Systematic Support for Renewable Energy in the United States and Beyond: A Selection of Policy Options and Recommendations

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1. Introduction

The way people use energy today is both needlessly filthy and inefficient.[1] For a variety of reasons, governments at all levels are increasingly recognizing that a heavy dependence on "conventional" energy resources—primarily fossil fuels and nuclear power—is not smart, safe or sustainable. Significant problems associated with the procurement and use of these energy resources include short-term and long-term environmental degradation, global warming, public-health deterioration and rising health-care costs, potential military conflict over dwindling resources, and an array of hazardous political and economic risks, including global-scale terrorism. Indeed, national security concerns have emerged as a prime motivator for the re-examination of government energy policies. Furthermore, the developed world's "business as usual" approach to energy procurement and use is disproportionately harmful—economically and heath-wise—to the world's poor.[2]

Renewable-energy resources offer governments an opportunity to generate and use clean energy within their own political borders. Benefits of renewable energy include: (1) fuel diversification; (2) energy independence, or a reduced exposure to fossil-fuel price spikes and supply interruptions; (3) economic development opportunities at the national, regional and local levels; (4) climate-change mitigation; (5) environmental protection; (6) public-health improvement; (7) energy surety and reliability; (8) overall energy cost savings; and (9) poverty alleviation.

2. A Brief Overview of U.S. Federal Support for Renewables

The United States consumes more energy than any other nation and therefore is especially vulnerable to the problems accompanying national dependence on conventional-energy resources. With less than 5 percent of the world's population, the United States consumes a whopping 24 percent of the world's energy. The United States uses more petroleum (24 percent) than any other country and imports 54 percent of its oil. The United States ranks first in the in world in annual consumption of natural gas (25 percent) and ranks second only to China in annual coal consumption.[3]

Current U.S. federal energy policy emphasizes ensuring the availability of cheap, conventional energy. U.S. consumers pay artificially low prices for electricity and gasoline, although these prices would be much higher if hidden taxes and costs were included. For example, although gasoline taxes in the United

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States average only $0.43 per gallon, a recent study found that consumers pay an average of $2.46 per gallon in hidden costs. Thus, the *actual* cost of a gallon of gasoline in spring 2004 was $4.03,[4] as opposed to the advertised cost of approximately $1.80.

Likewise, partially due to federal subsidies, the average retail cost of electricity in the United States is 8.5 cents per kilowatt-hour, as compared to 22 cents per kilowatt-hour in Japan.[5] Federal subsidies for renewable energy have been miniscule compared to long-term federal subsidies for coal and nuclear power. Indeed, a report by the Renewable Energy Policy Project (REPP) found that the nuclear-power industry received 25 times more federal funding than the solar and wind industries combined from 1943-1999.[6] Not surprisingly, non-hydro renewables currently account for only around 2 percent of U.S. electricity generation, while the vast majority of electricity is generated by coal (50 percent), nuclear (20 percent) and natural gas (17 percent).[7]

In addition to the existence of energy-price distortions and federal subsidies that heavily favor conventional-energy resources, there are other barriers to the deployment of renewable energy in the United States. Because many types of renewable-energy systems involve high start-up costs, financing may be difficult to obtain. Currently, there is a lack of renewable-energy infrastructure in most areas of the country, and economies of scale largely have not yet been achieved to lower the cost of renewable-energy systems and equipment significantly. Furthermore, electric utilities have a history of discouraging renewable energy and other forms of distributed generation among customers. Inconsistent terminology pertaining to renewable energy can be confusing even to policymakers, let alone consumers. Public awareness of renewable energy and its benefits is low, although it is rising.

In terms of systematic support for renewable-energy systems, the U.S. federal government currently offers a handful of tax incentives. These include a 10 percent business tax credit for solar and geothermal systems, a 1.8-cent per kilowatt-hour business tax credit for electricity generated from wind and biomass, and an accelerated depreciation business tax credit with a bonus depreciation for certain renewables. Until December 31, 2003, municipal utilities, rural utilities and local governments were eligible for a 1.8-cent per kilowatt-hour production incentive for electricity generated by certain renewables, including wind, solar-thermal electric, landfill gas and fuel cells.[*]

The U.S. government established the Million Solar Roofs Initiative (MSR) in 1997, with a goal of assisting in the installation of 1,000,000 new solar roofs by 2010. This program is administered by the U.S. Department of Energy and currently includes approximately 80 local partnerships around the country. MSR partnership activities typically include consumer education, professional workshops, and other outreach activities to help individuals and organizations who are considering installing a solar system. However, MSR does not provide direct funding to design, purchase or install solar-energy systems.

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[*] At the time of this writing, it appeared likely that the per kilowatt-hour federal business tax credit would be revised in terms of technology and credit amount, while the 1.8-cent per kilowatt-hour federal production incentive would be reinstated and expanded to include additional renewables.

The federal government has not (yet) implemented a renewables portfolio standard (RPS), although political momentum seems to be gaining for such a policy. In 2002 the U.S. Senate passed a provision (which was not enacted) for a 10 percent federal RPS by 2020. James Woolsey, former head of the U.S. Central Intelligence Agency (CIA), and U.S. presidential candidate John Kerry both support a 20 percent federal RPS by 2020.

A 2002 study by the U.S. Department of Energy's Energy Information Administration found that a 10 percent RPS by 2020 would have virtually no effect on consumer electricity prices, mostly because of a corresponding reduction in the cost of natural gas.[8] A more recent conducted by the Union of Concerned Scientists (UCS) in 2004 found that a 20 percent RPS by 2020 would increase U.S. renewable-energy capacity 11 times, from 17,000 megawatts in 2003 to 180,000 megawatts in 2020. This study also concluded that such a policy would generate 355,000 jobs, reduce carbon-dioxide emissions by 15 percent and save consumers $27 billion by 2025.[9]

3. U.S. States Take Charge

In the absence of strong, continuous federal support for renewable energy, dozens of U.S. states have stepped in to fill the void. Indeed, states collectively have implemented hundreds of policies to promote the adoption of renewable energy, for reasons ranging from energy diversification, to economic development, to air-quality improvement. It is important to recognize that some of these policies could become part of the "long-standing tradition in American governance whereby states serve as laboratories for subsequent federal policy."[10]

The *Database of State Incentives for Renewable Energy (DSIRE)*[11] tracks financial incentives and policies implemented by state and local governments, nonprofit organizations, utilities and other private corporations to promote the use of renewable energy. *DSIRE* also includes selected federal incentives that support renewables. This public, online resource was established by the North Carolina Solar Center in 1995 and receives funding from the U.S. Department of Energy.

DSIRE regularly contains between 800 and 1,000 individual records and for each record provides a summary, policy or incentive details, links to relevant legislation or authorizing documents, contact information, a link to the program web site, and other relevant information. The *DSIRE* home page features a clickable map to maximize facility of use, and includes a search function that allows users to explore the entire database of incentives by technology, eligible sector, incentive type and other criteria. Summary maps and summary tables pertaining to specific incentive types are also available on the site. *DSIRE* is a constantly evolving, comprehensive resource used by policymakers, consumers, businesses, investors, renewable-energy advocates and others. Approximately 30,000 different visitors use DSIRE each month.

4. State-Level Financial Incentives for Renewable Energy

U.S. states have created a variety of financial incentives to support the development of renewable energy. These include personal tax credits and deductions, corporate tax credits and deductions, sales tax exemptions, property tax incentives, industry recruitment incentives, rebates, grants, production incentives and low-interest loans.

Income tax credits range from 10 percent - 35 percent, with maximum incentive amounts ranging from $1,000 - $10 million. Most state tax credits must be claimed in the first year of system operation, with a carryover provision for the following five years. Tax credits are not the primary motivator of consumer purchasing decisions; they are most beneficial when used in combination with other incentives.[12]

Most rebate programs for renewables have been implemented by states with public benefits funds (PBFs)—also known as a clean energy funds—which typically are funded by system benefits charges (SBCs). These incentives range from $2 per watt to $6 per watt, or 20 percent - 70 percent of the installed system cost. The 15 U.S. states that have established PBFs will collect approximately $3.8 billion for renewable energy investments from 1998-2012. With aggregate funding averaging more than $200 million annually, these funds are expected to have a substantial impact on the market for renewable energy in these states, and perhaps at a national scale.

In terms of designing a successful financial-incentive program for renewable energy, governments should consider the following recommendations:[13]

- Educate the public about renewable-energy technologies and the available incentive program.
- Provide stable, long-term program funding and offer a generous incentive that decreases over time as the market matures.
- Design an easy and concise application process.
- Ensure utility cooperation.
- Establish a consistent but cost-effective quality assurance mechanism to protect consumers by guaranteeing adequate system performance.
- Incorporate incentives into an overall infrastructure development strategy; include installer training and certification.
- Develop a coordinated package of incentives, including net metering.
- Allow public-sector eligibility.
- Allow flexibility for program modifications.
- Track the details of program use and costs, as well as energy savings, and make this information publicly available and easily accessible.

5. State Regulatory Policies Promoting Renewable Energy

States have also implemented an assortment of regulatory policies that favor the deployment of renewables. These include renewables portfolio standards (RPSs), PBFs, net metering policies, government green-power purchase commitments, mandatory utility green-power options, environmental disclosure policies, solar and wind access laws, contractor licensing and equipment certification.

Net metering, which allows consumers to bank excess electricity generated by a renewable-energy system, now exists *in some form* in 39 U.S. states and Washington, D.C, either statewide or by individual utility. Net metering policies vary widely in terms of eligible technologies, maximum system capacity, treatment of net excess generation, overall enrollment limit, utility fees, insurance requirements, technical requirements, application process and other criteria.

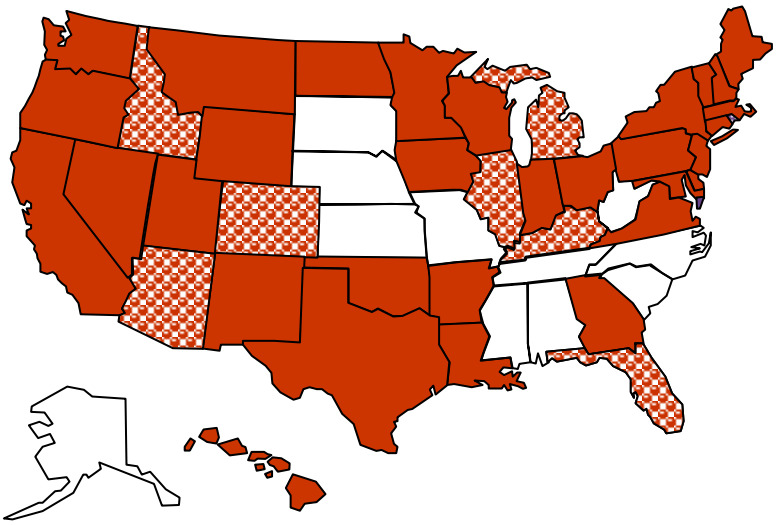

Figure 1. U.S. states with a net-metering policy.
Solid color indicates statewide net metering; patterned color indicates net metering by one or more electric utilities.

RPSs are a popular policy tool adopted by a growing number of states to stimulate the renewable-energy industry. An RPS requires utilities to generate a minimum amount (in terms of either capacity or percentage of overall generation) of their electricity from qualifying renewables within a specified schedule. Many of these policies resulted from federal legislation in 1992 that allowed states to restructure their electric-utility industries. Thus far in 2004, three states—Maryland, Rhode Island and New York—have adopted an RPS, raising the national total of U.S. states with an RPS to 17.[*] Like net metering policies, RPSs

[*] Included in this sum is Illinois, which has a non-binding *renewables portfolio goal*, as opposed to an RPS.

vary widely from state to state. They differ in terms of minimum percentage or capacity of mandated renewables, schedule, eligible renewable resources, applicable utilities, treatment of associated renewable-energy credits (RECs), compliance mechanism and so on. Most RPSs require an increasing amount of renewables over time, until a target level is reached. States take different approaches to funding the initial added costs of an RPS. Some pass these added costs along to all utility ratepayers, while others apply a charge to selected categories of electricity sales.[14]

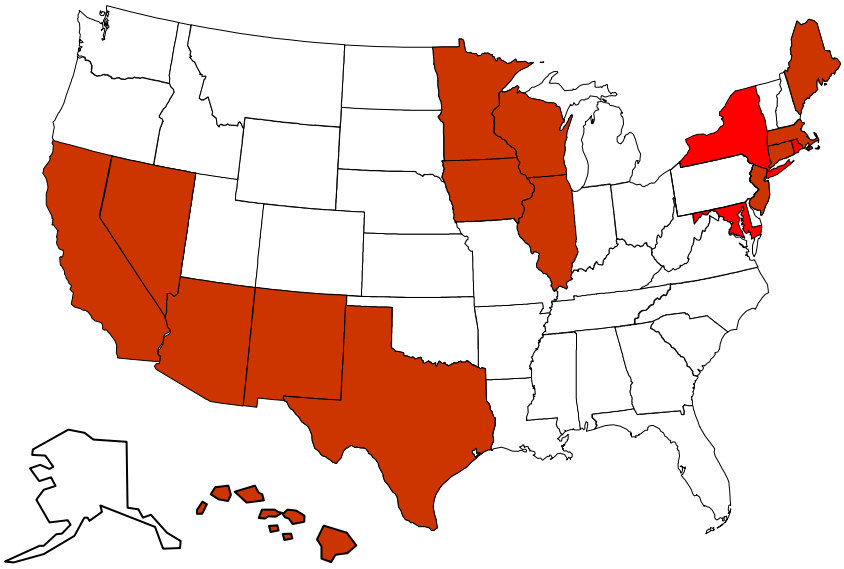

Figure 2. U.S. states with a renewables portfolio standard (RPS).

Texas, California and New York—three of the most politically and economically influential U.S. states—are among the 17 states that have implemented an RPS. Texas' RPS, enacted in 1999, is responsible for half of all renewable-energy capacity installed as a result of state RPSs through 2003. Of the 2,335 megawatts of new capacity installed in the United States through 2003 by all states with RPSs, Texas accounted for 1,186 megawatts of this sum, mostly in the form of wind.[15] Texas' RPS required 400 megawatts of new capacity by 2002, increasing to 2,000 MW by 2009 and holding constant through 2019. The policy applies to all utilities in the state—investor-owned utilities, municipal utilities and rural electric cooperatives. A dozen different renewables are eligible. There is a noncompliance penalty equal to the lesser of $50 per megawatt-hour or 200 percent of the average cost of credits.[16]

California, the most populous U.S. state, enacted an aggressive RPS in 2002. Like Texas' RPS, California's policy applies to all types of utilities and includes about a dozen eligible renewable-energy resources. California's RPS mandates an increase of 1 percent per year, with utilities obtaining a minimum of 20 percent of electric supply from renewables by 2017. There is a noncompliance

penalty of $0.05 per kilowatt-hour, with a maximum penalty of $25 million per utility. However, utilities that do not meet a specific year's requirement are allowed three years to comply, provided that future years' requirements are also met.[17] California Governor Arnold Schwarzenegger is a strong proponent of the state's RPS; he seeks to accelerate the deadline for the 20 percent requirement from 2017 to 2010.[18]

New York adopted an RPS in September 2004, completing an 18-month procedure that involved more than 150 stakeholders. Currently, renewable resources (mostly large hydropower) supply 19.3 percent of the state's electricity. The new RPS begins January 1, 2006, and mandates an increase to 25 percent renewable energy by December 2013. The New York Public Service Commission anticipates that around 3,700 megawatts of new renewable energy, mostly wind, will be installed as a result of New York's policy. Other eligible renewables include hydropower, biomass, liquid biofuels, ocean and tidal power, fuel cells and photovoltaics. In establishing the state's RPS, the New York Public Service Commission emphasized that its "major policy objective is to create a sustainable market for renewable energy without perpetual dependence upon government-mandated subsidies."[19]

New York's RPS will be funded by a non-bypassable, volumetric charge imposed on the delivery portion of customers' electric bills. The Public Service Commission stated that the impact on customers bill will be "modest," adding that "wholesale energy prices will likely decline as a result of adding substantial amounts of renewable resources."[20]

The U.S. Energy Information Administration has noted that states with capacity mandates—notably Texas, Minnesota and Iowa—have installed 2,004 megawatts of new capacity, as compared to 321 megawatts installed by states with percentage mandates. However, RPSs with capacity mandates have been in place longer than those with percentage mandates.

In addition, it is difficult to determine if recently installed renewable-energy capacity and planned projects are the direct result of state RPS requirements. In some cases, these projects are influenced at least in part by economic motivations, environmental obligations, or other federal, state or local incentives.[21]

6. Federal Policies in Other Countries – Models of Success

Other countries' federal governments have taken a much more aggressive role in promoting a domestic renewable-energy industry than the U.S. federal government. In particular, due primarily to strong and consistent federal policies, Germany and Japan have assumed world leadership roles in the wind and photovoltaic industries, respectively.

Germany's "Electricity Feed-In Law," passed in 1990 and modeled on a similar policy in Denmark, required utilities to purchase electricity generated by renewable-energy systems. For electricity generated by wind or photovoltaics, this rate was set at a minimum of 90 percent of the retail price. This law had been

modified several times since its passage. More recently, in 2000 the German government established a system of 20-year production incentives for renewables, based on the cost of the type of system and its operation. Although additional policies have contributed to the development of Germany's renewable-energy industry, the federal government's long-term pricing law has had the greatest impact by encouraging low-risk investment and creating economies of scale.[22] As a result, national wind capacity has increased from 56 megawatts in 1990 to more than 14,600 megawatts in 2003, and Germany now has more than twice as much installed wind capacity as each of its closest competitors, the United States and Spain.

Germany is second only to Japan in installed photovoltaic capacity.[23] The German government has a goal of obtaining 25 percent of the nation's electricity from wind by 2025, and by 2050 intends to meet half of its total energy needs with renewables.[24] Furthermore, Germany plans to close all 19 of the country's nuclear-power plants by around 2025.[25]

As a result of aggressive federal policies promoting renewable energy, Japan now leads the world in both photovoltaic production and installed capacity of photovoltaic systems. In 1992 Japan enacted a net-metering policy that required utilities to purchase excess photovoltaic power at the retail rate.[26] Japan's "70,000 Roofs" program, established in 1994 and considered by some to be the most significant government photovoltaic program in history,[27] included low-interest loans, a comprehensive education and outreach program, and declining rebates for interconnected residential systems. Phased out in 2002, this program was responsible for the installation of 144,000 photovoltaic systems totaling 424 megawatts of capacity.[28] More importantly, the installed cost of interconnected residential photovoltaic systems fell from $11 per watt in 1995 to around $5.50 per watt in 2003, and grid-tied photovoltaic electricity (11-15 cents per kilowatt-hour) is now cheaper than conventional electricity.[29]

7. Conclusions and Recommendations

The world can not continue its current "business as usual" approach to energy procurement, generation and consumption. Governments—especially wealthy governments—must recognize that the hyperconsumption of underpriced conventional energy resources is unhealthy and unsustainable. Governments must scrap whopping subsidies that favor dirty energy resources and begin to view and value renewable energy as an economic opportunity rather than an economic liability.

The U.S. government has shown relatively little support for the development of renewable energy. Fortunately, some U.S. states have acted to steer the country toward a cleaner, sustainable energy future. In terms of designing a financial-incentive program for renewables based on U.S. state governments' experiences, this paper has already outlined several "best practices" and recommendations. (See Section 4.) The establishment of a PBF by 15 states has provided substantial, continued funding to support many of the country's most

generous financial incentives—including rebates, grants, production incentives and low-interest loans—that support the development of renewable energy. These policies have had a significant impact on the renewable-energy industry, particularly in California, New York and New Jersey.

Likewise, RPSs are increasing popular at all levels of government, and for good reason. An RPS should mandate increasing amounts of renewable energy over a specific schedule, contain a strict definition of eligible resources, include noncompliance penalties, and provide for a government-supervised credit-trading system. Although state-level RPSs have proven capable of driving local and regional economies, especially in Texas, California and Minnesota (thus far), a federal RPS would have a much more significant impact on the development of a healthy, consistent renewable-energy industry. It is important to recognize that in many cases, as has been acknowledged by the U.S. Energy Information Administration, the Union of Concerned Scientists and the New York Public Service Commission, an RPS is cost-effective when compared to the "business as usual" approach to electricity—and this latter approach *does not include the external costs of conventional energy*.

Government programs implemented by Germany and Japan during the 1990s have proven that committed, long-term (but adaptable) federal policies can catapult a country's industry into a world leadership position within a decade. Given the tremendous success of these policies, federal governments in a position to support renewable energy should also seriously consider adopting programs modeled on Germany's and Japan's. When designing a financial incentive or regulatory policy to promote renewable energy, it is usually advisable for governments, when possible, to involve all stakeholders who will be affected.

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