New York Law Journal

SERVING THE BENCH AND BAR SINCE 1888

WWW.NYLJ.COM

An ALM Publication

VOLUME 245—NO. 46

THURSDAY, MARCH 10, 2011

ENVIRONMENTAL LAW

Expert Analysis

Increasing Use of Renewable Energy: Legal Techniques and Impediments

By
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The current turmoil in the Middle East and the consequent rise in oil prices are highlighting the long-recognized need for the United States to reduce its dependence on foreign energy sources. The most promising way to do that is through increased efficiency in our use of energy. My last column (Jan. 13, 2011) discussed the legal aspects of that measure. Today's column is devoted to the legal aspects of the second most important way—increasing the share of the energy that we use that comes from renewable sources.

Currently 83 percent of the energy consumed in the United States[1] is from fossil fuels. This in turn creates 81 percent of the United States'[2] emissions of greenhouse gases (GHGs), is the principal source of urban air pollution, and leads to major environmental problems where the fuel is extracted from the ground.

Increasing the share of non-fossil energy involves a switch from the fuels that took tens of millions of years to form under the ground, to sources that are constantly renewed. These renewable energy sources (with the exception of geothermal) derive from the constant influx of solar energy, and (with the exception of certain uses of biofuels) they emit little by way of GHGs and other air pollutants, require no imports, and are inexhaustible.

Legal Techniques

Several legal techniques have been developed to increase the use of renewable energy.

Portfolio Standards. Most states have adopted renewable portfolio standards (RPSs), which require electric utilities to supply a certain percentage of their power from renewable sources. There are wide variations in the numerical standard and in what sources qualify.

In his State of the Union address on Jan. 25, 2011, President Barack Obama called for a "clean energy standard," under which 80 percent of the nation's electricity would come from clean energy sources by 2035. Under this proposal, the figure could be met through not only renewable sources such as wind, solar and hydro, but also through nuclear power, coal with carbon capture and sequestration (if and when that comes into commercial application), and natural gas (perhaps receiving partial credit).

This would approximately double the portion of the nation's electricity that now comes from such sources, and is generally considered to be a very ambitious target. Whether Congress will embrace it is very much an open question.

Mandatory Utility Purchases. Electric utilities can be required to purchase renewable energy from those who offer it, thereby removing one of the chief risks in building a new facility (that it will not have enough customers). The Public Utility Regulatory Policies Act of 1978 (PURPA)[3] requires electric utilities to interconnect with and purchase excess power from "qualifying facilities" (a category that includes many independent producers of renewable energy) at the price the utility would pay to generate or purchase the power.

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Several European countries have instituted "feed-in tariffs," which involve long-term contracts under which utilities must purchase wholesale power from renewable energy suppliers at prices that are attractive to the suppliers. Feed-in tariffs are the centerpiece of Germany's successful policy to greatly expand its production of renewable energy,[4] and many have advocated their adoption in the United States.[5] However, imposing this requirement on investor-owned utilities raises difficulties due to the exclusive jurisdiction of the Federal Energy Regulatory Commission to set wholesale electricity rates.

Renewable Fuel Standards. Congressional enactments in 2005 and 2007 require motor vehicle fuels to include large and increasing content from renewable sources, most prominently corn-based ethanol.

Carbon Price. Imposing a price on burning fossil fuels, perhaps either under a carbon tax or a cap-and-trade system, would reduce their price advantage over renewable sources. Some of the considerable revenues that would be generated could also be used to subsidize renewables as well as efficiency.

Tax Incentives. A variety of tax incentives, such as production tax credits and investment tax credits, are available for certain renewables.

Non-Tax Incentives. The largest of these are contained in the American Recovery and Reinvestment Act, signed into law by Mr. Obama in 2009, which provided some $80 billion for various kinds of clean energy (though this includes substantial funding for nuclear power and carbon capture and sequestration in addition to efficiency and renewables).[6]

Government Procurement. The federal government spends more than $24 billion per year on energy purchases, and is the largest volume purchaser of energy-consuming products in the world.[7] The Energy Policy Act of 2005[8] and Executive Order 13423, issued by President George W. Bush in January 2007, require substantial purchases of renewable energy by the federal government.

Research and Development (R&D). Perhaps in part because the sun and the wind are freely available to everyone, and energy efficiency would save a lot of people a little money (as opposed to making a few people a lot of money), it has been suggested that R&D for renewables and efficiency have lagged behind R&D for oil and gas.[9] The American Recovery and Reinvestment Act and other sources are providing substantial funding for R&D for renewables and efficiency, though these and other federal financial supports for renewables are threatened by the current budget debates in Congress.

Impediments to Growth

Numerous impediments exist to the growth of renewables.

Intermittency. The largest single impediment to growth in renewables is that most of them are

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intermittent. The wind does not always blow, and the sun does not always shine. Thus, renewables have been thought of as unsuitable for providing baseload power—the irreducible minimum of electricity that must be available without fail. For that, fossil fuels, plus nuclear and some hydro, seemed essential. This problem is addressed in several ways:[10]

1) Storage. It is easy to store fossil fuels, but much harder to store electricity. The most widespread energy storage system used at the utility scale is pumped storage: surplus electricity (usually at night) is used to pump water up to an elevated reservoir; when there is a peak in power demand (or a drop in supply, such as when the wind calms), the water is released and spins a generator to produce electricity. Other storage technologies under development are compressed air storage, flywheels, and various advanced batteries. If plug-in hybrid vehicles become widespread, they can become a dispersed type of electricity storage. Surplus electricity can also be used to hydrolyze water; the resulting hydrogen can be stored for use in fuel cells.

2) Transmission. With enough transmission capacity to and from the right places, power can be brought in from remote locations to fill in for gaps in generation.

3) Energy Efficiency and Conservation. These lower the peaks in power demand, softening the impact of unavailable generation resources.

4) Demand Response. Many large commercial and industrial customers of electricity enter into interruptible power contracts with their utilities; in exchange for a substantial reduction in their electric bills, they agree to be on call to reduce their power demand in an emergency. In residential settings, this can be done automatically by, for example, sending out a signal to lower the air conditioning, or delay the operation of the dishwasher, at times of peak electric load.

Fossil Subsidies. The federal government has long provided numerous subsidies (whether in the form of direct spending or forgone revenues) to the fossil fuel industry. More recently it has also begun heavily subsidizing renewables. According to a study by the Environmental Law Institute, for the period 2002-2008 federal subsidies to fossil fuels totaled approximately $72 billion; those to renewables totaled $29 billion, but almost half of that was for corn-based ethanol.[11]

Most of the largest subsidies for fossil fuels are written into the U.S. Tax Code as permanent provisions. Many subsidies for renewables are implemented through temporary enactments and only last for a few years (sometimes only one), greatly reducing their usefulness as a spur to investment. Mr. Obama has proposed elimination of federal subsidies to the oil industry.

Capital Availability. Most renewables have low operating costs because their source of energy is free. (Biofuels are the notable exception.) In the words of Professor Geoffrey Heal, "If we build a wind (or other renewable) power station today, we are providing free electricity to its users for the next forty years: if we build a coal-fired power station today, we are meeting the capital costs but leaving our successors over its forty year life to meet the large fuel costs and the external costs associated with its pollution. When we build a renewable power station we are effectively pre-paying for the next forty years of electricity from it."[12] Thus most of the costs of renewables are for up-front capital; they do not have to pay for fuel. A corresponding advantage of renewables, of course, is that they are largely immune from the price fluctuations of oil and natural gas, allowing greater certainty in planning.

Turnover Rate of Capital Plant. Most capital facilities in the energy system have a lifetime of 25 to 50 years. That means only 2-4 percent of existing equipment needs replacing in a given year. Companies are reluctant to retire their equipment before the end of its useful life unless compelled by regulatory requirements, or unless the total cost of the new technology (capital and operating costs) falls below the operating cost of the old.[13] The average age of U.S. generating plants is 40 years for coal, 22 years for natural gas, and 30 years for nuclear.[14]

Until these plants are no longer economical to operate, they are unlikely to be replaced by renewables. (Closure of these plants could be accelerated if their owners need to pay for GHG emissions, as through a carbon tax or the purchase of allowances under a cap-and-trade system, but the ability to pass these costs through to captive customers dampens the effect.)

Scale and Timing. Some alternative energy technologies are still in the demonstration phase. It is a major step to move to commercial scale. Once a technology has reached a commercial scale—such as wind turbines have—it takes quite a bit of time to build so many units as to make a notable difference in the overall energy supply picture.[15] The new energy sources cannot simply be plugged into the transmission grid; extensive changes may be needed to the grid system to accommodate them.[16] Moreover, some specialized minerals and other materials are needed for certain renewable technologies, and their availability in the necessary quantities is uncertain.[17]

Siting and Environmental Impacts. Though renewables (other than biofuels) have minimal GHG emissions, they all have certain other environmental impacts. Each presents its own concerns. Wind turbines elicit aesthetic objections as well as concerns over avian impacts and noise. Solar collectors cover large areas of land and require much water to keep the pipes cool and the reflectors clean. Geothermal facilities may use large quantities of water. The life cycles of biofuels raise numerous issues in the growing, processing and transportation of crops. Hydropower harms aquatic life. Tidal, wave and ocean current energy may have uncertain aquatic effects. All of these facilities need to be connected to the users of the energy by a transmission grid, which usually involves crossing large swaths of land with overhead wires.

New energy generation facilities (whether renewable or fossil) all require approval from at least one and often several levels of government, based on a variety of environmental and other laws. Considerable litigation has arisen, typically from neighbors, seeking to prevent the siting of facilities by blocking these required approvals, using whatever laws and arguments are available, and this has often impeded construction.

In sum, existing economic and legal mechanisms as well as physical constraints significantly inhibit the growth of renewable energy resources, but numerous techniques are available to overcome many of these difficulties.

1. U.S. Energy Information Administration, Annual Energy Review (August 2010), Table 1.3.
2. U.S. Energy Information Administration, Emissions of Greenhouse Gases Report (Dec. 8, 2009).
3. 16 U.S.C. §824-a-3(e), 824(m); see 18 C.F.R. §292.602.
4. Frank N. Laird, Christoph Stefes, "The diverging paths of German and United States policies for renewable energy: Source of difference," 37 Energy Policy 2619 (2009).
5. See DB Climate Change Advisors, "Paying for Renewable Energy: TLC at the Right Price—Achieving Scale Through Efficient Policy Design," December 2009.
6. Joseph Biden, "Memorandum for the President from the Vice President: Progress Report: The Transformation to a Clean Energy Economy," Dec. 15, 2009.
7. Statement of Richard Kidd, Program Manager, Federal Energy Management Program, Office of Energy Efficiency and Renewable Energy, Department of Energy, before the Senate Subcommittee on Federal Financial Management, Government Information, Federal Services and International Security, Committee on Homeland Security and Government Affairs, Jan. 27, 2010.
8. 42 U.S.C. §15852.
9. Kenneth Gillingham et al., "Energy Efficiency Economics and Policy," 2009 Annu. Rev. Resour. Econ. 597, 608.
10. The following discussion draws heavily on North American Electric Reliability Corp., Reliability Impacts of Climate Change Initiatives: Technology Assessment and Scenario Development (July 2010), and David Lindley, "The Energy Storage Problem," 463 Nature 18 (Jan. 7, 2010).
11. Environmental Law Institute, Estimating U.S. Government Subsidies to Energy Sources: 2002-2008 (Septmber 2009). See also Richard W. Caperton and Sima J. Gandhi, American's Hidden Power bill: Examining Federal Energy Tax Expenditures (Center for American Progress, April 2010).
12. Geoffrey Heal, "The Economics of Renewable Energy," National Bureau of Economic Research, June 2009, p. 4.
13. Gert Jan Kramer and Martin Haigh, "No quick switch to low-carbon energy," 462 Nature 568 (Dec. 3, 2009).
14. North American Electric Reliability Corp., Reliability Impacts of Climate Change Initiatives: Technology Assessment and Scenario Development (July 2010), p. 51.
15. See Richard A. Kerr, "Do We Have the Energy for the Next Transition?" 329 Science 780 (Aug. 13, 2010).
16. Timothy P. Duane, "Greening the Grid: Implementing Climate Change Policy Through Energy Efficiency, Renewable Portfolio Standards, and Strategic Transmission System Investments," 34 Vermont L. Rev. 711 (2010).
17. David Fridley, "Nine Challenges of Alternative Energy," in Richard Heinberg and Daniel Lerch, eds., The Post Carbon Reader: Managing the 21st Century's Sustainability Crises (2010).