THE ENERGY TRILEMMA IN THE GREEN MOUNTAIN STATE: AN ANALYSIS OF VERMONT'S ENERGY CHALLENGES AND POLICY OPTIONS

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INTRODUCTION

Vermont is facing a serious energy problem, focused on its electricity sector, which must be addressed now.[1] The question facing Vermont is straightforward: How will the state continue to supply its citizens with low-cost, reliable electricity, but also maintain its high air quality standards and low greenhouse gas contributions? This question is complex since the state faces a three-part set of tensions focused on: i) cost, ii) infrastructure reliability, and iii) the environment. We use the term "trilemma" both to express the interwoven nature of these three concerns and to suggest, in a simplified way, the predominant vectors of the interest groups that care about and are affected by these issues.

Vermont is not alone. Across the United States the electric industry is dealing with enormous economic and environmental challenges.[2] In a world of growing demand for electricity, but finite fossil fuel resources (which are already being drained as quickly as the industry can work), the electric industry is struggling to find new sources for electricity generation.[3] As the country's social and political will to curb carbon dioxide emissions increases in an effort to slow global warming, electric utilities are

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1. *See* John A. Sautter, Op-Ed, *Nuclear Power, with a Caveat*, BURLINGTON FREE PRESS, Mar. 14, 2007, at A4 (noting that Vermont has obligations relating to climate change that it must meet in the future); JAMES MOORE, VERMONT PUBLIC INTEREST RESEARCH AND EDUCATION FUND, A DECADE OF CHANGE: A VISION FOR VERMONT'S RENEWABLE ENERGY FUTURE 5 (2006); Press Release, Vt. Governor's Office, Governor Douglas Leads on Climate Change—Douglas Signs Onto Historic Regional Program to Reduce Greenhouse Gas Emissions (Dec. 20, 2005), http://governor.vermont.gov/tools/index.php?topic=GovPressReleases&id=1642&v=Article.

2. *See* Richard D. Cudahy, *The Bell Tolls for Hydrocarbons: What's Next?*, 29 ENERGY L.J. 381, 381 (2008) (noting that the energy industry is attempting to find ways to deal with supply constraints on hydrocarbons and to stop global warming); *see also* Daniel V. Mumford, *Curbing Carbon Dioxide Emissions Through the Rebirth of Public Nuisance Laws—Environmental Legislation by the Courts*, 30 WM. & MARY ENVTL. L. & POL'Y REV. 195, 198–201 (2005) (discussing the scientific evidence that the uncontrolled emissions of carbon dioxide from utility companies significantly contribute to global warming); Pew Center on Global Climate Change, Basic Science, http://www.pewclimate.org/global-warming-basics/basic_science/ (last visited Apr. 12, 2009) (highlighting the long-term consequences of global warming).

3. *See* Cudahy, *supra* note 2 ("Many geologists are persuaded that oil production is currently at its peak and will soon sharply decline . . . ."); PAUL ROBERTS, THE END OF OIL: ON THE EDGE OF A PERILOUS NEW WORLD 8 (2004) ("[T]he modern energy economy should be changed . . . we no longer have a choice in the matter . . . . Everywhere we look we can see signs of an exhausted system giving way messily to something new: oil companies quietly reengineering themselves to sell natural gas . . . ."); BENJAMIN SOVACOOL, THE DIRTY ENERGY DILEMMA 3 (2008) ("[T]he EIA [Energy Information Administration] projects that total electricity consumption will grow at an annual rate of 1.3 percent per year . . . .").

struggling to find clean, low-carbon-emitting sources for electricity generation.[4]

Moreover, Vermont has signed onto the Regional Greenhouse Gas Initiative (RGGI).[5] RGGI is a set of parallel commitments that several northeastern states have made to curb greenhouse gas emissions on a regional level.[6] Vermont's commitment to RGGI obligates it to reduce greenhouse gas emissions by ten percent by the year 2018.[7] By signing on to a regional agreement, Vermont now faces political as well as legal

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4. *See* AL GORE, AN INCONVENIENT TRUTH: THE PLANETARY EMERGENCY OF GLOBAL WARMING AND WHAT WE CAN DO ABOUT IT 260 (2006) (quoting the editor-in-chief of *Science* magazine regarding global warming: "consensus as strong as the one that has developed around this topic is rare in science"); NATIONAL COMMISSION ON ENERGY POLICY, ENDING THE ENERGY STALEMATE 19-20 (2004), *available at* http://www.energycommission.org/ht/a/GetDocumentAction/i/1088 (discussing the need for clean energy sources); *see generally* John A. Sautter & Christina Switzer, *A Change in Climate? How State Regulators are Making Decisions in Response to Global Warming*, 21 ELECTRICITY J. 38, 38 (2008) (describing how states are taking action in the face of federal inaction and providing a synopsis of this federal inaction).

5. Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont have all committed to the initiative. *See* Regional Greenhouse Gas Initiative: An Initiative of the Northeast and Mid-Atlantic States of the U.S., http://www.rggi.org/home (follow "Participating States" hyperlink) (last visited Apr. 12, 2009) [hereinafter RGGI]. The organization defines itself in the following manner:

> These pioneering states are implementing the first mandatory cap-and-trade program in the United States to reduce greenhouse gas emissions. State-based innovation has historically led the nation in many other environmental and energy policy areas, and this continues with RGGI. The authority of the individual states is the basis for the RGGI CO_2 Budget Trading programs. Through laws and/or rules, each state limits emissions of CO_2 from electric power plants, creates CO_2 allowances and establishes the state's participation in CO_2 allowance auctions. A "Model Rule" drafted jointly by the states provided a coordinating framework as individual states developed their laws, rules or regulations. Regulated power plants will be able to use a CO_2 allowance issued by any of the ten participating states to demonstrate compliance with an individual state program. In this manner, the ten individual state programs, in aggregate, will function as a single regional compliance market for CO_2 emissions.

Id. See VT. AGENCY OF NATURAL RESOURCES, PRE-PROPOSAL OF VERMONT'S RULE TO IMPLEMENT THE REGIONAL GREENHOUSE GAS INITIATIVE (2007), *available at* http://www.anr.state.vt.us/air/docs/VTPreProposal%20Draft%20Rule%20to%20Implement%20RGGI.pdf (describing how Vermont will implement the RGGI agreement). The Northeast is not alone in this effort. Western states have partnered with the Canadian Provinces of British Columbia and Manitoba to form their own regional climate change initiative called the Western Climate Initiative. *See* Western Climate Initiative, http://www.westernclimateinitiative.org (last visited April 12, 2009) (discussing a western United States climate initiative "focusing on a market-based cap-and-trade system.").

6. RGGI, *supra* note 5.

7. *Id.*

pressure from its neighbors to live up to its RGGI commitments.[8] RGGI acts as one more force driving Vermont to face the implications of the near-future expiration of its nuclear and hydro contracts.[9]

Vermont's regional greenhouse gas reduction commitments; its citizens' economic, reliability, and environmental concerns; and the approaching expiration of its nuclear and hydroelectric contracts are working together to accelerate and complicate a solution to the state's energy trilemma. Unfortunately, there is no single solution because there is no single source of low-cost, low-emission electricity that is large enough or reliable enough to replace Vermont's nuclear or hydroelectric sources.[10] Truly, Vermont faces an enormous decision regarding its energy future.

This article attempts to shed light on how Vermont might approach its energy trilemma. This is not an article that deals with the political context of the state's energy decisions. We leave the politics to others to debate. Furthermore, we offer no specific answers regarding how Vermont should proceed. Instead, we deal with the larger picture of discussing resource options and offering guiding principles to help lawmakers, utilities, and citizens confront Vermont's energy challenges. We first put Vermont's electricity system in context by comparing it to other states. Next, we discuss the most viable options that are on the table for Vermont to pursue in solving its energy trilemma. Finally, we offer some guiding policy and legal principles that we believe are important in shaping the energy debate. Ultimately, Vermont is in a relatively enviable position in regard to questions of electricity generation and transmission. Much of this is due to decades-old decisions by state and utility policy makers. This article suggests that Vermont will retain its respectable electric energy posture as

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8. *Id.* (follow "About RGGI" hyperlink) ("RGGI is composed of individual CO_2 Budget Trading Programs in each of the ten participating states. These ten programs are implemented through state regulations, based on a RGGI Model Rule, and are linked through CO_2 allowance reciprocity. Regulated power plants will be able to use a CO_2 allowance issued by any of the ten participating states to demonstrate compliance with the state program governing their facility. Taken together, the ten individual state programs will function as a single regional compliance market for carbon emissions.").

9. *See id.* (noting that Vermont must meet its ten percent obligation by 2018 or be in violation of the agreement).

10. MOORE, *supra* note 1, at 5. *See* Daniel Barlow, *3 Utilities Exploring New Power Sources*, TIMES ARGUS, Jan. 13, 2009, *available at* http://www.timesargus.com/article/20090113/NEWS02/901130347/0 (noting that Central Vermont Public Service Corp., Green Mountain Power, and Vermont Electric Coop. issued a request for proposals in November 2008 for 100 mega watts of new electricity capacity). *See generally* Editorial, *Vermont Yankee Just Part of Energy Picture*, BURLINGTON FREE PRESS, Jan. 6, 2009, *available at* http://www.burlingtonfreepress.com/article/20090106/OPINION/901060301 (noting that Vermont utilities are looking beyond one source of new energy).

long as its leaders and public do not lose sight of those values which have served it so well in the past.

I. THE VERMONT ELECTRICAL SYSTEM IN CONTEXT

A. Comparative Electricity Prices

The past management of Vermont's electricity grid has yielded great economic benefits for Vermonters. Figure 1 shows the change in electricity prices for Vermont consumers compared to the rest of the New England states, combined, from February 2004 through February 2006.[11] During this time, the rest of New England averaged a monthly percent change in total prices of 0.67% while Vermont's monthly average percent change in total prices was only 0.05%. This data reveals that from February 2004 through February 2006, New England's average monthly electricity price increase was thirteen times more than Vermont's price change. Furthermore, Table 1 shows that as of February 2006 Vermont had the lowest residential (13.21 cents per kilowatt hour (¢/kWh)) and commercial sector (11.39 ¢/kWh) electricity prices in all of New England. During the February 2004 through February 2006 period, Vermont consumers were also faring five times better than the U.S. as a whole, since the U.S. averaged a 0.25% monthly change in total electricity prices compared to Vermont's 0.05% change. Over this two-year period, Vermont tended to have one of the lowest average increases in electricity prices of any individual state, nationwide.[12]

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11. Figure 1 showing Current and Historical Monthly Retail Sales, Revenues, and Average Retail Price by State and by Sector. *See* ENERGY INFORMATION ADMINISTRATION, FORM EIA-826, *available at* http://www.eia.doe.gov/cneaf/electricity/page/sales_revenue.xls (showing costs of electricity for Vermont per source and customer type). The data for Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont was taken from this website and compared for a two-year period from February 2004 through February 2006. In order to control for periodicity (seasonal fluctuation in price) the data represents a twelve-month centered moving, weighted average of total electricity price. For more information on how the data was transferred for this analysis, see John A. Sautter, *Where Have All the Benefits Gone? Cost Allocation Toward Residential Ratepayers in Restructured Electricity Markets*, 20 ELECTRICITY J. 36, 41–42 (2007).

12. ENERGY INFORMATION ADMINISTRATION, *supra* note 11.

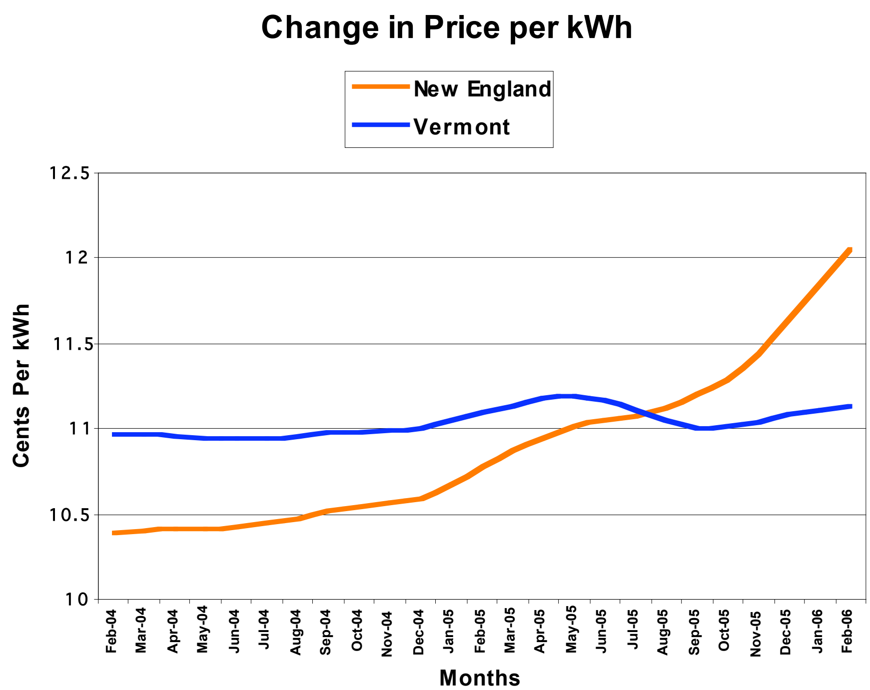

Figure 1. The monthly average price per kWh for Vermont and New England.

B. Measuring Vermont's Social Burden of Energy Production

We also evaluate the economic success of Vermont's energy-efficiency innovations by evaluating their "social burden."[13] Social burden is the quotient of a state's electric utilities' revenues divided by its gross state product, which we can think of as the percentage of a state's economy devoted to energy production.[14] This is an important measure of energy

13. For an explanation of social burden in context, see John A. Sautter, *Keep Energy Local and Renewable*, BURLINGTON FREE PRESS, Sep. 7, 2008, at 7C ("The social burden of electricity is the amount of dollars lost out of the economy in total. When you buy energy out of state, or ship in the fuel from out of the state, all of those dollars for energy or fuel are lost. This can be billions of dollars. There is no multiplier effect in the state for jobs, taxes and trade for this money. The money is in effect sucked out of the economy. On the other hand, locally produced energy keeps the money in Vermont so that there is a multiplier effect. Energy generation in Vermont creates wages, taxes and trade.").

14. Social Burden = $\frac{\textit{Electricity Revenues}}{\textit{Gross State Product}}$

because unlike other sectors of the economy, such as consumer spending or new home construction, much of the money spent on energy production tends to have a lower money multiplier effect.[15] In other words, to the extent that money spent on electricity pays for fuel, generation, personnel, or capital from outside the state, it does not "trickle down" through the rest of the state's economy to the extent that other spending does.[16] Thus, higher spending on electricity does not indicate a healthy economy; rather, it represents a more burdened economy. The fact that Vermont's social burden of electricity increased by only one percent (from February 2005 to February 2006), while the average social burden of electricity for the rest of New England increased by 7.5%, and the U.S. average increased by 5%, is another sign that Vermont's current electricity portfolio has been healthy for the state.

15. *See* FREDRIC MISHKIN, THE ECONOMICS OF MONEY, BANKING, AND FINANCIAL MARKETS 377 (7th ed. 2004) (examining and explaining the money multiplier).

16. Money "multiplies" through economic activity during every transaction that a dollar is used. For example, money spent on a new house is given to a plumber, electrician, and carpenter who in turn spend that money on supplies and equipment at the local home improvement center. The home improvement store then spends the remaining money on salaries of local workers. Fuel for electricity generation, like coal, oil, or hydro electricity, is a resource that has no multiplier effect because once the coal is burned or water is pushed through a dam, the resource is gone and there is no further multiplier effect, i.e., there is no opportunity for those dollars to be spent on further economic activity.

States	Residential	Commercial	Industrial
New England	18.12	15.61	13.45
Connecticut	20.24	16.51	14.30
Maine	16.21	13.19	11.15
Massachusetts	17.85	15.83	14.66
New Hampshire	16.26	14.81	13.80
Rhode Island	18.13	15.17	13.74
Vermont	15.12	12.77	9.12

Table 1. Average price per kWh by sector for New England states and region in September of 2008.

II. SOLVING THE TRILEMMA: POTENTIAL OPTIONS

In posing solutions to the state's energy trilemma, we have outlined the benefits and costs of the most viable options for Vermont. Some of the possible sources of energy that Vermont could use include wind, biomass, the building of more conventional coal or gas powered plants, or the extension of contracts with Vermont Yankee and Hydro-Quebec. There is no silver bullet to providing electricity that is clean, affordable, and reliable. Rather, the chosen solution will likely be a combination of various generation sources and programs.

A. Energy Efficiency

Vermont became a national leader in energy efficiency by establishing serious ratepayer-funded efficiency programs in 1990 and the first-ever state-wide efficiency utility in 1999.[17] The Vermont Energy Investment Corporation won a bidding process to manage the new utility and named it "Efficiency Vermont."[18] Efficiency Vermont is funded through a surcharge on distribution utilities' bills.[19] The funds generated by the surcharge are then used by Efficiency Vermont to sponsor incentive programs, pay for information distribution, and support non-profit organizations that assist Vermont ratepayers in making their homes and businesses more energy efficient.[20]

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17. Vt PSB Docket No. 5270, Order of April 16, 1990 and 1999 Vt. Acts & Resolves 431 (codified at VT. STAT. ANN. tit. 30, § 209(d)(2) (2000)) ("In place of utility-specific programs developed pursuant to section 218c of this title, the board may, after notice and opportunity for hearing, provide for the development, implementation, and monitoring of gas and electric energy efficiency and conservation programs and measures, including programs and measures delivered in multiple service territories, by one or more entities appointed by the board for these purposes. The board may specify that the implementation of these programs and measures satisfies a utility's corresponding obligations, in whole or in part, under section 218c of this title and under any prior orders of the board.").

18. Vermont Energy Investment Corporation, Efficiency Vermont, http://www.veic.org/ProjectProfiles/EfficiencyVermont.cfm (last visited Apr. 13, 2009) [hereinafter VEIC]. Importantly, the brand-name "Efficiency Vermont" belongs to the state, rather than to VEIC, which manages the program as an independent non-governmental business under contract with the Public Service Board. *Id*.

19. Efficiency Vermont, About Us, *http://www.efficiencyvermont.com/pages/Common/AboutUs* (last visited Apr. 13, 2009).

20. *Id.*

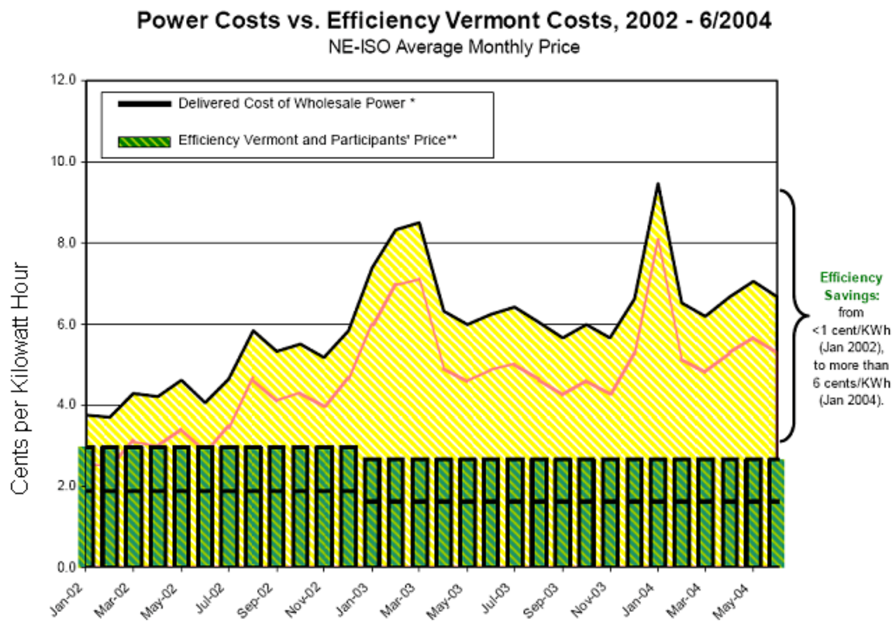

Figure 2. The Cost of Energy Efficiency Versus the Market Price for Wholesale Electricity.

Efficiency Vermont saves Vermonters money and saves the environment from the degradation associated with electricity generation by finding ways to reduce the need for electricity consumption without reducing Vermonters' quality of life.[21] During its first five years, Efficiency Vermont was responsible for eliminating the need for over twenty-four million dollars of energy consumption, which otherwise would have been purchased by Vermont utilities and charged to Vermont ratepayers. In addition, Efficiency Vermont's actions will reduce Vermont's carbon emissions by 2.65 million tons over the lifetime of the installed efficiency measures.[22] Efficiency Vermont creates large economic savings by spending a relatively small amount of money to reduce

21. VEIC, *supra* note 18; David Gram, *Douglas Calls for More Energy Efficiency*, TIMES ARGUS, Jul. 28, 2006, *available at* http://www.timesargus.com/apps/pbcs.dll/article?AID=/20060728/NEWS/607280345/1003/NEWS02

22. VEIC, *supra* note 18.

electricity consumption.[23] For example, the striped bars in Figure 2 represent the cost to Efficiency Vermont of reducing electricity consumption by one kilowatt hour. In contrast, the black line coursing above each of the bars shows the cost of purchasing that same kilowatt hour on the New England wholesale market. Throughout the two-and-a-half-year period, every kilowatt hour purchased through Efficiency Vermont costs at least two cents per kilowatt hour less than Vermonters would have had to pay to buy the electricity on the wholesale market.[24] And at many times, the savings were as high as six cents per kilowatt hour. These savings help explain why the Public Service Board voted to increase Efficiency Vermont's budget from $19.5 million in 2006, to $24 million in 2007, and to $30.75 million in 2008.[25] They also play a major part in explaining why Vermont's trend in electricity costs has been so much more successful than in other states.

Energy efficiency is clearly the most attractive solution to the trilemma because of its proven track record as an economically and environmentally beneficial alternative to energy production.[26] But even the most optimistic estimates of efficiency's potential show that it will not be sufficient to cover all of the electricity needs currently served by Vermont Yankee and Hydro-Quebec.[27] The most important key to successful implementation of energy efficiency as an answer to the trilemma is that efficiency programs must retain the foundation of cost-effectively reducing demand-side consumption of electricity while being open to efficiency improvements for other fuels..[28]

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23. *See id.* (Efficiency Vermont achieved "an energy saving rate 52% lower than what utilities would have paid to purchase this energy on the wholesale supply market").

24. ENERGY INFORMATION ADMINISTRATION, *supra* note 11.

25. STATE OF VT. PUB. SERV. BD., ORDER RE: ENERGY EFFICIENCY UTILITY BUDGET FOR CALENDAR YEARS 2006, 2007, AND 2008, at 18 (2006), *available at* http://www.state.vt.us/psb/document/ElectricInitiatives/eeu_budget_order.pdf.

26. PAUL HAWKEN ET AL., NATURAL CAPITALISM: CREATING THE NEXT INDUSTRIAL REVOLUTION 57 (1999).

27. Vermont will be losing two-thirds of its electricity portfolio by 2012. It would be impossible for electricity efficiency to recoup these lost MWhs. For an example of the limits of energy efficiency in general, see "Natural Capitalism: Creating the Next Industrial Revolution," which notes the "subtle imperfections that inhibit the efficient allocation and use of resources."

28. Memorandum from John Sautter, LL.M. Fellow, Inst. for Energy and the Env't to Michael Dworkin, Director, Inst. for Energy and the Env't (Jan. 3, 2009) (on file with the author) ("[T]he VT. Dept. of Public Service (DPS) most likely misinterpreted Act 92 by issuing a request for proposals (RFP) that focused on improving energy efficiency in low income residences instead of [also addressing] buildings and infrastructure that would produce higher returns on energy efficiency.").

B. Nuclear Power

Another possible solution to Vermont's electricity future is to continue or increase the state's reliance on nuclear power. Entergy, a New Orleans, Louisiana-based power utility, purchased Vermont Yankee, Vermont's only nuclear power plant, on July 1, 2002.[29] The plant's current operating license expires on March 21, 2012.[30] Entergy Nuclear submitted a license renewal application to the Nuclear Regulatory Commission on January 21, 2006. A decision on the application could be released at any time. In addition, as part of the sale of the plant in 2002, Entergy is contractually bound not to operate Vermont Yankee beyond the current license expiration until—and unless—it has been granted a new certificate of public good from the Vermont Public Service Board.[31] Subsequently, the Vermont State Legislature amended the law to prohibit the Vermont Public Service Board from "issu[ing] a final order or certificate of public good until the general assembly determines that operation will promote the general welfare and grants approval for that operation."[32]

The law allows the Public Service Board to investigate, hold hearings, and continue to proceed as normal in respect to the issuance of the certificate of public good, up to, but not including, issuance of a final order or an actual certificate. Thus, the legislature holds the ultimate authority. This includes what can be seen as a denial of the application through inaction—whether intentional or otherwise.

It is important to note that the Nuclear Regulatory Agency confers an entirely different license, and can proceed regardless of any actions that

29. *See* Press Release, Entergy Corp., Entergy Buys Vt. Yankee (July 31, 2002), *available at* http://www.entergy-nuclear.com/news_room/newsrelease.aspx?NR_ID=391 (last visited Apr. 13, 2009) ("The Vermont Yankee acquisition is Entergy's 10th nuclear unit and fifth in the Northeast, making the company the second largest and fastest growing nuclear power operator in the nation, and the largest in the Northeast. . . . Entergy Nuclear, the nuclear businesses of Entergy Corporation, is headquartered in Jackson, Miss. Entergy, a global energy company headquartered in New Orleans, is the third largest power generator in the nation with more than 30,000 megawatts of generating capacity, nearly $10 billion in revenue and almost 2.6 million customers. Besides Vermont Yankee, Entergy Nuclear operates five reactors at four locations in Arkansas, Mississippi and Louisiana under regulatory jurisdictions and four reactors at three sites in Massachusetts and New York. Entergy Nuclear also is now the nation's largest provider of license renewal and decommissioning services to the nuclear power industry.").

30. Entergy, Entergy Nuclear, Vermont Yankee, http://www.entergy-nuclear.com/plant_information/vermont_yankee.aspx (last visited Apr. 13, 2009).

31. Memorandum of Understanding Among Entergy Nuclear Vt. Yankee LLC, Vt. Yankee Nuclear Power Corp., Central Vt. Pub. Serv. Corp., Green Mountain Power Corp., & Vt. Dep't of Pub. Serv., ¶ 12 (Mar. 4, 2002), *available at* http://www.secinfo.com/d1awn.3d.htm [hereinafter Memorandum of Understanding].

32. VT. STAT. ANN. tit. 30, § 248(e)(2) (2008).

take place in Vermont. As the U.S. Supreme Court has said, the Nuclear Regulatory Commission's (NRC) "prime area of concern in the licensing context . . . is national security, public health, and safety."[33] The Court has also ruled that "[t]he safety of nuclear technology [is] the exclusive business of the Federal Government."[34] While federal law has not affirmatively set out the role for states in the regulation of nuclear power plants, the relevant statute, 42 U.S.C. § 2021(k), leaves it to "State or local agency to regulate activities for purposes other than protection against radiation hazards." The Supreme Court has partially explained the State role by saying, "the States exercise their traditional authority over the need for additional generating capacity, the type of generating facilities to be licensed, land use, ratemaking, and the like."[35] In the end, issues regarding the most contentious and divisive issues—nuclear operation safety and radioactive waste disposal—are pre-empted by federal authority granted to the NRC. Issues involving economics and reliability are left for state authorities.

The contract for the sale of Vermont Yankee in July 2002 was also accompanied by a Power Purchase Agreement (PPA)—a ten-year contract for Vermont utilities to purchase Vermont Yankee electricity at lower-than-market rates for the remaining term of the operating license; i.e., until 2012.[36] Under the contract, Entergy Nuclear Vermont Yankee (ENVY) has been providing power to Vermont utilities at costs between 3.9 and 4.5 ¢/kWh.[37] During the years since the PPA went into effect, the wholesale market price for electricity has ranged from 3.4 to over 20.7 cents per kWh.[38] Thus, from the perspective of Vermont ratepayers, the importance

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33. Vt. Yankee Nuclear Power Corp. v. Natural Res. Def. Council, Inc., 435 U.S. 519, 550 (1978).

34. Pacific Gas & Electric Co. v. State Energy Res. Conservation & Dev. Comm'n, 461 U.S. 190, 208 (1983) (identifying congressional legislative records regarding the purpose and intentions behind 42 U.S.C. § 2018 (1982)).

35. *Id*. at 212.

36. Nuclear Energy Institute, U.S. Nuclear Plant Sales, http://www.nei.org/filefolder/US_Nuclear_Plant_Sales_1.xls (last visited Apr. 15, 2009).

37. Prefiled Testimony of Scott M. Albert at 9, Petition of Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operation, Inc., for amendment of their Certificates of Public Good and other approvals required under VT. STAT. ANN. tit.10, §§ 6501–6504 (2008) and VT. STAT. ANN. tit.30, §§ 231(a), 248 (2008) for authority to continue after March 21, 2012, operation of the Vermont Yankee Nuclear Power Station, including the storage of spent-nuclear fuel, No. 7440 (VT. Public Service Board, Nov. 14, 2008), *available at* http://publicservice.vermont.gov/nuclear/Albert_testimony_final1108.pdf.

38. Energy Information Administration, Official Energy Statistics from the U.S. Government, http://www.eia.doe.gov/cneaf/electricity/wholesale/wholesale.html (last visited Apr. 13, 2009) (citing ENERGY INFORMATION ADMINISTRATION, FORM EIA–861, ANNUAL ELECTRONIC POWER INDUSTRY REPORT). The daily weighted average price dipped under four cents per kWh a few times in 2002.

of the reissuance of the certificate of public good for Vermont Yankee is intertwined with future alternatives to the current PPA. No rational assessment of the merits of a renewal for the plant can be made without an assessment of future power costs for Vermont; assessments of past pricing under the current PPA simply do not tell us the value of future production from the plant under an as-yet-unknown future PPA..

A closely related feature of the 2002 sale is a clause in the Memorandum of Understanding that provides for revenue sharing.[39] Specifically, "ENVY agrees to share with [previous utility owners of Vermont Yankee] fifty percent of the Excess Revenue for ten years commencing on March 13, 2012."[40] The "excess revenues" are all sales of electricity, whether to Vermont utilities or not, for greater than the "strike price" of $61 per MWh, with some upward adjustment as the costs of employment, domestic product growth, and fuel change after the revenue sharing begins.[41] The "strike price" is not affected by the price of fossil fuels or other variables that do not directly affect Vermont Yankee's ability to provide power. Thus, the value of the provision depends directly on how future wholesale electricity prices compare to the "strike price." Since we cannot know this relationship in advance, the estimated value depends on current best estimates of future prices, as modified to reflect our awareness that there is no warranty for the accuracy of those forecasts. As of the drafting of this article, the most recent estimates from the federal government for the wholesale price of electricity in the Northeast Power Coordinating Council/New York region rise from $76 to $91 per MWh from 2012 to 2022.[42] The revenue sharing clause provides Vermont utilities with half the difference between $61 and the actual sale price of the electricity, regardless of who makes the purchase.

Conceptually, it is helpful to look at the re-licensing of the plant under each of the three legs of the trilemma. First, in establishing reliability from fuel supply to delivery of energy, nuclear power went through a period of significant unplanned outages, some of them related to safety issues and others purely for engineering reasons. In recent decades, the reliability indices for operating plants have improved greatly and the nuclear power industry now asserts it has a proven track record for general infrastructure

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However, for the overwhelming majority of days the price was well in excess of the price contracted under the PPA. *Id*. (citing Intercontinental Exchange (ICE) data).

39. Memorandum of Understanding, *supra* note 31, ¶ 4.

40. *Id*.

41. *Id*.

42. Energy Information Administration, *supra* note 38.

reliability and safety.[43] However, incidents such as the Davis-Bessie plant's tardy recognition of a degraded containment vessel still raise concerns,[44] and the Vermont Yankee plant itself has had several serious unplanned outages related to equipment outside its containment area. Vermont commissioned a special reliability assessment and then an oversight panel to review and comment upon reliability issues related to operation of the plant.[45] "The Panel concludes that reliability of VY for operation beyond 2012 can be reasonably expected if the recommendations of this report and the NSA report are taken."[46] Assessing reliability is necessarily based on predicting operating reliability for the future, and can only estimate the likelihood of future operation.[47] For the immediate future, Vermont Yankee's reliability rests on managerial oversight and continued correction of issues that do not have a significant impact on the plant's ability to continue providing electrical power.

Second, while nuclear waste disposal issues are significant in addressing the environment, the direct generation of nuclear power produces relatively low emissions of carbon dioxide or other air pollutants.[48] The related mining and fuel distribution cycles, while significant, appear to produce less than the levels of emissions for

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43. *See generally* Nuclear Energy Institute, Safety and Security, http://www.nei.org/keyissues/safetyandsecurity (last visited Apr. 15, 2009) (providing information on safety and security measures taken by the nuclear power industry). *But see* Vermont.gov, "Vermont Yankee Reliability Assessment Filed" (Dec. 23, 2008), *available at* http://vermont.gov/portal/government/article.php?news=761 (noting that a comprehensive vertical assessment completed by the Vermont Department of Public Service concluded that Vermont Yankee was "operated and maintained in a reliable manner." Although "management action, oversight, and follow-through are needed . . . ."); Susan Smalheer, *Vt. Yankee Finds More Problems with Tower*, RUTLAND HERALD, Sept. 19, 2008, *available at* http://www.rutlandherald.com/apps/pbcs.dll/article?AID=/20080919/NEWS04/809190379/1003/NEWS02 ("Vermont Yankee's cooling towers have been a source of trouble for Entergy Nuclear since last summer . . . .").

44. Tom Henry, *FirstEnergy is Slapped with $5.45M Fine*, TOLEDO BLADE, Apr. 22, 2005, *available at* http://www.toledoblade.com/apps/pbcs.dll/article?AID=/20050422/NEWS17/504220375.

45. Vermont.gov, *supra* note 43.

46. *The Public Oversight Panel Report for the Comprehensive Vertical Audit and Reliability Assessment of the Vermont Yankee Nuclear Facility*, Mar. 17, 2009, at 42, *available at* http://www.leg.state.vt.us/jfo/VY%20Legislative%20Briefing/Public%20Oversight%20Panel%20Report%2003-17-2009.pdf.

47. *See Testimony of Peter A. Bradford, Public Oversight Panel for the Vermont Yankee Reliability Assessment House Committee on Natural Resources and the Senate Finance Committee*, Mar. 19, 2009, (testimony of Peter A. Bradford), *available at* http://www.leg.state.vt.us/jfo/VY%20Legislative%20Briefing/Bradford%20Testimony%2003-19-2009.pdf. At 9, Bradford comments, "No report written in 2009 can provide firm assurances as to events between now and 2032." *Id.*

48. *See* JOSPEH P. TOMAIN & RICHARD D. CUDAHY, ENERGY LAW 330 (2004) (stating that nuclear power could become economically competitive if costs are assigned to carbon emissions).

comparable amounts of power from fossil fuels, albeit more than energy efficiency or renewables.[49] Discussion of the independent problem of radioactive waste disposal is beyond the scope of this paper, but it is worth noting that under current arrangements nuclear waste from Vermont Yankee is stored on-site and that there seems little prospect for off-site disposal absent major changes in federal law and policy.

The third leg of the trilemma raises serious and currently unresolved issues about the future of nuclear power in Vermont. As early as 2006, the future economic viability of Vermont Yankee began to be questioned.[50] The most recent discussions regarding future power contracts between Entergy and the Vermont utilities are being closely watched by Vermont utility regulators as well as the Vermont public, with the expiring PPA taking at least a temporary front seat. The utilities want both a new PPA and the benefits of the revenue sharing clause; Entergy asserts that combining both benefits is beyond that required to show benefits for Vermont ratepayers.[51] It asserts that Vermont utilities and, in turn, Vermont ratepayers stand to recoup up to an estimated $1.4 billion or more under the revenue sharing clause if Vermont Yankee continues to operate through 2022.[52] The validity of this assertion depends in very large part on the predictability of future energy prices.

Vermont utilities no longer own Vermont Yankee. As a wholesaler of electricity, Entergy is free from state regulation of rates.[53] Vermont Yankee will be able to charge market rates for whatever portion of its power it sells to customers outside of the PPA with Vermont utilities. Given that most of

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49. *See* NUCLEAR ENERGY INSTITUTE, PROTECTING THE ENVIRONMENT, *available at* http://www.nei.org/keyissues/protectingtheenvironment (last visited Apr. 13, 2009) (describing life-cycle analysis of nuclear power plants). *But see* MARK DIESENDORF & PETER CHRISTOFF, CO_2 EMISSIONS FROM THE NUCLEAR FUEL CYCLE 2 (2006), http://www.energyscience.org.au/FS02%20CO2%20Emissions.pdf. The authors note that there can be no doubt that if uranium ore grade declines by a factor of ten, then energy inputs to mining and milling must increase by at least a factor of ten. As ore grade decreases, there has to be grade at which the CO_2 emissions from mining and milling become unacceptably high. However, the exact value of this critical ore grade is still subject to continuing scientific debate. *Id*.

50. David Gram, *Douglas Calls for More Energy Efficiency*, TIMES ARGUS, Jul. 28, 2006, at B1.

51. Letter from Jay K. Thayer, Vice President–Operations, Entergy Nuclear to Susan M. Hudson, Clerk, Vt. Pub. Serv. Bd. (Dec. 22, 2008), http://www.evacuationplans.org/Entergy-Letter-re-Revenue-Sharing-is-enough.pdf.

52. Bob Audette, *Officials Discuss PPA vs. Revenue Share for Vermont Yankee*, BRATTLEBORO REFORMER, Dec. 26, 2008, at 1, *available at* http://www.istockanalyst.com/article/viewiStockNews/articleid/2909204.

53. Under the Federal Power Act, state utility commissions can specify retail rates for electricity, but wholesale pricing is subject to federal state review, rather than state regulatory control. Federal Power Act of 1920, 16 U.S.C. §§ 796(15), 824 (2006).

the costs of the plant are fixed and that future costs (such as fuel, operations, and maintenance) appear relatively small, it seems that Entergy could continue to operate Vermont Yankee at a cost less than they are charging Vermont utilities under the current PPA. However, external review of needed maintenance and operational costs is difficult, so it is difficult to predict whether they will. With recent predictions of energy prices for the next fifteen years approximately double the price in the PPA, it is not likely that Entergy will continue to provide power at the old contract price; however, it is unclear what degree of "discount from market" would be required to make the plant's operation economically attractive to Vermont. Importantly, if Vermont Yankee sells some of its product to Vermonters at a discount from market and sells the rest of its product into New England's wholesale markets at full market price, then it will have a strong incentive to minimize the portion of its output committed to Vermont and to maximize the portion available for sale to others. For this reason, as for so many others, Vermont will maximize its bargaining power by placing a heavy emphasis on investments in measures, such as end-use energy efficiency, that reduce its need to buy from Vermont Yankee and allow it to accept smaller purchase requirements.

C. Wind

One promising solution to Vermont's energy trilemma could be wind.[54] Some wind developers estimate that twenty percent of the state's energy needs could be met through wind power by the year 2015, although because of the natural intermittency of wind twenty percent would be the maximum possible amount.[55] Wind generation has great promise as a possible solution to the trilemma for three reasons.[56] It does not emit carbon dioxide or any other air pollutant.[57] It is cost effective over the life of the generation investment because there are no fuel costs.[58] And finally, wind power would be a reliable component of Vermont's energy infrastructure.[59]

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54. *See generally* Louis Porter, *Kingdom Wind Project Downsizes*, TIMES ARGUS, Sept. 26 2006, *available at* http://www.timesargus.com/apps/pbcs.dll/article?AID=/20060926/NEWS/609260336/1003/NEWS02 (noting that wind power could be a viable solution to Vermont's power needs); MOORE *supra* note 1, at 13.

55. MOORE, *supra* note 1, at 13.

56. *See generally* AMERICAN WIND ENERGY ASSOCIATION, WIND ENERGY: FAST FACTS, *available at* http://www.awea.org/newsroom/pdf/FastFacts2006.pdf (providing background facts about wind energy in the United States).

57. PAUL GIPE, WIND POWER 71–77 (2004).

58. MOORE, *supra* note 1, at 13.

59. *Id.*

The main problem with wind energy generation is that, as in many states and localities, some public interest groups and citizens who believe that wind turbines will spoil the state's natural and valuable beauty have opposed wind farms in Vermont.[60] The uncertainties surrounding the impact of wind turbines on wildlife and the visual and aesthetic characteristics of wind turbine generation make this source of power unpalatable for many Vermonters.[61] Under current Vermont law, the state's Public Service Board is ultimately responsible for deciding whether wind projects, other non-carbon emitting generation projects, or any electricity generation projects at all will move forward.[62] V.S.A. 30 § 248(a)(2)(A), states that: "no company, as defined in section 201 of this title, and no person . . . may begin site preparation for or construction of an electric generation facility or electric transmission facility within the state which is designed for immediate or eventual operation at any voltage."[63] Furthermore, V.S.A. 30 § 248(a)(2)(B) states:

> [N]o such company may exercise the right of eminent domain in connection with site preparation for or construction of any such transmission or generation facility, unless the public service board first finds that the same will promote the general good of the state and issues a certificate to that effect.[64]

During the summer of 2006, the Public Service Board rejected a wind development project proposed for the Northeast Kingdom.[65] While it appears that wind developers are moving forward with proposals in other parts of the state, their success with the Public Service Board is far from guaranteed. As long as vocal segments of the public and the Governor continue to oppose wind development, the record in wind-siting cases will include strong presentations of evidence in opposition to siting.

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60. *See* Porter, *supra* note 52 (noting that low frequency noise, disturbance of bear habitat, and aesthetics are all concerns that Vermonters have voiced in regard to wind generation projects); Darren M. Allen, *Vermont Agencies Split on Wind Project*, RUTLAND HERALD, Mar. 29, 2006, *available at* http://www.rutlandherald.com/apps/pbcs.dll/article?AID=/20060329/NEWS/603290345/1004 (noting that the Vermont Agency of Natural Resources opposed the wind turbines while the Vermont Department of Public Service supported them).

61. Allen, *supra* note 58; Porter, *supra* note 52.

62. VT. STAT. ANN. tit. 30, § 248(a)(2)(A) (2008).

63. *Id.*

64. *Id*. § 248(a)(2)(B).

65. Wilson Ring, *Public Service Board Denies Permit for East Haven Wind Farm*, BOSTON GLOBE, July 17, 2006, *available at* http://www.boston.com/news/local/vermont/articles/2006/07/17/public_service_board_denies_permit_for_east_haven_wind_farm.

Responding to this and rebutting it will require extensive and demanding advocacy by proponents who may well choose to devote such resources to projects in other states. Recently, Green Mountain Power and Vermont Electric Cooperative have proposed a new wind project in Lowell, Vermont that would provide enough electricity for 15,000 homes in the state.[66]

While much remains to be seen, one telling sign of the future of wind power in Vermont concerns the approval of a new wind project near Searsburg, VT. On April 16th, 2009 the Vermont Public Service Board approved the new project, which will consist of 15 wind powered generators each standing at 400 feet in height with a maximum generating capacity of 30 MW of electricity in total.[67] Important to the Board's decision were the economic, environmental and social benefits that the electricity generation source would produce. Indeed, the Board's approval rested, in part, on an expectation that the contracts for purchase of power from the facility could be revised to provide ratepayers with some of the benefits of being shielded from fossil-fuel price volatility. Though the Board noted the environmental and aesthetic drawbacks to the project, it emphasized the fact that the wind turbines would be a source of zero-carbon emission electricity, new jobs, needed electricity and would assist Vermont in meeting its Regional Greenhouse Gas Initiative commitments.[68] In many respects this decision could be a sign of how the Board will decide future petitions for wind development. Ultimately, the decision marks an important step toward building wind capacity in Vermont by outlining the necessary benefits that must accrue before a project will win approval.

D. Hydroelectricity

Hydroelectricity is another potential source of future electricity.[69] Currently, hydroelectricity meets approximately thirty-eight percent of Vermont's electricity needs, the bulk of which comes from Hydro-Quebec.[70] Hydroelectricity is seemingly an answer to the state's trilemma. It is clean for the air and potentially cost effective if the state can sign new

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66. *Power Companies Explore Possible Wind Farm in Lowell*, BURLINGTON FREE PRESS, Jan. 11, 2009, *available at* http://push.pickensplan.com/profiles/blogs/2187034:BlogPost:1770985.

67. State of Vermont Public Service Board, Docket Number 7250, Petition of Deerfield Wind LLC, April 16, 2009 at 3.

68. *Id.*

69. MOORE, *supra* note 1, at 17, 22.

70. *See* Vermont Department of Public Service, Vermont's Electric System, http://publicservice.vermont.gov/electric/electric.html (last visited Apr. 13, 2009) (noting that of the 38%, Hydro Quebec accounts for 28.2% with Instate Hydro accounting for the other 9.2%).

long term contracts.[71] Concerns about environmental impacts on the Canadian shield and about social impacts on First Nations groups in Canada were significant when these contracts were first negotiated and reviewed.[72] However, since then, both Cree and Inuit peoples have become entitled to larger portions of the revenue from such sales and opposition has eased, if not ended.[73] At the same time, environmental concerns about carbon emissions have risen to a degree that seems to outweigh concerns about impacts within Canada. Unfortunately, like the state's contracts with Vermont Yankee, Vermont's current economically favorable contracts with Hydro-Quebec are set to expire in the near future.[74] Negotiations for new contracts, if the state's utilities can win them, are likely to result in significantly higher power purchase prices because projected wholesale market prices will most likely continue to be much higher than the current hydropower contract price.[75] Therefore, new contracts might meet environmental and reliability concerns, but the question of how much they will cost is still uncertain.

E. Biomass

Biomass offers an alternative that would make Vermont self-sufficient, and thus would bolster the state's economy by providing jobs and cheap electricity.[76] Electricity produced from biomass can take the form of burning wood chips.[77] Seventy-eight percent of Vermont is covered in forests.[78] Therefore, there is a large stock of wood as a renewable resource that could be used to provide for Vermont's electricity needs. In 2005,

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71. TOMAIN & CUDAHY, *supra* note 46, at 332–34.

72. KARL FROSCHAUER, WHITE GOLD: HYDROELECTRIC POWER IN CANADA 5–6 (1999).

73. Pierre Fortin, *The Hydro Industry and the Aboriginal People of Canada: Paving the Way for New Relationships*, 3 INT. J. ON HYDROPOWER & DAMS, 47, 49–50 (2001).

74. *See* Bruce Edwards, *CVPS Corp. Chief: VT Is at Crossroads*, RUTLAND HERALD, May 8, 2008, *available at* http://www.timesargus.com/apps/pbcs.dll/article?AID=/20080508/NEWS/805080320/1003/NEWS02 (noting that Vermont's contracts with Hydro Quebec will expire in 2016).

75. *See id.* (stating that CVPS pays attention when the price is between 6.5 and 7 ¢/kWh for Hydro-Quebec power while the spot price in New England is between 7 and 8 ¢/kWh).

76. *See generally* C.D. Foster et al., *Advantages of Woody Biomass Utilization Fact Sheet 1.3*, *in* SUSTAINABLE FORESTRY FOR BIOENERGY AND BIO-BASED PRODUCTS: TRAINERS CURRICULUM NOTEBOOK 31, 32 (W. Hubbard et al. eds., 2007), *available at* http://www.mba.wfu.edu/download.aspx?id=1547 (explaining the economic advantages of using biomass).

77. Benjamin K. Sovacool & Christopher Cooper, *Nuclear Nonsense: Why Nuclear Power is No Answer to Climate Change and the World's Post-Kyoto Energy Challenges*, 33 WM. & MARY ENVTL. L. & POL'Y REV. 1, 87 (2008) (noting that biomass is an option in a land area with wood chips available to burn).

78. SOCIETY OF AMERICAN FORESTERS, FORESTRY IN THE STATE OF VERMONT 1 (2005), *available at* http://www.safnet.org/policyandpress/Vermont.pdf.

Vermont served six percent of its electricity needs by burning wood chips.[79] Although its renewability is a positive environmental attribute, the prospect of burning more wood for energy is actually not too bad for the environment either. Although the burning of wood chips does emit carbon, biomass contributes much less to global warming when compared to fossil fuels.[80] Much of the carbon emitted by the burning of biomass is re-absorbed in the carbon cycle by plants grown to replace the harvested stock.[81] Therefore, while not carbon-neutral, biomass does offer a better alternative than using a fossil fuel like coal.[82] Additionally, harvesting trees in Vermont does not necessarily create negative environmental consequences. Some policy analysts have claimed that to meet projected needs, less than twenty-five percent of the annual growth of biomass needs to be harvested annually.[83] Biomass is cost-effective and reliable.[84] Furthermore, its outcome on the environmental prong of the trilemma is positive.[85] The only thing holding back the development of this renewable resource is the natural limitations of growing and harvesting forests.[86] Ultimately, biomass offers a real option that Vermont utilities should consider in the future depending on the price comparison to other sources of electricity.

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79. *See* MOORE *supra* note 1, at 12 (referencing 2005 Sources of Vermont's Electric Power).

80. Bioenergy Technology Ltd., What is Biomass?, http://www.bioenergy.org/biomass.html (last visited Apr. 13, 2009) (stating that using biomass, like wood, as an energy source creates a 'closed carbon cycle').

81. *Id.*

82. *See* Biomass Center, Climate Change, http://www.biomasscenter.org/resources/faqs.html (last visited Apr. 13, 2009) (noting that as a comparative fuel biomass is not as harmful to the atmosphere).

83. MOORE, *supra* note 1, at 15.

84. RENEWABLE ENERGY POLICY NETWORK FOR THE 21ST CENTURY, RENEWABLES 2007: GLOBAL STATUS REPORT 14, tbl.1 Status of Renewable Technologies—Characteristics and Cost (2008), *available at* http:// www.ren21.net/pdf/RE2007_Global_Status_Report.pdf (noting that biomass can produce electricity at a comparatively cheap rate). Biomass is reliable in the sense that Vermont has an ample supply of the fuel on hand to meet projected needs.

85. Bioenergy Technology Ltd., *supra* note 76 (stating that the burning of biomass is not as harmful to the environment as the burning of fossil fuels).

86. ANDREW COX, LOW CARBON HEATING WITH WOOD PELLET FUEL 7, *available at* http://www.bioenergy.org/downloads/PelletReport.pdf (stating that biomass energy sources, such as plants, absorb the CO_2 emitted from the burning of biomass, thus suggesting that the only thing holding back the development of the biomass resource market is the natural limitation of growing and harvesting forests).

F. Natural Gas

Natural gas provides a final example of an alternative that many states have turned to, but it fails to solve the trilemma.[87] Natural gas is a relatively clean burning source of energy.[88] It emits a fraction of the carbon dioxide and other harmful pollutants that are produced by burning coal.[89] But, like coal, extracting natural gas out of the ground and transporting it to power plants has many severe environmental consequences.[90] Additionally, natural gas is not going to be cost-effective in the long run.[91] The United States has currently overbuilt its natural gas infrastructure and so there may be a huge increase in demand in the coming years as new natural gas plants come on line.[92] Natural gas prices are forecasted to increase dramatically as North American stocks of gas are depleted, which in turn brings questions about the reliability of natural gas.[93] It is uncertain that the North American stock of natural gas is sufficient to meet the future needs of energy producers.[94] Plans are already underway to build liquefied natural gas ports in southern California and in the northeastern United States in order to import natural gas from the South Pacific and the Middle East.[95] But, as the oil industry has illustrated, these are not always reliable sources for U.S. energy needs.[96]

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87. TOMAIN & CUDAHY, *supra* note 46, at 220.

88. *See, e.g.,* ROBERTS, *supra* note 3, at 126 (stating that the United States' existing energy technology, which includes gas-fired power plants, is becoming on the whole more efficient and cleaner).

89. For one of the most stalwart advocates of natural gas as a replacement for oil see T. BOONE PICKENS, PICKENS' PLAN, *available at* http://www.pickensplan.com/theplan (last visited Apr. 13, 2009).

90. *See* Seth Mydans, *Colorado River May Face Fight of its Life: Increased Toxins Likely as Energy Companies Seek Oil, Gas, Uranium*, SAN DIEGO UNION-TRIBUNE, Dec. 21, 2008, at A1 (explaining that natural gas wells rely on a process called hydraulic fracturing, which is known to contaminate groundwater with toxic chemicals).

91. *See generally* ANDREW WEISMAN, ENERGY VENTURES GROUP, LLC, THE CRITICAL NEED TO EXAMINE MORE CAREFULLY THE ROLE OF LIQUEFIED NATURAL GAS IN MEETING FUTURE U.S. ENERGY NEEDS (2005), *available at* http://www.energyvg.com/Where_Will_the_Gas_Come_From_ExSum_v01.pdf (outlining why natural gas is not a viable solution to the United States' energy dilemma).

92. *Id.* at 2–3.

93. *See id.* at 2 (commenting on the potential reduction of natural gas in the future and the correlating increase of price for natural gas).

94. *Id.* at 3.

95. *See, e.g.,* ROBERTS, *supra* note 3, at 248–49 (discussing proposed multibillion-dollar natural import infrastructure); *see also* Associated Press, *Broadwater Challenging LI Sound LNG Edict*, NY DAILY NEWS, Apr. 28, 2008, *available at* http://www.nydailynews.com/ny_local/2008/04/28/2008-04-28_broadwater_challenging_li_sound_lng_edic.html (discussing the proposed establishment of the world's first floating liquefied natural gas terminal in Long Island Sound).

96. ROBERTS, *supra* note 3, at 249–50.

III. GUIDING POLICY AND LEGAL PRINCIPLES

A. Defining a Long-Term Strategy to Meet the Trilemma

Vermont's energy future depends on its electricity generation goals. While the above-mentioned energy alternatives assume that environmental goals are just as paramount as cost and reliability, the state could decide that cost alone is the most important element in deciding what energy source the state should choose. Many other states have made fuel cost the driving factor in energy decisions, and have thus chosen coal-fired power plants as the best way to serve their energy needs.[97]

Coal is very cheap, abundant, and has a proven track record of providing reliable electricity.[98] More than half of the electricity in the United States currently comes from coal-fired power plants.[99] Further, the United States has enough coal reserves to provide energy for at least the next 200 years.[100] Even if environmental factors are subordinated to economics in energy-source decision-making, no state can ignore the fact that the burning of coal is responsible for forty percent of U.S. emissions in 2006 and for a large majority of the carbon dioxide emissions of the last century.[101] Burning coal also emits sulfur dioxide, nitrous oxide, mercury, and particulate matter. These harmful emissions from coal combustion create acid rain, destroy wildlife, and are believed by some experts to be responsible for over 30,000 premature human deaths in the United States every year.[102]

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97. *See, e.g.,* M. Granger Morgan, *Don't Grandfather Coal Plants*, 314 SCIENCE 1049 (2006) (suggesting that states are attempting to build coal plants quickly in order to 'grandfather' them before a carbon tax regime is implemented).

98. TOMAIN & CUDAHY, *supra* note 46, at 223.

99. U.S. Department of Energy, http://www.energy.gov/energysources/coal.htm (last visited Apr. 13, 2009).

100. TOMAIN & CUDAHY, *supra* note 46, at 226.

101. *See* NATURAL RESOURCES DEFENSE COUNCIL AND PUBLIC SERVICE ENTERPRISE GROUP, BENCHMARKING AIR EMISSIONS OF THE LARGEST ELECTRIC POWER PRODUCERS IN THE UNITED STATES—2006, at 19 (2008) ("Over the past 60 years, fossil-fired power plants in the U.S. have generated upwards of 77 billion metric tons of CO_2. Coal-fired power plants were responsible for 80 percent of these emissions.").

102. ABT ASSOCIATES, PARTICULATE RELATED HEALTH BENEFITS OF REDUCING POWER PLANT EMISSIONS 42 (2000), *available at* http://www.abtassociates.com/reports/particulate-related.pdf.

While coal is a cheap source of fuel, its high cost to the environment and human lives makes the initial savings seem insignificant at best.[103] However, even putting aside the environmental and human health costs, choosing fossil fuels is short-sighted based on the economic considerations alone.[104] Most energy experts expect that, within a decade, regulators at federal, state, or regional levels will place limits on carbon dioxide emissions in an attempt to curb global warming.[105] These limits will likely be imposed in the form of a cap-and-trade system of carbon credits of the kind currently used to limit sulfur dioxide emissions.[106] A cap-and-trade system essentially monetizes a utility's right to pollute; thereby, providing an incentive for utilities to find non-emitting ways to provide energy or to upgrade their facilities and reduce carbon dioxide emissions.[107] Thus, building dirty coal power plants at relatively low costs may be very expensive when carbon dioxide limits are imposed. Whether the utilities' investors pay, or the utilities' customers pay, someone is going to have to foot the bill for carbon control technology and emissions permits.

It is vital that the state government and utilities conceptualize Vermont's energy generation goals with environmental concerns on par with reliability and cost. As the example with coal demonstrates, generation options that are environmentally green are also likely to be more financially sustainable over the long run.[108] The fact that Vermont has joined the RGGI in many respects has created an environmental mandate for the state to generate electricity in a manner that does not contribute to global warming. In truth, this is essentially an affirmation of the state's pre-existing statutory commitment to consider both economic and environmental costs when making resource choices.[109] Therefore, the state government should press utilities to help meet the state's needed reduction of ten percent of its carbon emissions by 2018. Doing so will not only

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103. Indeed, Tomain and Cudahy describe it as "cheap and dirty." TOMAIN & CUDAHY, *supra* note 46, at 223.

104. *See generally* PACIFICORP, INTEGRATED RESOURCE PLAN (2007), *available at* http://www.pacificorp.com/File/File74765.pdf (providing an example how utilities often base their energy portfolio decisions on costs and risk of regulation).

105. *Id.* at 31–41.

106. *Id.* at 34 n.7.

107. U.S. Environmental Protection Agency, Clean Air Markets: Cap and Trade, http://www.epa.gov/airmarkets/captrade/index.html (last visited Apr. 15, 2009).

108. *See* Michael Dworkin et al., *Revisiting the Environmental Duties of Public Utility Commissions*, 7 VT. J. ENVTL. L. 1, 2 (2006) (noting that some states fail to recognize the strong link between economic and environmental issues).

109. See VT. STAT. ANN. tit. 30, § 218c (2008), discussed below in the context of integrated resource planning.

make the Green Mountain State more environmentally green, but financially green as well in the long term.

B. Integrated Resource Planning

Vermont state law requires organized long-term planning by its utilities.[110] V.S.A. 30 § 218c(b) states that "each regulated electric or gas company shall prepare and implement a least cost integrated plan for the provision of energy services to its Vermont customers."[111] Under this law, all electric companies that own or operate electric transmission facilities within the State of Vermont must file a least cost integrated plan that looks forward for at least ten years.[112] In addition, utilities must file the plans with the relevant state legislative committees.[113] These committees in turn review the plans to make sure that the energy needs of the state are being met.[114] Ultimately, "[t]he objective of the plan shall be to identify the potential need for transmission system improvements as early as possible, in order to allow sufficient time to plan and implement more cost-effective non-transmission alternatives to meet reliability needs, wherever feasible."[115]

An important part of resource planning in Vermont involves including community groups and the public.[116] V.S.A. 30 § 218c(d)(2) mandates that before a transmission plan is adopted the utility must hold at least two public meetings. These meetings must be in geographically diverse areas

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110. *Id.* § 218c(b).
111. *Id.*
112. *Id.* § 218c(d)(1) states in part that:

> Least cost transmission services shall be provided in accordance with this subsection. Not later than July 1, 2006, any electric company that does not have a designated retail service territory and that owns or operates electric transmission facilities with the state of Vermont, in conjunction with any other electric companies that own or operate these facilities, jointly shall prepare and file with the department of public service and the public service board a transmission system plan that looks forward for a period of at least ten years. A copy of the plan shall be filed with each of the following: the house committees on commerce and on natural resources and energy and the senate committees on finance and on natural resources and energy.

113. *Id.*
114. *Id.*
115. *Id.*
116. *Id.* § 218c(d)(2) states that "[p]rior to the adoption of any transmission system plan, a utility preparing a plan shall host at least two public meetings at which it shall present a draft of the plan and facilitate a public discussion to identify and evaluate non-transmission alternatives."

that are near the area where the transmission upgrades will take place.[117] Utilities must attempt to include the public in the planning process by advertising the meetings at least three weeks ahead of time in local media. Furthermore, the utility must make a transcript of the meeting available to the public and to the Public Service Board.[118]

Integrated resource planning should be and is a standard procedure for all utilities. Most states have statutory obligations requiring all utilities to use integrated resource planning.[119] In other states, public service boards have taken it upon themselves to introduce integrated resource planning through commission orders or case decisions.[120] The focus on community input and the balancing of long-term social interests also underscores the obligation that all utilities have to serve ratepayers "as efficiently and practically as possible."[121] Indeed, it makes the most business sense to use integrated resource planning. Resource planning requires that utilities consider the most efficient and frugal methods to increase their energy production. For these reasons, all utilities benefit from using integrated resource planning. The Department of Public Service and the Public Service Board should be firm with utilities in ensuring that they are planning with environmental concerns on an equal basis with cost and reliability. After all, state law holds "economic" and "environmental" concerns to be equally important after safety in all planning activities.[122] In fact, the law lists environmental costs before economic costs.[123]

C. Least Cost Life Cycle Analysis

Vermont energy policy during the last decade has produced cost savings, increased efficiency, and protected the environment.[124] V.S.A. 30 § 218c(a) drove this innovation by creating a legal basis for the Public Service Board to incorporate a "least-cost-life-cycle" standard into all energy planning.[125] The statute provides that:

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117. *Id.*

118. *Id.*

119. *See* Dworkin et al., *supra* note 104, at 20, 21, 29, 41, 61 (noting that Hawaii, Nevada, Kentucky, Vermont, and Florida are states with a statutory mandate for integrated resource planning). At this time thirty-six states have integrated resource planning. *Id.* at 5, n.22.

120. *See* NEV. PUBLIC UTILITIES COMMISSION, REGULATORY ASSISTANCE PROJECT ELECTRIC RESOURCE LONG RANGE PLANNING SURVEY ¶¶ 3–7 (2006), *available at* http://www.raponline.org/Pubs/IRPsurvey/IRPNV2006.pdf (indicating proactive state measures).

121. VT. STAT. ANN. tit. 30, § 218c(d)(2) (2008).

122. Sautter & Switzer, *supra* note 4, at 40.

123. *Id.*

124. *Id.*

125. VT. STAT. ANN. tit. 30, § 218c(a)(1) (2008).

> [a] 'least cost integrated Plan' for a regulated electric or gas utility is a plan for meeting the public's need for energy services . . . *at the lowest present value life cycle cost, including environmental and economic costs*, through a strategy combining investments and expenditures on energy supply, transmission and distribution capacity, transmission and distribution efficiency, and comprehensive energy efficiency programs.[126]

A least-cost life-cycle standard means that the value of any energy production unit is calculated by projecting the future value of all resource commitments to producing energy from the generating unit. Thus, when assessing the viability of an energy strategy a utility must take into account the present value of the long-term costs of the infrastructure.[127] This law has three notable effects. By requiring an assessment of the "lowest present value life cycle cost," it causes utilities to have a long-range planning horizon, it makes utilities quantify environmental costs as part of the analysis, and it stipulates that utilities must make decisions that are the least expensive to the customers.[128]

An example of how a least-cost life-cycle standard works in practice can be understood by comparing a cost evaluation of a coal energy generation unit to a wind energy generation unit. In order to assess the value of each project, three main components are analyzed: the initial cost for the plant infrastructure, the total future costs of all resources needed to fuel the generation unit, and the price volatility of future resources. In this example, coal would have a significantly less expensive initial capital cost than installing wind generation facilities.[129] However, the future cost of the resources needed to fuel the coal generation plant would be significantly higher than the wind generation facilities.[130] Furthermore, there is no price volatility in the future price of wind power because wind energy costs nothing, except for operations and maintenance costs, to produce electricity.[131] On the other hand, depending on the future market for coal there could be price volatility due to fluctuations in supply and demand.

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126. *Id.* (emphasis added).

127. *Id.*

128. *Id.*

129. Catherine M. Cooney, *High-tech Coal Energy Cheaper than Texas Wind Power*, 39 ENVTL. SCI. & TECH. 455A (2005).

130. TOMAIN & CUDAHY, *supra* note 46, at 223 (noting that half of the country's electricity is produced by coal).

131. Christine Real de Azua, *The Future of Wind Energy*, 14 TUL. ENVTL. L.J. 485, 491–92 (2001).

Therefore, while the initial capital cost of wind energy is more expensive, the "life cycle" cost of wind energy production would likely be lower than coal.

Least-cost-integrated planning is vital to ratepayers because utilities do not necessarily have an interest in lower life cycle costs. Most customers in Vermont are served by utilities that are investor-owned corporations.[132] Utilities are often interested in ensuring that their short-term planning horizon meets the projected targets of earnings per share. Thus, a twenty-five year, long-term planning horizon that is less expensive over the long run might not be as attractive as a short-term planning horizon, which promises lower costs in the near future as opposed to long-term savings.

Drawing on the example used above, it is instructive to note that utilities might want to build the coal plant because it would cost less in the short-term even though price volatility and resource costs over the long-term make the project more expensive. The economic incentive structure holds corporate managers accountable through quarterly profit reports, which rewards "short-term planning" behavior. This is not to suggest that Vermont utilities have been thinking in the short term in the past. Rather, it is our contention that Vermont utilities have done an effective job of planning and thinking for the long term. Our main point is that utilities should continue to use and emphasize least-cost-integrated planning in future discussions on energy decisions.

D. New and Innovative Programs

Finally, Vermont should consider the adoption of programs that will educate and prepare the state for the energy challenges of the future. For example, other states have taken steps to create climate change laws and task forces in preparation for larger efforts. Arkansas recently established a "Governor's Commission on Global Warming."[133] Alaska has developed a Climate Impact Assessment Commission.[134] Connecticut established a "Climate Change Action Plan."[135] These programs constitute innovative

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132. Central Vermont Public Service Corporation (CVPS), and Green Mountain Power (GMP), are Vermont's two largest utilities and both are traded on the New York Stock Exchange.

133. H.R. 2460, 86th Gen. Assem., Reg. Sess. (Ark. 2007), *available at* http://arkansasstatechamber.com/government/pdf/2007LegSummary.pdf.

134. L.R. No. 49, 24th Leg., 2nd Sess. (Alaska 2006).

135. CONN. GEN. STAT. ANN. § 22a-200a (2004). Another example is in California where the state government passed a comprehensive "Global Warming Solutions Act of 2006," which established a statewide mandate to reduce carbon dioxide by future deadlines. CAL. HEALTH & SAFETY CODE §§ 38,500–38,599 (2007).

methods and procedures for organizing a response to each state's individual energy situation.

States have always been natural laboratories for social experimentation in developing and testing new policies. Vermont's development and cultivation of Efficiency Vermont was one such effort. Vermont must not shirk away from experimenting with energy policies that might be different from more traditional methods of meeting consumer needs. Programs that are pragmatic and potentially effective should always be pushed forward and aided by utilities, the Public Service Board, and the state legislature.

CONCLUSION

This article first examined Vermont's energy circumstances. Next, the article outlined some of Vermont's energy options. Finally, the article looked at specific statute-based principles that utilities and the Public Service Board should be using to guide their decisions. Vermont must prioritize its energy goals, not by being cynical about the impossibility of alleviating global warming or becoming more energy independent, but by having an honest discussion about what sorts of values the state should manifest in its electricity generation. Ultimately, the energy trilemma should not be looked at as a question of dollars and cents, even though cost is one of its key elements. Rather, Vermont's energy plan must be a diverse mix of resources, policies, and programs that hedge against all potential scenarios.

This is a tall order. What might such an energy resource mix look like? First, it is important to consider all alternatives—including nuclear. Rejecting nuclear power based primarily on old arguments against building new nuclear plants is not good policy where such a facility already resides within the state. Nuclear power has the possibility of providing reliable and very low carbon energy while contributing a fractionally smaller amount of waste to the problem. And, it may be that Vermont will not have nuclear power in its future due to more technical questions of retro-fitting the Vermont Yankee production facility, due to the operational costs or due to reliability issues associated with an aging reactor. This remains to be seen. However, nuclear power should be carefully considered as an alternative because of the necessity of providing carbon-neutral electricity.

Second, wind power must be considered. Though local groups oppose wind energy production facilities, wind energy needs to be a central facet of Vermont's energy future. Those opposing wind energy cite concerns about harm to the visual aesthetics of the Vermont landscape. However, scientists estimate that global warming will eliminate maple trees in Vermont by the year 2070.[136] Therefore, there is a cost-benefit question that goes beyond dollars and cents. The introduction of windmills, albeit only in a small way, may prevent the destruction of Vermont's beautiful woodlands and cultural traditions. If Vermont can take actions to avert such a scenario, it should. Importantly, Vermont should be open to the purchase of wind power from sites beyond its own borders.

Third, both hydroelectricity and biomass should be considered viable options for the state. Hydro currently provides roughly a third of Vermont's electricity. Though we are too far away to estimate the price per kWh of hydro when Vermont's contracts with Hydro Quebec expire in 2016, this Canadian source of electricity will likely be an emission-free source of reliable power at a reasonable price. Biomass will likely not play as large a role as hydro in Vermont's future energy mix, but it should be kept on the table as a carbon-neutral and locally-sustainable fuel for Vermont's utilities. Both of these renewable energy sources offer the state important options in answering the energy trilemma.

Finally, and most importantly, Vermont's energy future must involve energy efficiency. Though the state has made tremendous headway in this area, there is still much to be done. Vermont should strive to reduce the social burden of energy production, decrease demand for energy, and reduce waste. In this vein, energy efficiency programs must operate with the primary goal of reducing demand. Money spent for energy efficiency should not be compromised by other political issues like poverty reduction or business subsidies. In short, spending for efficiency should be seen as the acquisition of an energy resource, rather than as a matter of social-welfare policy; i.e., money spent on energy efficiency *must* be put to use in the manner that will most likely reduce energy consumption.

There is no easy answer to the trilemma of cost, reliability, and environmental needs. However, as long as Vermonters retain the values of conservation and ingenuity as guiding principles when making these decisions, the resulting resource mix providing the state's energy future will likely be successful at solving the energy trilemma.

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136. UNITED STATES GLOBAL CHANGE RESEARCH PROGRAM, POTENTIAL CONSEQUENCES OF CLIMATE VARIABILITY AND CHANGE 610 (2005), *available at* http://www.usgcrp.gov/usgcrp/Library/nationalassessment/17C.pdf#search=%22Canadian%20Scenario%202070%20to%202100%22.