind turbine. Further, it would reduce Cooperative Research and Testing by $7.5 million, or 62%. This would eliminate the Wind Powering America initiative aimed at opportunities and barriers to development and reduce efforts to study the integration of wind power into utility grid systems.

For Superconductivity, the proposed cut would lead to cancellation of the next stage of industry partnership for developing highly efficient transmission cables and scale back the Second Generation Wire Initiative and related strategic research.

P.L. 106-377 (H.R. 4635; H.Rept. 106-988) was signed into law on October 27, 2000. It includes the FY2001 Energy and Water Appropriations bill that provides $373.2 million for the DOE Renewable Energy Program under the Office of Energy Efficiency and Renewable Energy and $47.1 million for DOE renewable energy research programs under the Office of Science.

Climate Change

Since 1988, the federal government has accelerated programs that study the science of global climate change and created 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, 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 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.

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 restructuring, some have proposed PURPA repeal. In the 107th Congress, H.R. 381/S. 552 would repeal PURPA.

Renewables Under Electric Industry Restructuring. To ensure a continued role for renewable energy under restructuring, some states and utilities have enacted measures such as a renewable energy portfolio standard (RPS), public benefits fund (PBF), and/or "green" pricing and marketing of renewable power. Also, some restructuring legislation in the 106th Congress included such provisions for renewables. (For a discussion of broader electricity restructuring issues, see CRS Electronic Briefing Book on *Electricity Restructuring* at [http://www.congress.gov/brbk/html/ebele1.html].)

Renewable Energy Portfolio Standard (RPS). About 10 states have created an RPS; several with – and a few without – restructuring in place. State experience indicates an RPS can be ineffective unless attention is given to key design elements that include policy goals, an energy target, eligible resources, a focus on retail sellers, tradable credits, an enforcement mechanism, and coordination with other policies. Some see a federal RPS as a way to replace the PURPA's administrative price determination for power from renewables with a more market-oriented mechanism. The 106th Congresses considered a federal RPS

proposal for a 7.5% renewable energy requirement. In the 107th Congress, S. 1333/H.R. 3037 proposes a 20% RPS, and the Chairman's Mark for an omnibus Senate energy bill proposes a 5% RPS. (For more on RPS, see CRS Memorandum on *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 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 better quality, more reliable energy supplies and a cleaner environment. Technologies for distributed electricity generation include 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 on-site energy 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, easy to site near the use, has low operating and maintenance costs, and its power output curve follows the peak electrical demand. In December 2000, DOE issued a Strategic Plan for Distributed Energy Resources (available at: http://www.eren.doe.gov/distributedpower/).

In March, to help increase electricity supplies in the Western states, 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. This action tends to encourage more generation from distributed renewable energy power sources. Also, H.R. 1045 would create incentives 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 April 2001, California enacted a law (ABX129) that raised the size limit for net-metered systems from 10 kw to 1 Mw. Further, the California Public Utility 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, H.R. 954 and S. 597 would provide for net metering.

Legislative Activity in the 107th Congress

More than 80 renewable energy bills have been introduced during the 107th Congress. These bills cover a wide range of renewable energy technologies including alcohol fuels and biofuels, biopower, geothermal, hydrogen, hydropower, solar, and wind. Also, they cover a range of policies that include tax credits, regulation, funding, goals, and environment. So far, tax credits and incentives for alcohol fuels and biofuels are the policy topics that have generated the greatest number of bills.

The Senate Energy Committee Chairman has issued a "Chairman's Mark" for a forthcoming omnibus Senate energy bill that says the bill would have a renewable energy portfolio standard and several other renewable energy provisions. Many of these provisions may be derived from the Democratic energy bills, S. 597 and S. 596, and some may also be drawn from the Republican energy bills, S. 388 and S. 389.

An omnibus House energy bill (H.R. 4, Securing America's Future Energy Act of 2001), includes many, if not most, of the recommendations from Bush Administration's National Energy Policy (NEP) report. It incorporates many of the renewable energy provisions that are included in H.R. 2436, H.R. 2460, H.R. 2511, and H.R. 2587. Another House bill (H.R. 2324) has some renewable energy provisions which differ markedly from those in H.R. 4.

Some key renewable energy bills are listed in the Legislation section below. A detailed, comprehensive list of renewable energy bills appears in CRS Report RL31044, *Renewable Energy Legislation in the 107th Congress.*

LEGISLATION

P.L. 107-66, H.R. 2311)

Energy and Water Appropriations Bill, FY20002. Makes appropriations for DOE's Renewable Energy Program. Reported (H.Rept. 107-112) June 26, 2001. Passed House without amendments for renewable energy on June 28. Senate Appropriations Committee reported a Senate bill (S. 1171, S.Rept. 107-39) July 13, 2001. Passed Senate without amendments to renewables, July 19. Conference Committee reported (H. Rept. 107-258) October 30. Signed into law November 12,2001.

H.R. 4 (Tauzin)

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. 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.

H.R. 2324 (Woolsey)

Renewable Energy and Energy Efficiency Act of 2001. Creates a broad range of provisions for renewable energy and energy efficiency. Section 3 sets a 20% goal for non-hydro renewables share of national energy production by 2020. Section 102 sets individual cost reduction goals for wind, photovoltaics, and other renewable energy technologies; and it also authorizes appropriations for FY2002 through FY2006. Section 103 sets goals of tripling bioenergy use by 2010, integrating biomass gasifers with gas turbines and fuel cells, and accelerating the commercial production of cellulosic ethanol; and it also authorizes appropriations for FY2002 through FY2006. Section 104 directs Department of Energy (DOE) to undertake resource assessments that would support commercial development of renewables. Section 201 directs Department of Energy (DOE) to study innovative financing techniques for renewables. Section 202 directs the Office of Science and Technology Policy to study and report on regulations that may pose barriers to commercial use of renewables. Section 203 directs DOE to provide commercialization assistance for renewables and authorizes appropriations from FY2002 through FY2020. Section 204 creates an educational outreach program and authorizes appropriations from FY2002 through FY2020. Introduced June 26, 2001; referred to Committee on Science.

H.R. 2436 (Hansen)

Energy Security Act. Introduced July 10, 2001; referred to Committees on Resources and Energy and Commerce. Section102 creates an inventory of certain biomass resources on federal lands. Title expedites federal action on leases and modifies royalty provisions for geothermal energy. Resources Committee reported (H.Rept. 107-160, Part I) July 25, 2001. Energy and Commerce Committee discharged on July 25. Incorporated into H.R. 4.

H.R. 2460 (Boehlert)

Comprehensive Energy Research and Technology Act of 2001. Title I authorizes appropriations for alternative fuel (including methanol and hydrogen) vehicles and distributed energy resources. Title II authorizes appropriations for renewable energy R&D programs. Introduced July 11; referred to Committee on Science. Reported (H.Rept. 107-177) July 18. Incorporated into H.R. 4.

H.R. 2511 (McCrery)

Amends IRS tax code to create tax incentives. Section 101 creates a residential solar energy tax credit, Section 102 extends the renewable energy production tax credit, and Section 104 creates a credit for alternative fuel vehicles. Also, Section 306 extends a tax credit for certain biomass sources. Introduced July 17, 2001; referred to Committee on Ways and Means. Reported (H.Rept. 107-157) July 24. Incorporated into H.R. 4.

H.R. 2587 (Tauzin)

Creates a variety of energy conservation and other energy policy measures. Title IV has provisions for hydropower, namely alternatives to fishways and data on time and costs for hydroelectric licensing. Introduced July 23, 2001; referred to Committee on Energy and Commerce and many other committees. Reported (H.Rept. 107-162, Part I) July 25. Incorporated into H.R. 4.

H.R. 2646 (Combest)

Farm Security Act of 2001. Section 605 provides loan guarantees for renewable energy equipment and Section 606 broadens the range of renewable energy equipment available for

loans. Introduced July 26; referred to Committee on Agriculture. Reported (H.Rept. 107-191, Parts I, II, and III) August 2. Passed House October 5.

H.R. 3090 (Thomas)

Economic Security and Recovery Act of 2001. Section 303 of the House version would extend the renewable energy production tax credit for 2 years, from January 1, 2002 to January 1, 2004. It also extends a credit for electric vehicles and a deduction for clean fuel vehicle property. Committee on Ways and Means reported (H.Rept. 107-251) bill on October 17, 2001. Passed House October 24. Senate Finance Committee reported (Committee Print 107-49) an amendment in the nature of a substitute with an amendment to the title (Economic Recovery and Assistance for American Workers Act) on November 9. Section 404 of the Senate version would extend renewable energy production tax credit, for one year, from January 2002 to January 2003. Brought to the floor November 13.

S. 389 (Murkowski)

National Energy Security Act of 2001 and Energy Security Tax Policy Act of 2001. Identical to S. 388 except that it adds the tax provisions of the Energy Security Tax Policy Act of 2001 as Title IX. In Subtitle G on Alternative Fuels, Section 981 creates a tax credit of up to 85% for the incremental cost of alternative-fueled vehicles that use alcohol fuels or biofuels. Section 983 creates a 25-cent retail sales tax credit for alternative fuels. For refueling property that supports clean-fueled vehicles, Section 984 extends a credit from tax year 2004 through 2007, and Section 985 sets a cap for the value of this credit. In Subtitle H on Renewable Energy, Section 991 expands the production tax credit to include landfill gas, geothermal, incremental hydropower, municipal solid waste, and additional forms of biomass; and it extends the credit through tax year 2011. Section 992 creates a 15% investment tax credit for residential solar and wind energy equipment. Section 993 makes the use of bagasse (a form of biomass) for energy production at solid waste facilities eligible for tax-exempt financing

S. 596 (Bingaman)

Energy Security and Tax Incentive Policy Act of 2001. Modifies tax incentives for using renewable energy equipment and building design features in the commercial and residential sectors. Introduced March 22, 2001; referred to Committee on Finance.

S. 597 (Bingaman)

Comprehensive and Balanced Energy Policy Act of 2001. Permits net metering and sets a renewables portfolio standard starting at 3% in 2002 and rising to 7.5% by 2010. Introduced March 22, 2001: referred to Committee on Energy and Natural Resources. Hearing on renewables provisions scheduled for July 19.

CONGRESSIONAL HEARINGS, REPORTS, AND DOCUMENTS

U.S. Congress. House. Committee on Small Business. Subcommittee on Rural Enterprises, Agriculture, and Technology. Renewable Fuels. Hearing held July 24, 2001. [http://www.house.gov/smbiz/hearings/107th/2001/010724a/index.html]

U.S. Congress. Senate. Committee on Energy and Natural Resources. S. 1006, Renewable Fuels for Energy Security Act of 2001. Field hearing held July 6, 2001. [http://www.senate.gov/~energy/]

U.S. Congress. House. Committee on Energy and Commerce. Subcommittee on Energy and Air Quality. The National Energy Policy Report of the National Energy Policy Development Group. Hearing held June 13, 2001. [http://energycommerce.house.gov/107/hearings/06132001Hearing271/hearing.htm]

U.S. Congress. House. Committee on Science. The Nation's Energy Future: Role of Renewable Energy and Energy Efficiency. Hearing held February 28, 2001.

U.S. Congress. House. Committee on Energy and Commerce. Subcommittee on Energy and Air Quality. National Energy Policy. Hearing held February 28, 2001.

CRS Reports

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

CRS Report RL31044 . *Renewable energy legislation in the 107th Congress,* by Fred Sissine.

CRS Report RL31033. *Energy efficiency and renewable energy fuel equivalents to potential oil production from the Arctic National Wildlife Refuge (ANWR),* by Fred Sissine.

CRS Report RS20270 . *Renewable energy and electricity restructuring,* by Fred Sissine.

CRS Electronic Briefing Book. Electric utility restructuring and reliability, by Amy Abel. [http://www.congress.gov/brbk/html/ebele1.html]

CRS Issue Brief IB10054. *Energy tax policy,* by Salvatore Lazzari.

CRS Report RL30953. *Energy tax incentives: a comparison of the National Energy Security Act of 2001 (S. 389) and the Democratic Alternative (S. 596),* by Salvatore Lazzari.

CRS Report RL30369. *Fuel ethanol: background and public policy issues,* by Brent Yacobucci.

FOR ADDITIONAL READING

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

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Wiser, Ryan et al. *Renewable energy policy and electricity restructuring: a California case study*. Energy Policy, v. 26, 1998. p. 465-475.

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

Center for Renewable Energy and Sustainable Technology (CREST). [http://solstice.crest.org/index.shtml]

International Solar Energy Society (ISES). [http://www.electricnet.com/orgs/intsolar.htm]

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

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Table 3. DOE Renewable Energy Budget for FY2000-FY2002

($ millions)

OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY	FY2001 Apprn.	FY2002 Request	FY2002 House	FY2002 Senate	FY2002 Conf	Conf.- FY2001	Pct. Diff.
Biofuels - Total	86.3	82.0	89.0	103.0	93.0	6.0	7%
Biofuels/Utility Power	39.7	37.8	41.0	53.0	----	----	----
Biofuels/Transportation	46.5	44.2	48.0	50.0	----	----	----
Geothermal	26.9	13.9	27.0	32.0	29.0	2.0	7%
Hydrogen	26.9	26.9	27.0	35.0	31.0	4.0	15%
Small Hydro	5.0	5.0	3.0	9.3	5.3	0.3	6%
Solar Energy	92.7	42.9	94.7	92.3	95.0	1.5	2%
Concentrating Solar Power	13.7	1.9	7.9	15.3	----	----	----
Photovoltaics	75.1	39.0	81.8	70.0	----	----	----
Solar Buildings	3.9	2.0	5.0	7.0	----	----	----
Wind	39.6	20.5	40.0	45.0	41.0	1.0	3%
TECHNOLOGIES SUBTOTAL	277.3	191.2	280.6	316.6	294.3	14.8	5%
Electric/Storage	51.7	51.7	60.0	71.0	63.0	11.0	21%
Renewable Support & Implementation	21.5	9.6	12.5	15.0	14.5	-7.1	-33%
Dept. Energy Management	2.0	1.0	2.5	1.0	1.5	-0.5	-24%
International Renewables	4.9	2.5	3.0	3.0	3.0	-2.0	-40%
Production Incentive	4.0	4.0	4.0	4.0	4.0	0.0	0%
Renew. Amer. Indian Res.	6.6	0.0	0.0	4.0	3.0	-3.6	-54%
Program Support	4.0	2.1	3.0	3.0	3.0	-1.0	-25%
NREL (incl. construction)	4.0	5.0	5.0	12.0	5.0	1.0	25%
Program Direction	18.7	19.2	18.7	21.0	19.2	0.5	3%
RENEWABLES, Subtotal	373.2	276.7	376.8	435.6	396.0	20.3	5%
OFFICE OF SCIENCE							
OS/Photovoltaics Rsch.	2.8	----	----	----	----	----	----
OS/Biomass-Biofuels	26.7	----	----	----	----	----	----
OS/Wind	0.3	----	----	----	----	----	----
OS/Solar Photoconversion	14.3	----	----	----	----	----	----
OS/Hydrogen	3.0	----	----	----	----	----	----
OS/Subtotal	47.1	----	----	----	----	----	----
RENEWABLES with OS	420.3	----	----	----	----	----	----

Source: S.Rept. 107-39; H.Rept. 107-112; DOE FY2002 Cong. Budget Request, v. 3; April 2001.