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# ARTICLE

# Innovations in Energy and Climate Policy: Lessons from Vermont

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## I. INTRODUCTION

Walk into a room and ask people to describe what they know about the state of Vermont, and they may mention that it is the second least-populated state in the United States, that it is famous for its maple syrup, dairies, and lakes, or that it was the only state without a Walmart until the year 1996.[1] Some may say that the state typifies small-town America,[2] while others may recall that Vermont was home to the poet Robert Frost and the artist Norman Rockwell, who frequently commented on the state's "unspoiled character and landscape."[3] Still others may remember former Vermont Governor Howard Dean's failed bid for the White House in 2003 and 2004. Some may even mistake

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1. *Ten Fun Facts about Vermont*, TEN FACTS ABOUT, http://www.10-facts-about.com/Vermont/id/46 (last visited Mar. 23, 2014).

2. ROBERT WUTHNOW, SMALL-TOWN AMERICA: FINDING COMMUNITY, SHAPING THE FUTURE 8 (2013).

3. Robert M. Vanderbeck, *Vermont and the Imaginative Geographies of American Whiteness*, 96 ANNALS OF THE ASS'N OF AM. GEOGRAPHERS 641-42 (2006).

Vermont for part of Canada, given its northern location and political liberalness.[4] But would anybody really declare that the state is a leader in energy and climate policy?

In this article, we argue that they should. We propose that Vermont has accomplished impressive feats across the domains of energy efficiency, renewable energy, the smart grid, and energy planning that deserve to be considered by, perhaps even replicated in, other states and countries.

For instance, in 2011 the American Council for an Energy Efficient Economy ranked Vermont first in the nation for its energy efficiency programs.[5] These programs, largely administered by Efficiency Vermont, have reduced the state's electricity demand by 1.9%, displaced 108,000 MWh of electricity, and avoided emissions of 790,000 tons of carbon dioxide.[6] Vermont was recognized for "sustained excellence" by the U.S. Environmental Protection Agency (EPA) for its contribution to the Energy Star efficiency program.[7] In 2012, the U.S. Department of Energy (DOE) similarly recognized Efficiency Vermont as one of seven LED Lighting Facts Partners of the Year.[8] The Kennedy School of Government at Harvard University named Efficiency Vermont one of the five best government programs in the United States.[9]

Vermont's electricity sector is the cleanest and least fossil fuel intensive in the nation.[10] Oil and natural gas provide less

4. Ian Austin, *Quebec and Vermont Towns Bond Over a Sleepy Border*, N.Y. TIMES, July 18, 2007.

5. SCIORTINO ET AL., THE 2011 STATE ENERGY EFFICIENCY SCORECARD (2011), *available at* http://www.aceee.org/sites/default/files/publications/researchreports/e115.pdf.

6. EFFICIENCY VERMONT, 2011 ANNUAL HIGHLIGHTS 3 (2011), *available at* http://www.efficiencyvermont.com/docs/about_efficiency_vermont/annual_summaries/2011_Highlights_EfficiencyVermont.pdf.

7. *Id.*

8. *2012 LED Lighting Facts Special Recognition*, LED LIGHTING FACTS, http://www.lightingfacts.com/Library/Content/SpecialRecognition/2012 (last visited Mar. 29, 2014).

9. This comes from one of our interview respondents. See the section on "Research Methods" for more about how these sources are attributed.

10. U.S. ENERGY INFO. ADMIN., STATE-LEVEL ENERGY-RELATED CARBON DIOXIDE EMISSIONS, 2000-2010 (2013), *available at* http://www.eia.gov/environment/ emissions/state/analysis/pdf/stateanalysis.pdf.

than one percent of the state's electricity, and coal is not used at all in electricity generation. The state was the first in the country to ban the hydraulic fracturing (fracking) of natural gas.[11] The state has been on the "forefront" and "vanguard" of development of biomass and wood-to-energy electricity nationwide since the 1980s.[12] It receives about twenty-five percent of its electricity from in-state renewables such as biomass and hydroelectricity, but aims to expand this to ninety percent by 2050.[13] The state has the lowest energy related carbon dioxide emissions for the entire country (in aggregate) and the second lowest (behind New York) when adjusted to per capita figures—putting it ahead of "green states" such as California and Oregon.[14] The electricity sector contributes a mere 0.1% to the state's emissions profile. Vermont also has the lowest carbon intensity in the nation, meaning the lowest amount of carbon dioxide emissions per million BTUs of energy.[15]

Vermont has pursued one of the most proactive smart grid policies in the United States. The Vermont Electric Cooperative (VEC) exemplified this leadership by installing advanced meters in roughly ninety percent of homes by 2011.[16] This put VEC in the top one percent of utilities in the country for deployment[17] and earned recognition by Power Magazine with its first "Power

11. GUY PAGE, VERMONT ENERGY PARTNERSHIP, VERMONT'S ELECTRICITY OUTLOOK: TODAY THROUGH 2016 2 (2012), *available at* http://www.nei.org/corporatesite/media/filefolder/07-30-12_FINAL-VT-Electricity_Porfolio_Issue_Brief.pdf.

12. Fredefick Frankena, *Rethinking the Scale of Biomass Energy Conversion Facilities: The Case of Wood-Electric Power*, 14 BIOMASS 149 (1987).

13. Stephen Lacey, *Vermont's Energy Secession Goal: 90 Percent Renewables by 2050*, GRIST (Dec. 25, 2011, 7:28 PM), http://www.grist.org/energy-policy/2011-12-25-vermonts-energy-secession-movement-90-renewables-by-2050/.

14. U.S. ENERGY INFO. ADMIN., STATE-LEVEL ENERGY-RELATED CARBON DIOXIDE EMISSIONS 2000-2010 1, 3 (2013).

15. *Id*. at 4.

16. *VEC's Smart Grid Story*, VERMONT ELEC. COOP., http://www.vermontelectric.coop/vecs-smart-grid-story-1 (last visited July 24, 2013).

17. *Id.*

Smart Grid Award."[18] The magazine stated that VEC was at least a decade ahead of the market on smart grid.[19]

Underlying these successes has been the development of several types of robust energy institutions and governance systems. The state has a Comprehensive Energy Plan, which involves stakeholders throughout the state in assessing the energy system and planning for the future.[20] This planning process has catalyzed the emergence of local grassroots organizations called Town Energy Committees.[21] More recently, the creation of the Climate Cabinet[22] in the executive branch and the Climate Caucus[23] in the legislative branch increases political coordination to act on climate change and energy issues.

And so we ask in this article: how can planners and policymakers replicate Vermont's energy and climate policies?

We begin by explaining the research methods utilized for this article—mainly research interviews with a pool of experts, coupled with a targeted literature review. We then analyze the success of Vermont energy policy across four areas: energy efficiency, renewable energy, the smart grid, and energy governance. The following sections first explain how Vermont accomplished these successes, next identify a number of remaining barriers and elements of Vermont's approach that may not be replicable, and finally present the article's conclusions.

18. CHRISTOPHER KOLIBA ET AL., VERMONT-SANDIA P'SHIP, THE ENERGY VERMONT COLLABORATIVE: BRINGING THE SMART GRID TO THE STATE OF VERMONT (2013), *available at* http://www.uvm.edu/~jeffords/reports/pdfs/The%20e Energy%20Vermont%20Collaborative.pdf (last visited Mar. 23, 2014).

19. *Id.*

20. VT. DEP'T OF PUB. SERV. COMPREHENSIVE ENERGY PLAN 2011 (2011), *available at* http://publicservice.vermont.gov/sites/psd/files/Pubs_Plans_Reports/State_Plans/Comp_Energy_Plan/2011/2011%20CEP_Volume%202%5B1%5D.pdf.

21. *Id.*

22. *See Climate Cabinet*, VT. AGENCY OF NATURAL RES., http://www.anr.state.vt.us/anr/climatechange/ClimateCabinet.html (last visited Mar. 29, 2014).

23. *See Legislative Update: Burlington Rep. Chris Pearson*, COMMONGOOD VT. (Jan. 29, 2013), ttp://blog.commongoodvt.org/2013/01/legislative-update-burlington-rep-chris-pearson/.

## II. RESEARCH METHODS

Because many of Vermont's energy policy innovations are relatively recent, they have yet to be written about in peer-reviewed literature.[24] We therefore undertook a mixed methods approach of data collection for this article, relying primarily on semi-structured research interviews with a pool of energy experts (see Appendix I) supplemented with a review of relevant reports and internet websites. These tools have been widely used in both the social sciences and energy policy disciplines.[25] In June and July 2013, we conducted a total of seventeen of these interviews at thirteen institutions.

For each interview, we asked the following questions: In your opinion, in the area(s) of energy efficiency, renewable energy, the smart grid, and/or energy planning/policymaking:

24. A May 2013 search of the ScienceDirect database—home to journals such as *Energy Policy* and *Electricity Journal*—found only 6 articles with the word "Vermont" and "energy," "efficiency," or "renewable" in the title, keyword or abstract published in the last twenty years.

25. For application of the semi-structured research interview method, the following provides a small sample, see generally Pamela Baxter & Susan Jack, *Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers*, 13 THE QUALITATIVE REP. 544 (2008); WAYNE C. BOOTH ET AL., CRAFT OF RESEARCH (2008); GARY KING ET AL., DESIGNING SOCIAL INQUIRY: SCIENTIFIC INFERENCE IN QUALITATIVE RESEARCH (1994); ROBERT K. YIN, CASE STUDY RESEARCH: DESIGN AND METHODS (2003), GEORGE L. ALEXANDER & ANDREW BENNETT, CASE STUDIES AND THEORY DEVELOPMENT IN THE SOCIAL SCIENCES (2004). For application of this method specifically to energy policy, see generally Malavika Jain Bambawale et al., *Realizing Rural Electrification in Southeast Asia: Lessons from Laos*, 15 ENERGY FOR SUSTAINABLE DEV. 41 (2011); Benjamin K. Sovacool, *The Importance of Comprehensiveness in Renewable Electricity and Energy Efficiency Policy,* 37 ENERGY POLICY 1529 (2009); Benjamin K. Sovacool, *Rejecting Renewables: The Socio-technical Impediments to Renewable Electricity in the United States*, 37 ENERGY POL'Y 4500 (2009); Benjamin K. Sovacool, *A Comparative Analysis of Renewable Electricity Support Mechanisms for Southeast Asia*, 35 ENERGY 1779 (2010); Benjamin K. Sovacool, *A Critical Stakeholder Analysis of the Trans-ASEAN Gas Pipeline (TAGP) Network*, 27 LAND USE POL'Y 788 (2010); Benjamin K. Sovacool & Brent Brossmann. *Symbolic Convergence and the Hydrogen Economy*, 38 ENERGY POL'Y 1999 (2010); Benjamin K. Sovacool, et al., *The Socio-Technical Barriers to Solar Home Systems (SHS) in Papua New Guinea: Choosing Pigs, Prostitutes, and Poker Chips over Panels,* 39 ENERGY POL'Y 1532 (2011); Benjamin K. Sovacool et al., *Gers Gone Wired: Lessons from the Renewable Energy and Rural Electricity Access Project (REAP) in Mongolia*, 15 ENERGY FOR SUSTAINABLE DEV. 32 (2011).

1. What have been some of Vermont's greatest accomplishments?
2. What did it do to achieve these accomplishments?
3. What barriers had to be overcome, and what barriers remain?
4. What lessons does the Vermont experience offer others?

Participants were asked to answer as much (or as little) as they liked, and to support their remarks with secondary sources, if available. We did not offer compensation to any respondent nor did we prompt them for answers. Though Appendix I presents the names and institutional affiliations of all interviews, we provide quotations from them *without* attribution below—that is, we present them as anonymous. This is because confidentiality was mutually agreed upon at the beginning of each interview, and because anonymity protects respondents from retaliation over divulging potentially controversial information. Moreover, it encourages candor, as people often speak their minds if they no longer have to worry about their statements coming back to haunt them. Finally, individuals were not speaking on behalf of their institutions and were instead giving their personal opinion, making institutional affiliation less relevant (though still important for sampling purposes). That said, we kept the original notes and transcripts for each interview and have cross-checked them to ensure their accuracy.

## III. WHAT HAS IT DONE?: THE BENEFITS OF VERMONT'S ENERGY POLICY

This section documents the benefits of Vermont's energy policies over the past few decades, essentially answering the question, "what have been some of Vermont's greatest accomplishments?" As one respondent summed up:

> [Vermont has] the cleanest portfolio in the country, with the lowest greenhouse gas emissions and the best air quality in New England. Vermont is known the world over for its green ethic. In fact, Forbes Magazine named Vermont the "greenest" state in America in 2007. We were also recognized as the "greenest state" in 2009, this time by the Earthsense Eco-Insights Survey. In

> December, 2010 the website 24/7 Wall Street ranked Vermont as the greenest state in American when energy consumption, pollution problems and state energy policies are evaluated. Our state's energy portfolio is among the greenest in the world.[26]

As this section will argue, a combination of four things—investments in energy efficiency, the promotion of renewable electricity, deployment of smart-grid technologies, and strong energy governance and institutions—enabled the state to achieve these feats.

## A. Efficiency

Vermont offers a comprehensive array of energy efficiency programs that have yielded significant results. State efficiency programs reduced Vermont's electricity requirements by more than five percent in 2005. From 2012 to 2014, about 6.6% in cumulative savings are expected. Between 2006 and 2008 the state saved 311 gigawatt-hours (GWh), exceeding their three-year target of 261.7 GWh, and more than offsetting the average underlying rate of growth in electricity demand.[27] More important, these efforts have been very cost effective, with savings achieved at a cost of 2.7 to 2.9 cents per kWh.[28] Vermont's natural gas efficiency programs saved 97,924 million cubic feet (mcf) in 2008 and more than 800,000 mcf since their beginning in 1993.[29] Figure 1 shows that Vermont had the highest net incremental savings from energy efficiency programs in the entire United States. In 2011, the inhabitants of the state

26. Anonymous survey response (on file with author).

27. *State Energy Efficiency Policy Database*, AM. COUNCIL FOR AN ENERGY EFFICIENT ECON., http://aceee.org/sector/state-policy/vermont (last visited Mar. 23, 2014).

28. INSTITUTE FOR INDUSTRIAL PRODUCTIVITY, DELIVERY MECHANISMS FOR FINANCING OF INDUSTRIAL ENERGY EFFICIENCY: A COLLECTION OF BEST PRACTICES 27 (2012), *available at* http://www.iipnetwork.org/IIP11.%20FinancialVehicles BestPractices.pdf.

29. SETH NOWAK ET AL., ENERGY EFFICIENCY RESOURCE STANDARDS: STATE AND UTILITY STRATEGIES FOR HIGHER ENERGY SAVINGS 75 (2011), *available at* http://www.aikencolon.com/assets/images/pdfs/IECC/maryland/u113.pdf.

used an average of 6,876 kilowatt hours of electricity per capita, far below the national average of 11,280 kWh.[30]

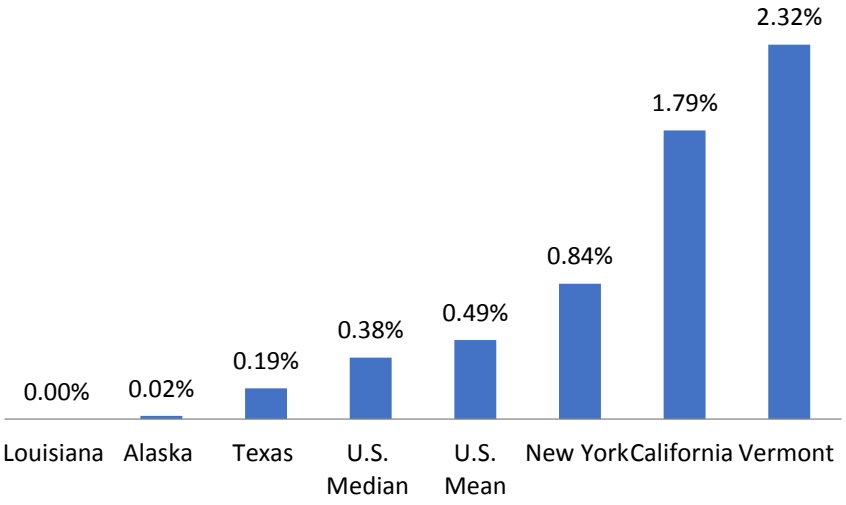



**Figure 1: Net Incremental Savings from Electric Energy Efficiency Programs, % of statewide retail sales of electricity, in 2010[31]**

In 2012 alone, Efficiency Vermont, the state's energy efficiency utility, saved homeowners and businesses $206 million in energy costs.[32] That same year, 1,100 homes completed whole-house energy efficiency projects; 42,500 homes implemented some type of energy efficiency upgrade (including 4,300 low income homes).[33] This number may not sound impressive, but it

30. *See How Much Electricity Does an American Home use?*, U.S. ENERGY INFO. ADMIN. (March 19, 2013), http://www.eia.gov/tools/faqs/faq.cfm?id=97&t=3 ("In 2011, the average annual electricity consumption for a U.S. residential utility customer was 11,280 kWh, an average of 940 kilowatthours (kWh) per month.").

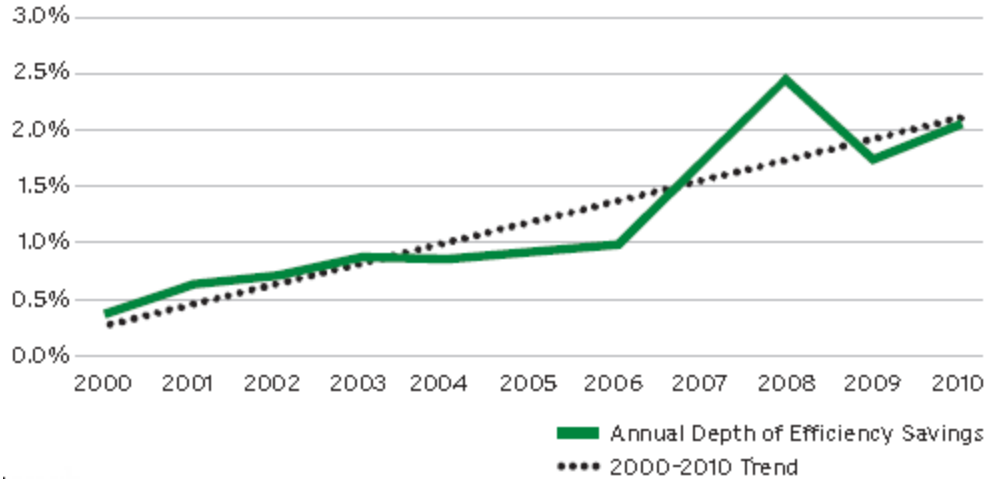
31. *Id.*

32. EFFICIENCY VERMONT, 2012 ANNUAL HIGHLIGHTS (2013), *available at* http://www.efficiencyvermont.com/docs/about_efficiency_vermont/annual_reports/EVT_2012Highlights_FINAL.pdf.

33. *Id.*

represents 13% of all homes in Vermont.[34] Efficiency Vermont's business programs have seen similar success; projected lifetime savings of 912,000 MWh are equivalent to providing energy to 134,000 homes (roughly one-third of the state's homes) for one year.[35] In 2010, Efficiency Vermont's programs reduced carbon dioxide emissions by 718,000 tons—equivalent to taking 128,000 cars off the road for a year.[36] As Figure 2 shows, from 2007 to 2010, energy efficiency measures more than offset electric energy load growth.

**Figure 2: Energy Efficiency Savings as a Percentage of**




**Vermont's Electricity Needs, 2000 to 2010[37]**

The savings from some schools, commercial enterprises, and industries are equally striking. The Elm Hill and Union Street Elementary Schools were able to save 76,000 kWh and $9,900 in annual costs by upgrading lighting, HVAC systems, windows,

34. *See generally Quick Facts*, U.S. CENSUS BUREAU, http://quickfacts.census.gov/qfd/states/50000.html (last visited Mar. 23, 2014) (stating that Vermont had 324,389 housing units in 2011).

35. EFFICIENCY VERMONT, *supra* note 32, at 3.

36. *Id.*

37. EFFICIENCY VERMONT, 2010 SUCCESS STORIES AND PERFORMANCE (2010), *available at* http://www.efficiencyvermont.com/docs/about_efficiency_vermont/annual_summaries/2010_results_summary.pdf.

cafeteria equipment, and insulation.[38] John Fitzpatrick, Director of Physical Plant, Springfield School District, remarked that, "with the guidance and assistance of Efficiency Vermont, my school district was able to undertake several innovative and long overdue energy efficiency projects. The savings we've realized will enable the district to move forward with additional energy- and cost-saving projects."[39] School leaders at the Lyndon Town School similarly upgraded lighting throughout their 105,000 square foot facility to save 138,000 kWh per year and offset $21,000 in energy bills.[40] One project at the Burlington International Airport reduced the airport's power usage by 20 percent, even as operations expanded significantly. This was achieved through retrofits to interior and exterior lighting, and HVAC systems—saving 2.1 million kWh per year and resulting in $266,000 of annual savings.[41]

Industrial and agricultural enterprises such as Fulflex Incorporated (a manufacturer of elastics), Energizer Holdings (a global conglomerate involved in everything from skin care to plastics), Newmont Farm (a dairy and creamery), and Laggis Brothers Farm (a dairy farm) have also benefited from programs that improve lighting, controls, compressed air, and ventilation. These upgrades not only resulted in energy and financial savings, they also improved sales.[42]

One underlying element to these efficiency upgrades is their cost effectiveness. Cost effectiveness did not happen accidently; it was an intentional part of the policy design. It was encoded in the state's energy policy, which mandates ongoing efforts to identify and evaluate "least cost integrated energy planning."[43] In 2011, the levelized cost of Efficiency Vermont's total expenditures was approximately 1.6 cents per kWh, but the equivalent amount of money needed to supply the same energy

38. *Id.*

39. EFFICIENCY VERMONT, 2011 ANNUAL HIGHLIGHTS: 6 EFFICIENCY SUCCESS STORIES (2011), *available at* http://www.efficiencyvermont.com/docs/about_efficiency_vermont/annual_summaries/2011_Highlights_EfficiencyVermont.pdf.

40. *Id.*

41. EFFICIENCY VERMONT, *supra* note 32.

42. *Id.*; EFFICIENCY VERMONT, *supra* note 39.

43. VT. STAT. ANN. tit. 30, § 202a(2) (West 2013).

and capacity over the average 10-year life of efficiency measures was 11.2 cents per kWh,[44] based on current values of avoided costs—leading to the positive cost-benefit curve shown in Figure 3. One respondent told us that:

> In 1999, Vermont had the second highest electric rates of seven north-eastern states; by 2005 we had the lowest such rates. More importantly than rates, [because of our efficiency programs,] the burden went down. Commercial and industrial electric costs dropped from 1.9 percent of Gross State Product to less than 1.6 percent. Residential electric bills dropped from 3.9 percent of disposable personal income to 3.3 percent.[45]

Indeed, Efficiency Vermont estimated that Vermont businesses, institutions, and municipalities saved 70,000 MWh and 97,000 MMBtu in 2013, delivering "Total Resource Benefits" of $100.3 million to 3,400 customers—numbers reflected in Table 1.[46] Put another way, the average return on investment for efficiency improvements in 2012 was 45 percent.[47]

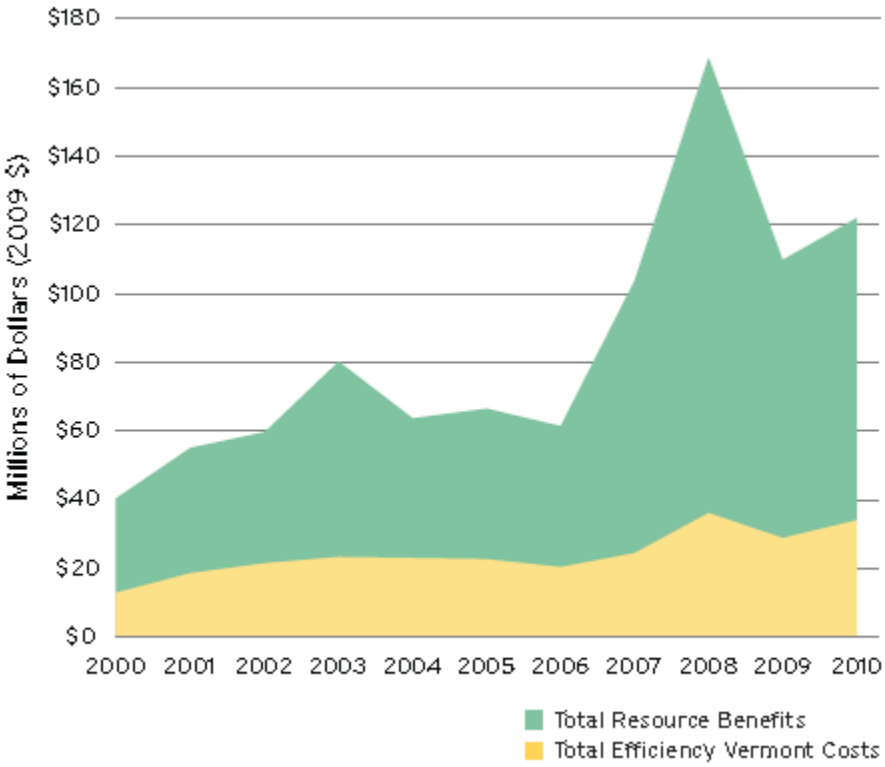
44. *Efficiency Vermont's Accomplishments*, STATE OF VT. PUB. SERV. BD., http://psb.vermont.gov/utilityindustries/eeu/generalinfo/evtaccomplishments (last visited Mar. 23, 2014).

45. Anonymous survey response (on file with author).

46. EFFICIENCY VERMONT, SAVINGS CLAIMS SUMMARY 2012 (2013), *available at* http://www.efficiencyvermont.com/docs/about_efficiency_vermont/annual_reports/Efficiency-Vermont-2012-Savings-Claim-Summary.pdf.

47. *Id.*

**Figure 3: Cost-Benefit Curve for Efficiency Vermont Programs, 2000-2010**[48]




48. EFFICIENCY VERMONT, *supra* note 32.

**Table 1: Net lifetime economic value of energy efficiency investments in 2012[49]**

| | | |
|---|---|---|
| Benefits | $157,300,000 | Total Resource Benefits |
| | $ 23,600,000 | Operations and maintenance savings |
| | $180,900,000 | Total Benefits |
| Minus Costs | $ 35,900,000 | Efficiency Vermont resource acquisition |
| | $ 35,600,000 | Participant and third- party |
| | $ 71,500,000 | Total Costs |
| Equals Net Benefits | $109,400,000 | Net Lifetime Economic Value to Vermont |

Efficiency Vermont emphasizes developing new consumer products that meet, and often exceed, efficiency standards set under the U.S. Department of Energy's Energy Star program.[50] The state used rebates, cost buy downs, displays, and advertising to promote the most efficient appliances on the market, such as lighting, air conditioners, dehumidifiers, pool pumps, and electronic devices.[51] It works with service providers to ensure that these items are always in stock, and in 2012, electricity savings from these products amounted to 36,800 MWh.[52]

## B. Renewables

Vermont is a national leader in renewable electricity and low-carbon energy supply. The state had about 500 MW of renewable energy capacity in 2011, as depicted in Table 2.[53] However, it is rapidly growing this portfolio—construction of a 63 MW wind farm in Lowell began in 2012, and the state installed

49. EFFICIENCY VERMONT, *supra* note 46, at 17.
50. *Id.* at 11.
51. *Id.*
52. *Id.* at 11.
53. AMERICAN COUNCIL ON RENEWABLE ENERGY, RENEWABLE ENERGY IN VERMONT (2012), *available at* http://www.acore.org/files/pdfs/states/Vermont.pdf.

16 MW of new solar in 2012.[54] Given Vermont's small population, the state now boasts the ninth highest installed solar capacity per-capita in the country.[55] These recent efforts with new renewable sources build on Vermont's past leadership in biomass. The McNeil Generating Station was the world's largest wood-burning facility when built in 1984 and became a laboratory for many of the biomass power plants that followed.[56] Several schools statewide are heated with biomass, such as Green Mountain College, where a $5.8 million combined heat and power ("CHP") wood chip heating system provides heating and electricity to the 155 acre campus.[57]

**Table 2: Sources of Renewable Electricity in Vermont (as of December 31, 2011)[58]**

| | | | |
|---|---|---|---|
| Wind | 46 MW | Ocean | 0 MW |
| Solar Photovoltaic | 12 MW | Biomass Power | 88 MW |
| Concentrated Solar Thermal | 0 MW | Bioethanol | 0 mGy |
| Geothermal | 0 MW | Biodiesel | 0 mGy |
| Hydropower | 315 MW | Totals 461 | |

Overall the state has about 1,100 MW of installed capacity (excluding the Vermont Yankee Nuclear Power Plant, which supplies New York state), provided by Green Mountain Power

54. TONY DUTZIK & ROB SARGENT, ENV'T AM. RESEARCH & POLICY CTR., LIGHTING THE WAY: WHAT WE CAN LEARN FROM AMERICA'S TOP 12 SOLAR STATES 6 (2012), *available at* www.environmentamerica.org/sites/environment/files/reports/Lighting_the_way_EnvAM_scrn_0.pdf.

55. *Id*.

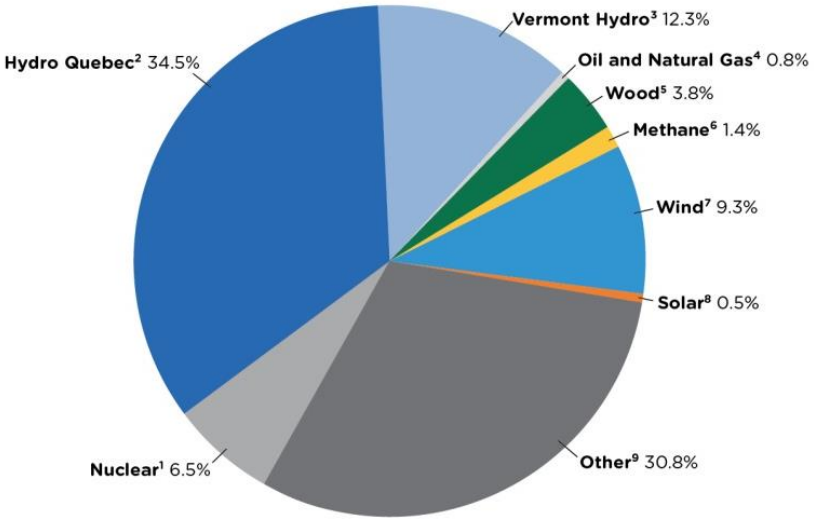
56. *History*, BURLINGTON ELECTRIC DEP'T, https://www.burlingtonelectric.com/page.php?pid=68&name=history (last updated Mar. 26, 2014).

57. *Sustainability at Green Mountain College: Biomass Facility,* GREEN MTN. COLLEGE, http://www.sustainability.greenmtn.edu/operations/buildings_energy/biomass_facility.aspx (last visited Mar. 23, 2014).

58. AMERICAN COUNCIL ON RENEWABLE ENERGY, *supra* note 53.

Corporation,[59] two non-profit cooperatives, and 14 municipal utilities.[60] Beyond the renewables shown in Table 2, the rest of Vermont's electricity mix comes from imported hydroelectricity from Quebec and a variety of other sources shown in Figure 4.[61] As a result of this mix, Vermont has the lowest total carbon dioxide emissions and the second lowest per capita emissions of any state across the country (see Figure 5).

**Figure 4: Projected Vermont Sources of Electricity (before renewable energy credit sales), 2013[62]**




[1]Nuclear" includes imports from Millstone 3 and Seabrook. [2]"Other" includes known and planned bilateral sources from the New England Independent System Operator and New York Independent System Operator.

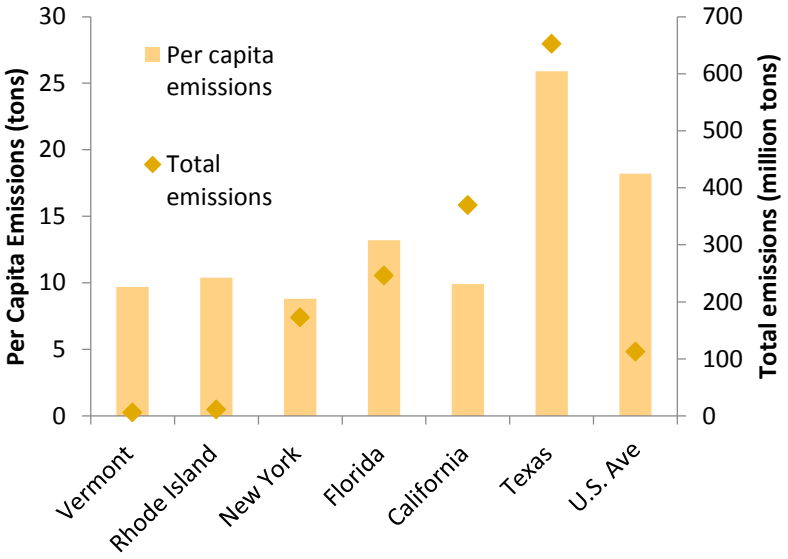
59. GMP became the state's largest power company through its merger with Central Vermont Public Service ("CVPS") in 2012.

60. VERMONT DEP'T OF PUB. SERV., VERMONT COMPREHENSIVE ENERGY PLAN, APPENDIX B, VERMONT'S ENERGY FUTURE, *available at* http://www.epa.gov/statelocalclimate/documents/pdf/background_vermont_energy_plan.pdf.

61. *Fuel Mix*, GREEN MOUNTAIN POWER, http://www.greenmountainpower.com/fuel-mix/#sthash.GBTkyx7M.dpuf (last visited Mar. 23, 2014).

62. *Id.*

**Figure 5: Total and per capita state energy-related carbon dioxide emissions in 2010 (million metric tons of CO2)**[63]




One innovative project managed by the Central Vermont Public Service Corporation is the "Cow Power program." This program has six dairy farms generating 12 million kWh of electricity per year, serving 4,600 electricity customers who voluntarily pay a premium to receive electricity from cow waste.[64] The project has not only grown by a factor of four since its initiation in 2004—it has also provided a 14.13 % return on equity for dairy farmers, making it a lucrative business decision.[65]

## C. Smart Grid

Vermont's smart grid effort has four components, which provide benefits toboth the consumer and utility. The first component of the state's smart grid efforts is to install advanced

63. This chart was from U.S. Energy Information Administration data on carbon dioxide emissions from 2000-2010, on file with author.

64. Q. Wang et al., *Economic Feasibility of Converting Cow Manure to Electricity: A Case Study of the CVPS Cow Power Program in Vermont*, 94 J. DAIRY SCI. 4937–4949 (2011).

65. *Id.*

metering infrastructure (AMI) through the eEnergy Vermont Project.[66] A majority of customers received smart meters by 2012.[67] The next component is customer site automation.[68] Through smart meters and the state's telecommunications network, customers will install in-home displays, home area networks, smart appliances, and extremely efficient devices, which will save money and electricity.[69] The third part of the state's efforts is demand response, or voluntary reductions in consumption to moderate peak load.[70] Demand response can reduce demand at peak or near peak consumption times when the most expensive, most polluting, and least efficient generators would ordinarily be called upon to operate.[71] Lastly, utilities will have substation and grid automation controls that will reduce maintenance costs.[72]

Vermont, according to one respondent, has a "higher penetration of [smart grid technology] than any other state,"[73] with 90 percent of homes receiving advanced meters by 2011 (see Figure 6). Vermont has done more than invest in hardware; it is also working on consumer services like Smart Power, a program run by Green Mountain Power.[74] Under the program, customers with smart meters are able to track their electricity usage online.[75] They can access data that reveals their energy use on a monthly, weekly or hourly basis.[76] Similarly, VEC customers can

66. *Components of the eEnergy Vermont Project,* VERMONT ELEC. POWER CO., http://www.velco.com/Projects/smartgrid/Pages/components.aspx (last visited Mar. 23, 2014).

67. *Id*.

68. *Id*.

69. *Id.*

70. *Id*.

71. *Id.*

72. *Components of the eEnergy Vermont Project,* VERMONT ELEC. POWER CO., http://www.velco.com/Projects/smartgrid/Pages/components.aspx (last visited Mar. 23, 2014).

73. Anonymous survey response (on file with author).

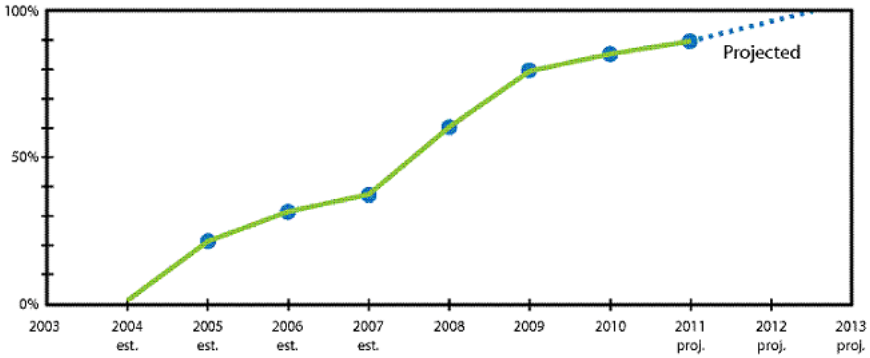
74. *Benefits of GMP Smart Power*, GREEN MOUNTAIN POWER, http://www.greenmountainpower.com/smart/benefits/?gclid=CIWkzbvm-rcCFXDNOgodZ2sADg#sthash.GHlcyLqp.dpuf (last visited Mar. 23, 2014).

75. *Frequently Asked Questions*, GREEN MOUNTAIN POWER, http://www.greenmountainpower.com/smart/what-is/faqs/ (last visited Apr. 2, 2014).

76. *Id.*

take part in the cooperative's Watt Watchers program, which is also web based.[77] The goal is to provide information products that empower consumers to save money by reducing their peak usage, or to identify high energy using appliances that can be replaced or used more sparingly.[78] The meters not only encourage household energy efficiency, they also minimize the impacts of unplanned outages, enabling quicker restoration of service and isolating affected areas.[79]

**Figure 6: Percent of Vermont Electric Cooperative Customers with Smart Meters[80]**




Vermont ranked 14th out of 41 states and the District of Columbia on the Grid Modernization Index, making it one of the nation's smart grid leaders.[81] The index scored states by three categories for smart grid implementation, customer engagement,

77. *VEC wattWatchers Demo*, VT. ELEC. COOP., http://www.vermontelectric.coop/demo (last visited Apr. 9, 2014).

78. *Benefits of GMP Smart Power*, GREEN MOUNTAIN POWER, http://www.greenmountainpower.com/smart/benefits/?gclid=CIWkzbvm-rcCFXDNOgodZ2sADg#sthash.GHlcyLqp.dpuf (last visited Mar. 23, 2014).

79. *Id.*

80. *VEC's Smart Grid Story*, VERMONT ELECTRIC COOP., http://www.vermontelectric.coop/vecs-smart-grid-story-1 (last visited Apr. 2, 2014).

81. GRIDWISE ALLIANCE & SMART GRID POLICY CENTER, 2013 GRID MODERNIZATION INDEX (2013), *available at* http://www.gridwise.org/documents/GridModernizationIndex_July2013.pdf.

policy, and grid optimization.[82] Vermont tied for 13th place with Maine on customer engagement, tied for second place with Maryland and Delaware for policy, and was ranked fifteenth for grid optimization.[83]

### D. Institutions and Governance

Vermont's success in energy efficiency, renewable energy, and smart grid has been facilitated by a unique institutional and energy governance structure. The state's electricity industry has a distinct regulatory regime. Unlike the rest of New England, Vermont did not restructure its electric system.[84] Green Mountain Power is the major utility, serving almost 80 percent of the state's customers.[85] The rest of the power is provided by two cooperatives and a number of small municipal utilities.[86] However, as Figure 7 below depicts, the industry's design does not resemble a traditional utility system. Transmission in the state is operated by Vermont Electric Power Company (VELCO), which is owned by all of the utilities in the state.[87] The board of VELCO also includes representatives of the Public Interest.[88] This transmission system falls under the jurisdiction of ISO New England, which controls dispatch.[89] Energy efficiency for most utilities (excluding the Burlington Electric Department) is not handled by the utility but rather Efficiency Vermont.[90] The Public Service Board is the chief regulatory body, while the Public Service Department serves as the public advocate in rate and

82. *Id.* at 8-10.

83. *Id.*

84. JOHN KWOKA ET AL., RESTRUCTURING THE U.S. ELECTRIC POWER SECTOR: A REVIEW OF RECENT STUDIES 47 (2006), *available at* http://www.economics.neu.edu /papers/documents/06-005.pdf

85. Alan Panebaker, *Dworkin: Merger Deal Would Give Green Mountain Power Too Much Control Over VELCO*, VTDIGGER.ORG, http://vtdigger.org/2012/01/11/dworkin-merger-deal-would-give-green-mountain-power-too-much-control-over-velco/ (last visited Apr. 2, 2014).

86. *Vermont's Electric System*, VT. PLANNING COMM., http://www.vermontspc.com/Vermonts%20Electric%20System/Forms/AllItems.aspx (last visited Mar. 23, 2014).

87. *Id.*

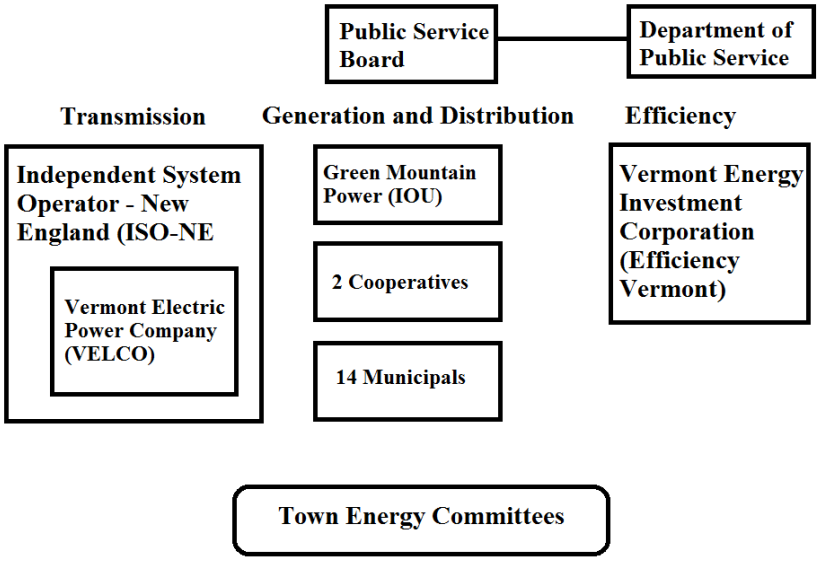
88. *Id.*

89. *Id.*

90. *Id.*

other cases before the board.[91] In additional to the formalized structure, there are over 100 grassroots town energy committees that are focused on implementing renewable energy and energy efficiency projects at the local level.[92]

**Figure 7: Institutional Architecture of Vermont's Electricity System**




Furthermore, Vermont developed a Comprehensive Energy Plan to guide energy policymaking in the state. Mandated by state law (30 V.S.A. § 202a and b), the Comprehensive Energy Plan presents the current "energy situation, projects future energy use and models and recommends energy policies for the

91. *Id.*

92. ENERGY PLANNING & IMPLEMENTATION GUIDEBOOK FOR VERMONT COMMUNITIES, VERMONT NATURAL RES. COUNCIL & VERMONT LEAGUE OF CITIES AND TOWNS 9 (2011), *available at* http://www.vlct.org/assets/Resource/Handbooks/Energy-Planning-Guidebook.pdf.

next 20 years."[93] The first plan was issued in 1998 with a second plan issued in 2011.[94] The plan is written by the Public Service Department with a goal to "outline an energy strategy that is safe, adequate, reliable, secure, sustainable, environmental sound, efficient, and affordable."[95]

Two of the most recent innovations in energy governance are the formation of the climate cabinet in the executive branch and the climate caucus in the legislative branch. These developments are indicative of the close link between climate change and energy policy in Vermont. The climate cabinet was formed at the direction of Governor Shumlin in May 2011 to facilitate the executive branch's actions on climate change and energy.[96] The cabinet is composed of the heads of Vermont agencies that may be able to address or are impacted by climate change, including the Secretaries of Administration, Agriculture Food and Markets, Commerce, and Transportation as well as the Commissioners of the Departments of Economic Development, the Department of Housing and Community Development, the Department of Building and General Services and the Department of Public Service.[97] The chair is held by the Secretary of the Agency of Natural Resources.[98] The Cabinet is focused on supporting the implementation of the state's Comprehensive Energy Plan.[99] The Cabinet has also worked to address the impacts of Tropical Storm Irene, which severely damaged the state in 2011.[100]

93. *Previous Plan: 1998 Comprehensive Energy Plan*, STATE OF VT. PUB. SERV. DEP'T, http://publicservice.vermont.gov/publications/energy_plan/1998_plan (last visited Mar. 23, 2014).

94. *Id.*

95. *Id*.

96. *Gov. Shumlin Announces Formation of the Vermont Climate Cabinet*, VERMONT.GOV (May 17, 2011),
http://governor.vermont.gov/newsroom-climate-cabinet.

97. *Id.*

98. *Id.*

99. *Climate Cabinet*, Vermont Agency of Natural Resources, http://www.anr.state.vt.us/anr/climatechange/ClimateCabinet.html (last visited Mar. 23, 2014).

100. *Id.*

The Vermont Legislature has a similar body called the Climate Caucus.[101] The Climate Caucus is an informal group of legislators that meet for lunch every other week to discuss proposed climate and energy legislation and hear from guest speakers.[102] Both Representatives and Senators attend.[103] The Caucus provides a forum for discussion about legislation in committees and increases coordination within the legislature.[104]

Vermont has a number of specific policies that make its energy governance unique and more effective. Property Assessed Clean Energy (PACE) is a program that enables homeowners to finance home energy improvements through payments tied to their property taxes.[105] If an individual or family sells their home, the financing remains tied to property taxes, helping to ensure that property owners will recover their investments in efficiency improvements.[106] Finally, the Vermont legislature frequently makes use of working groups and task forces to identify how to act.[107]

## IV. HOW DID IT DO IT?: VERMONT'S POLICY ARCHITECTURE

As this section of the study explains, Vermont accomplished all of the benefits mentioned in the previous section through a suite of different policies backed with strong political leadership. As one respondent put it:

> In 2003, [Vermont] issued an Executive Order creating the Climate Neutral Working Group tasked with coordinating, documenting and encouraging efforts to meet Vermont's

101. Stephanie Beland, *Pearson Thinks Climate Change*, THE VERMONT CYNIC (Sept. 27, 2012), http://www.vermontcynic.com/news/pearson-thinks-climate-change-1.2770069#.Uy-FSq2wLPU.

102. *Id.*

103. *Id.*

104. *Id.*

105. *List of PACE Programs*, PACE NOW, http://pacenow.org/resources/all-programs/ (last visited Mar. 23, 2014).

106. *Id.*

107. *See, e.g.*, *Study Committees, Commissions, and Other Working Group*s, VT. STATE LEGISLATURE, http://www.leg.state.vt.us/legdir/comms.cfm?body=X (last visited Mar. 23, 2014).

> greenhouse gas reduction goals. Much of the work we achieved in this area is the product of this initial effort. The state presented its first-ever comprehensive environmental impact and resources management plan in 2004 – setting a goal of reducing government's emissions by 25 percent by 2012. And in 2005, the state created the Governor's Commission on Climate Change to take a much more comprehensive look at the impact of climate change on Vermont, including its impact on public health, natural resources and the economy. Today, Vermont's regional climate change initiatives extend beyond RGGI. Working through the New England Governors and Eastern Canadian Premiers Conference, Vermont committed to the organization's Climate Change Action Plan, which calls for a 10 percent reduction from 1990 levels in greenhouse gas emissions in the region by 2020. We became a charter member of the Climate Registry on May 8, 2007. And in 2010, we again joined with our regional partners by signing onto an effort to develop a Low Carbon Fuel Standard.[108]

Indeed, Table 3 shows 11 major policies going back almost four decades. This section of the article discusses the dynamics of how these different policies worked.

**Table 3: Timeline of Major Energy and Climate Policies in Vermont, 1970 to 2009[109]**

| Year | Policy/Program | Description |
|---|---|---|
| 1970 | Act 250 | Set a progressive land use policy which set restrictions on environmental pollution |
| 1978 | HEAT | Home Energy Audit Teams established |
| 1990 | Energy Efficiency | Public Service Board orders that electric utilities invest in cost effective measures for reducing customers |

108. Anonymous survey response (on file with author).

109. Table compiled by the authors based on their knowledge of Vermont supplemented with anonymous survey responses.

| | | |
|---|---|---|
| | | demand for electricity |
| 1993 | 30 V.S.A. section 235(d) | Vermont Gas Systems begins administering natural gas efficiency programs |
| 1998 | Act 136 | Created state net metering |
| 1999 | Efficiency Vermont | Statewide energy efficiency utility created and initially funded by a public service charge |
| 2003 | Act 69 | Allowed consumers to invest in renewable energy projects |
| 2005 | Act 61 | Established SPEED program, 10-yr transmission planning |
| 2006 | Act 168 | Set energy related greenhouse gas reduction goals |
| 2006 | Act 208 | Expanded net metering and amended SPEED |
| 2009 | Act 45 | Created Vermont's standard offer feed-in tariff |

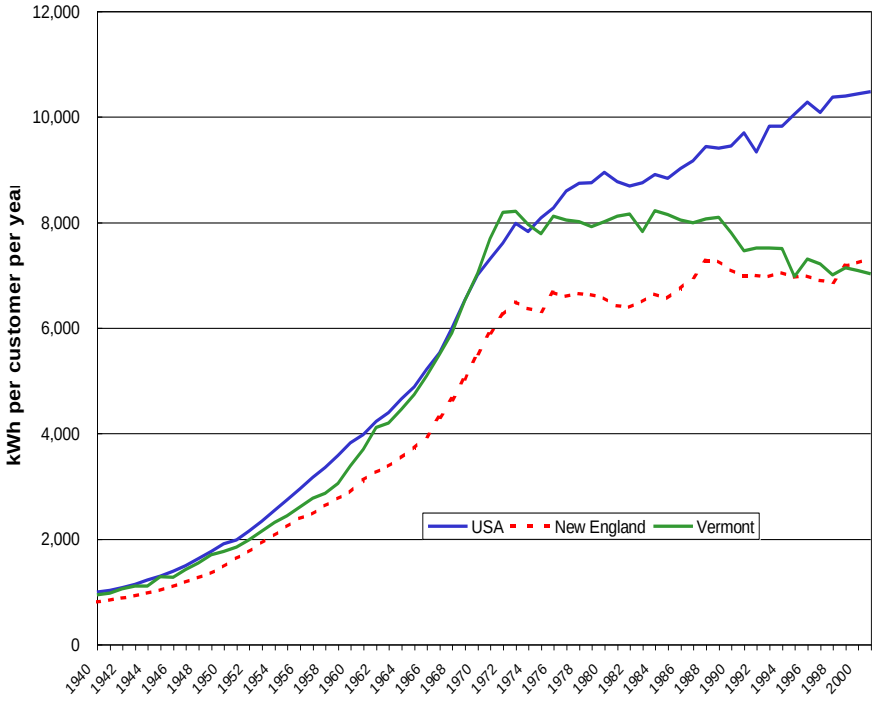
### A. Efficiency

Vermont's energy policies led to a decoupling in growth of its energy use from the rest of New England and the country as a whole (see figure 8). We highlight numerous individual programs that have made a difference in Vermonters' energy use and saved them money in the process.[110]

This section argues that actions in three areas—Efficiency Vermont, residential programs, and commercial/industrial programs—are largely responsible.

110. Some of these policies overlap, for example Efficiency Vermont implements several of them but is listed as its own policy, since it was created through regulation and was appointed by the Vermont Public Service Board.

**Figure 8: Residential Electricity Use in Vermont, 1940-2000**[111]




### a. Efficiency Vermont

The Vermont Public Service Board appointed two entities, an energy efficiency utility and a municipally owned utility, to help consumers save money by investing in energy efficiency measures. The organizations, Efficiency Vermont and the Burlington Electric Department, deliver electricity and heating-and-process-fuel energy efficiency services to Vermont's residential and commercial consumers. Efficiency Vermont's activities cover most of the state and the Burlington Electric Department provides energy efficiency assistance in its service area. During the course of our interviews, all participants had

111. Michael Dworkin, Presentation: Energy Choices for a Balanced Utility System: Three Choices for a State-Wide Energy Trilemma (Mar. 2013).

praise for Efficiency Vermont. One respondent commented that, "Efficiency Vermontis the crown jewel. It is the first efficiency utility in the nation and a model for others."[112]

Efficiency Vermont programs cost the state roughly $41 million dollars in 2012, but provided more than $121 million in total resource benefits.[113] Resource benefits are defined as "the present value of economic benefits resulting from resource saving measures, including avoided costs of electricity, fossil fuels, and water."[114] If we look only at the electricity sector, the total resource benefits of $157.3 million far outweigh the cost of $71.5 million. Indeed, the benefits-to-costs ratio is 2.5 to 1.[115] Efficiency Vermont completed 1,100 whole house energy upgrades, and through their programs, 42,000 households took action to improve efficiency in 2012.[116]

The state has enabled Efficiency Vermont to excel through what one interviewee called a "triangle of excellence," the three points of which are: good policy with clear objectives, a visionary, adaptable and enabling regulatory structure, and a working method for delivering service.[117] Efficiency Vermont uses these principles to move beyond delivering projects. They build markets technology by technology and deliver performance, which can be measured through carefully designed indicators. The Efficiency Vermont approach seeks to enact measures that have lasting impacts, or as aptly put by one executive, policies that do not result in "the tide receding and the water returning to where it was before."[118]

In addition to systems benefits, the Efficiency Utility tracks seven performance indicators: (1) electric savings in megawatt-hours; (2) total resource benefits; (3) summer peak kilowatt (kW)

112. Anonymous survey response (on file with author).

113. EFFICIENCY VERMONT, SAVINGS CLAIMS SUMMARY 2012 (2013), *available at* http://www.efficiencyvermont.com/docs/about_efficiency_vermont/annual_reports/Efficiency-Vermont-2012-Savings-Claim-Summary.pdf.

114. *Id.*

115. *Id.*

116. EFFICIENCY VERMONT, 2012 ANNUAL HIGHLIGHTS (2012), *available at* http://www.efficiencyvermont.com/docs/about_efficiency_vermont/annual_reports/EVT_2012Highlights_FINAL.pdf.

117. Anonymous survey response (on file with author).

118. *Id.*

demand reduction; (4) summer peak kW demand reduction in geographic targeting areas— Susie Wilson Road; (5) summer peak kW demand reduction in geographic targeting areas— Saint Albans; (6) ratio of gross electric benefits to spending; and (7) MMBtu savings.[119] These indicators are central to the performance-based model that several of the interview participants cited as being key to success for the efficiency utility.[120]

### b. Residential and Household Efficiency Policies

The Vermont Residential Building Energy Standard (RBES), 21 V.S.A. § 266, originally applied to all new homes built after July 1, 1998, but was revised in 2011 to apply to new residential construction, including additions, alterations, renovations or repairs.[121] The standards apply to insulation, ducts, programmable thermostats, high efficiency lamps, HVAC installation, and mechanical equipment, among others.[122] The Green Mountain Power Energy Efficiency Fund also has several components, including the EverGreen Fund for K-12 Schools.[123] The benefit-cost ratio for the program was $2.13 for every $1.00 invested from 2008 to 2013.[124]

### c. Commercial & Industrial Policies

Action in the residential sphere is complemented by polices in the commercial and industrial sectors. The state revised its Commercial Building Energy Standard in 2011.[125] Like the residential standards, it applies to all new construction including

119. EFFICIENCY VERMONT, *supra* note 113.

120. *Id.*

121. *Residential Building Energy Standards,* VERMONT PUBLIC SERVICE DEP'T, http://publicservice.vermont.gov/topics/energy_efficiency/rbes (last visited Mar. 23, 2014).

122. *Id.*

123. GREEN MOUNTAIN POWER, GREEN MOUNTAIN POWER ENERGY EFFICIENCY FUND 2013 ANNUAL PLAN (2012), *available at* http://psb.vermont.gov/sites/psb/files/projects/EEU/gmpefficiencyfund/GMP2013AnnualPlanPresentation12-13-2012.pdf.

124. *Id.*

125. VT . STAT. ANN. tit. 21 §268 (2011).

additions, alterations, retrofits, and repairs.[126] The standards regulate building envelope, mechanical equipment, water heating, and electric power and lighting.[127] Under the School Energy Management Program, operated by the Vermont Superintendent's Association, 269 schools between 2005 and 2010 received energy audits. Most visits resulted in an energy report suggesting efficiency programs. In 2010 the Program undertook an evaluation by choosing a sample of ten schools.[128] Among the ten schools surveyed, electricity use was reduced by seventeen percent and fuel use was reduced by eighteen percent. The schools implemented seventy-three percent of the recommended actions.[129] Under a statewide Energy Savings Account program, large energy consumers who pay more than $5,000 per year in energy efficiency charges are permitted to self-administer their energy efficiency programs. The customers can do this by putting up to seventy percent of the energy efficiency charge into an Energy Savings Account (ESA) and use the funds for efficiency projects at their facilities. Customers are required to use the funds within twenty-four months.[130] Lastly, the state has an Energy Leadership Challenge which has attracted sixty-nine of Vermont's large businesses, who are working towards achieving 7.5% energy savings at their facilities.[131]

126. *Commercial Building Energy Standards*, VERMONT PUBLIC SERVICE DEP'T, http://publicservice.vermont.gov/topics/energy_efficiency/cbes (last visited Mar. 23, 2014).

127. 2011 VERMONT COMMERCIAL BUILDING ENERGY STANDARDS, CH. 5: COMMERCIAL ENERGY EFFICIENCY (2011), *available at* http://ecodes.biz/ecodes_support/free_resources/2011vermont/Commercial/PDFs/Chapter%205%20-%20Commercial%20Energy%20Efficiency.pdf.

128. EVALUATION PROJECT REPORT UPDATED AUGUST 2010, VT. SUPERINTENDENTS ASS'N SCHOOL ENERGY MGMT. PROGRAM (2010), available at http://www.vtvsa.org/files/Final%20Report%20PDF.pdf.

129. EVALUATION PROJECT REPORT UPDATED AUGUST 2010, VT. SUPERINTENDENTS ASS'N SCHOOL ENERGY MGMT. PROGRAM (2010), *available at* http://www.vtvsa.org/files/Final%20Report%20PDF.pdf.

130. STATE OF VT. PUB. SERV. BD., ORDER ESTABLISHING AN OPTION FOR CERTAIN BUSINESS CUSTOMERS TO SELF-ADMINISTER ENERGY EFFICIENCY THROUGH THE USE OF AN ENERGY SAVINGS ACCOUNT, *available at* http://psb.vermont.gov/sites/psb/files/ESA_Order.pdf.

131. *About the Energy Leadership Challenge*, EFFICIENCY VERMONT, http://www.efficiencyvermont.com/for_my_business/energy_leadership_challenge/About.aspx (last visited Mar. 23, 2014).

## B. Renewables

As one respondent put it, "Vermont's electricity network is premised on three ideals: carbon-neutrality, having the lowest kWh prices in the northeast U.S, and maintaining a very high reliability index."[132] The development and deployment of renewable energy plays a key role in achieving each of these goals. Vermont's renewable energy leadership first began in response to the energy crisis of the 1970s. The city of Burlington retrofitted a ten MW coal-fired power plant to use wood chips in 1977.[133] The experiment reduced kWh costs from 3 to 2 cents and the utility soon proposed a larger fifty MW plant to meet future demand.[134] A $40 million bond was issued to finance the project. After some controversy, the plant was finally built in 1984, and it served as a model for future woody biomass facilities nationwide.[135] Burlington's use of wood as a renewable energy continues today; one respondent described Burlington plans to build a district heating system based on wood.[136]

This early leadership was followed by a number of successful policies to encourage the adoption of more renewable energy. Essentially, a combination of five programs—a state capital subsidy, a feed-in tariff, a renewable portfolio standard, net metering and interconnection, and tax incentives—continue to push growth in renewable energy.

### a. Small Scale Renewable Energy Incentive Program

Vermont's Small Scale Renewable Energy Incentive Program began in 2003 and provides funding to the residential, commercial, and industrial sector.[137] Eligible technologies include new solar water heating, solar PV, wind, and micro-hydro

132. Anonymous survey response (on file with author).

133. Fredefick Frankena, *Rethinking the Scale of Biomass Energy Conversion Facilities: The Case of Wood-Electric Power*, 14 BIOMASS 149-71 (1987).

134. *Id.*

135. *Site Data*, CITY OF BURLINGTON, http://www.burlingtonvt.gov/CEDO/Site-Data (last visited Mar. 23, 2014).

136. Anonymous survey response (on file with author).

137. *Vermont: Incentives/Policies for Renewables & Efficiency*, DATABASE OF STATE INITIATIVES FOR RENEWABLES & EFFICIENCY, http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=VT17F (last visited Mar. 23, 2014).

installations.[138] The Program is now in its seventh round of financing; applicants must use pre-approved installers to be eligible for the funding.[139] Interestingly, the Program has been funded from multiple sources, including the Clean Energy Development Fund, Central Vermont Public Service, Green Mountain Power, U.S. Department of Energy, Vermont Public Service Department, and the American Recovery and Reinvestment Act (stimulus bill).[140] Overall, the Program has supported the installation of 3,111 systems between 2003 and early 2013. The Program has paid out $14.3 million in incentives, covering approximately 16.5% of system costs.[141] Importantly, the cost per kWh for systems installed under the program has dropped significantly over the program's life (see Figure 9).

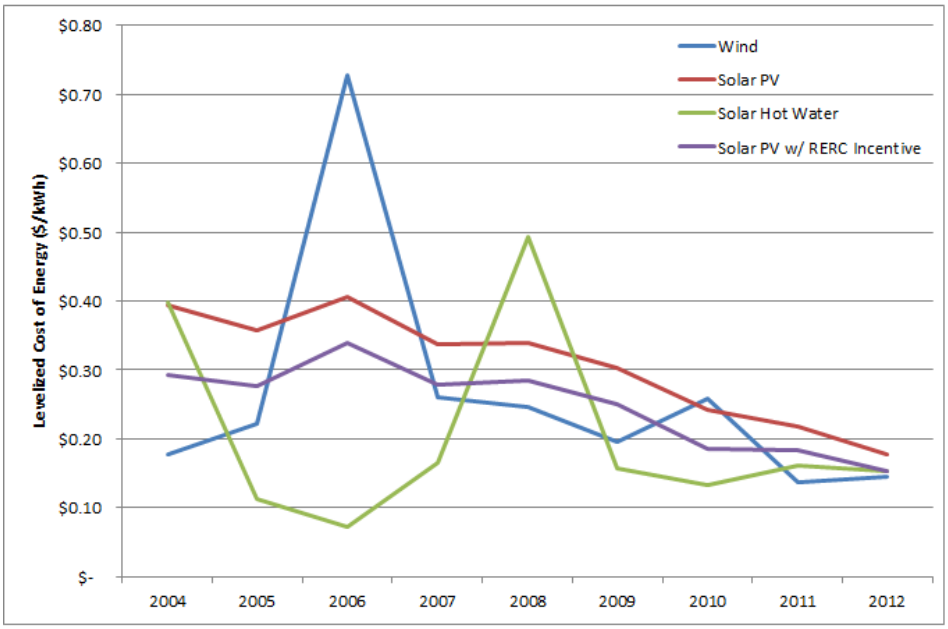
138. *Id.*

139. *Id.*

140. *Incentives: General Information*, THE RENEWABLE ENERGY RESOURCE CTR., http://rerc-vt.org/incentives/index.htm (last visited Mar. 23, 2014).

141. *Incentives: Progress Reports*, THE RENEWABLE ENERGY RES. CTR., http://www.rerc-vt.org/incentives-program/progress-reports (last visited Mar. 23, 2014).

**Figure 9. Average Cost per KWh for Systems Receiving Small Scale Renewable Energy Incentive[142]**




### b. Feed-in tariff

In May 2009, Vermont became the first state in the United States to establish a "feed-in tariff" (FIT).[143] Called the Standard Offer program, the tariff requires that all retail electricity providers purchase electricity generated by eligible renewable energy facilities.[144] The term "standard offer" refers to the fixed price, long-term contracts for electricity.[145] Eligible facilities include solar, landfill gas, wind, biomass, hydroelectric, and farm methane facilities.[146] Individual projects are capped at 2.2 MW and the overall program is capped at 127.5 MW, up from an

142. THE RENEWABLE ENERGY RES. CTR., http://www.rerc-vt.org/incentives/reports (last visited Jul. 24, 2013).

143. *Standard Offer Program Summary,* VERMONTSPEED, http://vermontspeed.com/standard-offer-program/ (last visited Mar. 23, 2014).

144. *Id.*

145. *Id.*

146. *Id.*

original fifty MW.[147] Contract lengths vary, with 10 to 25 years for solar, and 10 to 20 years for all other technologies. Current rates range from $90 to $271.[148]

Like other energy legislation in Vermont, the program has changed and been adjusted over time. One respondent described how the standard offer posed challenges because Vermont was the first state to enact it.[149] The offer, although similar to other FITs, has some important differences. According to one respondent, "unfortunately, we were not able to do a pure FIT because of concerns over potential rate impacts."[150] With limited experience, the tariff was designed on a first come, first serve basis. This approach did not account for the economic competitiveness of different projects and has since been replaced with an auction style system. Overall, the standard offer has increased renewable energy; one respondent credited the standard offer with increasing distributed generation in particular.[151] However, other respondents, expressed concern about rate impacts.[152] Another respondent noted that the standard offer, along with other renewable energy policies, is increasing renewable energy generation but is not addressing grid integration issues.[153]

### c. Sustainably Priced Energy Development Program

While the standard offer is noted for incentivizing smaller projects, Vermont's Sustainably Priced Energy Development (SPEED) Program encourages the development of utility scale projects. Unlike most states that now have mandatory renewable portfolio standards (RPSs) requiring a certain amount of renewable electricity generation, the SPEED program itself is not a renewable portfolio goal or standard. Rather, it encourages the state's utilities to enter into long-term contracts for renewable

147. *Id.*
148. *Id.*
149. Anonymous survey response (on file with author).
150. *Id.*
151. *Id.*
152. *Id.*
153. *Id.*

generation.[154] The program aims to have twenty percent of the total statewide electric retail sales coming from SPEED resources by 2017.[155] If this goal is not met, the Public Service Board can make the program into a binding RPS.[156] Utilities do not have to surrender the Renewable Energy Certificates under SPEED and are therefore able to sell them out of state to meet other states' RPS requirements.[157]

### d. Net Metering and Interconnection

Vermont was one of the first states to enact a net metering policy in 1998.[158] Under net metering, a customer may install a renewable energy system on their property; when they produce more electricity than they consume, the meter rolls backwards, reducing the cost of their electric bills as the customer receives a credit for excess electricity. Net metering is available for most systems up to 500 kW.[159] Accompanying net metering are interconnection standards that guide the connection of new systems with the grid. Asked about the net metering policy, one respondent replied, "We were a model for the other states and now it has become the norm in the rest of the country."[160] The net metering policy has been expanded and adjusted several times. An original program cap of two percent of utility peak demand was increased to four percent, allowing more systems.[161] Groups of individuals can now collectively purchase and own a net metered system, even if it is not on their property.[162] One respondent noted that net metering is "a model for how we have

154. *Vermont's Transition to Renewable Energy*, VERMONTSPEED, http://vermontspeed.com (last visited Oct. 25, 2013).

155. *Id.*

156. VT. STAT. ANN. tit. 30 §§ 8001-8005 (2012).

157. *Vermont's Transition to Renewable Energy*, *supra* note 154.

158. *Vermont: Incentives/Policies for Renewables & Efficiency*, DATABASE OF STATE INITIATIVES FOR RENEWABLES & EFFICIENCY, http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=VT02R.

159. VT. STAT. ANN. tit. 30 § 219a (2012).

160. Anonymous survey response (on file with author).

161. VT. STAT. ANN. tit. 30 § 219a (2012).

162. *Id.*

approached other policies. Innovate, see how it works and adjust to encourage more RE and just to improve the system overall."[163]

#### e. Tax Incentives

In addition to the standard offer, net metering, and SPEED, Vermont offers certain tax incentives to encourage the development of renewable energy. From 2011 to 2016, the state is offering a 2.4 to 7.2% investment tax credit for businesses that install certain renewable energy systems.[164] Statewide, solar PV systems under ten kW are exempt from property taxes, while larger systems are assessed a low, uniform rate.[165] The state also offers a sales tax exemption (currently six percent) for the purchase of renewable systems under 250 kW.[166] High tech businesses involved in alternative fuel or electric vehicles have a number of different tax credits to choose from.[167] More recently, the legislature passed a uniform renewable energy taxation system that ensured uniformity in how towns can assess taxes on renewable energy systems.

### C. Smart Grid

Vermont has emerged as a leader in smart grid deployment ever since it was awarded $69 million in American Reinvestment and Recovery Act (ARRA) funds in 2009.[168] Local and regional utilities matched the $69 million and have used the total amount

163. Anonymous survey response (on file with author).

164. AM. COUNCIL ON RENEWABLE ENERGY, RENEWABLE ENERGY IN VERMONT 2 (2012), *available at* http://www.acore.org/files/pdfs/states/Vermont.pdf.

165. VT. STAT. ANN. tit. 32 § 8701 (2012).

166. *Id.* § 9741.

167. *Vermont Laws and Incentives*, U.S. DEP'T OF ENERGY, http://www.afdc.energy.gov/laws/laws/VT (last updated Nov. 12, 2013).

168. Energy experts have long argued that the US electric grid is antiquated and that the modern economy needs a system that takes advantage of new technologies, especially from the IT sector. They envision a grid that enables information to flow two ways, from customer to utility and from utility to customer. This new grid will also enable better integration of intermittent energy sources like solar and wind. It will provide information to customers allowing them to make decisions in real time about their energy use, and will automate many of the utility's maintenance and operations procedures. A grid that can do some or all of these things is considered to be a smart grid.

to provide smart meters to virtually every home in the state.[169] The state's program, known as eEnergy Vermont, has four primary goals:[170]

1. Deploying smart meters to over ninety percent of Vermont premises,
2. Pilotingthe use ofin-home devices for communicating and controlling consumer energy patterns,
3. Studying dynamic rate structures enabled by smart meter technology, and
4. Deploying automated controls to the grid and substations.

The first two of these goals have already been achieved, with the latter two goals being targeted for completion in 2013. The Smart Grid systemhas already improved utilities' ability to resolve outages more quickly with fewer resources.[171]

## D. Institutions and Governance

Although the institutional architecture of Vermont's electricity industry developed over time, we believe that six factors account for the state's commitment to efficiency, renewables, and the smart grid: creating a stand-alone energy efficiency utility, relying on cooperatives, having a comprehensive energy plan, promoting town energy committees, tying efficiency improvements to peoples' property, and managing different task forces and working groups.

### a. An Independent Efficiency Utility

Very few states have efficiency directed by a separate utility; however, one respondent noted that "I think Efficiency Vermont's model of putting all the efficiency programs under direction of

169. CHRISTOPHER KOLIBA ET AL., VERMONT-SANDIA PARTNERSHIP, THE EENERGY VERMONT COLLABORATIVE: BRINGING THE SMART GRID TO THE STATE OF VERMONT (2013), *available at* http://www.uvm.edu/~jeffords/reports/pdfs/The%20eEnergy%20Vermont%20Collaborative.pdf.

170. *eEnergy Vermont*, PUB. SERV. DEP'T STATE OF VT., http://publicservice.vermont.gov/topics/electric/smart_grid/eenergyvt (last visited Apr. 2, 2014).

171. *Id.*

single agency that doesn't have a vested interest in selling energy is critical."[172] Removing utilities from the equation makes energy efficiency easier to develop, as does having an entity committed to developing a robust industry.

### b. Electric Cooperatives

Similarly, Vermont's two electricity cooperative utilities have different incentives than traditional Investor Owned Utilities (IOU). One respondent believed that because IOUs are trying to get a return on investment, "there is a big incentive for them to build out."[173] Cooperatives, on the other hand, "are more sensitive to rates than IOUs."[174] This fundamental difference in motivation leads to differences in implementation, with benefits for consumers. For example, Vermont Electric Cooperative often beats the state's other utilities, in terms of outages and keeping rates low, despite having fewer customers per mile.[175] The coop's customer base recognizes these benefits and support their cooperative; competition for board seats has increased along with coop voter participation. [176]

### c. Comprehensive Energy Plan

Vermont's Comprehensive Energy Plan was mandated by state law, which directs the Public Service Board to undertake extensive energy planning every decade. The plan includes stakeholder and public input.[177] The most recent plan had five public hearings and received more than 9,000 written comments during two comment periods from various municipal, business, non-profit entities, and individuals.[178] One respondent stated that "one of Vermont's advantages has been community

172. Anonymous survey response (on file with author).
173. *Id.*
174. *Id.*
175. *Id.*
176. *Id.*
177. *Current Plan: 2011 Comprehensive Energy Plan*, VERMONT PUBLIC SERVICE DEP'T, http://publicservice.vermont.gov/publications/energy_plan/2011_plan (last visited Mar. 23, 2014).
178. *Id.*

leadership and development of far reaching visions that are brought in by the process" of conducting the Comprehensive Energy Plan.[179] However, another respondent noted that generally, the state suffers from a lack of planning with the energy plan being the exception to the rule.[180] The respondent continued, "even then we have this really thoughtful plan that is all goals but no action."[181]

### d. Town Energy Committees

The emergence of Town Energy Committees did not arise from any single actor, but rather, grassroots activism at a local level. Emerging in the early 2000's, several nonprofits worked to coordinate and empower committees to enact projects.[182] As one respondent described, "the general idea of energy committees is feeding existing programs to a volunteer community at the local level who can then implement projects at that level."[183] The success of each committee varies, largely depending on the level of commitment and activism of its members. Some committees have very active members and small financial resources, while others have limited volunteer capacity. Today, there are over 100 energy committees, which is an impressive number since Vermont only has 251 towns.[184] According to one respondent, "they have become more of a force in terms of people and lawmakers turning to them as a resource not just for projects being implemented on the ground, but as a source of policy."[185] Although the Town Energy Committees are still emerging and organizing themselves, another respondent believed that "with time they will become more and more effective."[186]

179. Anonymous survey response (on file with author).
180. *Id.*
181. *Id.*
182. *See generally*, VT. ENERGY & CLIMATE ACTION NETWORK, http://www.vecan.net/ (last visited Apr. 2, 2014).
183. Anonymous survey response (on file with author).
184. *Energy Committes*, VT. ENERGY & CLIMATE ACTION NETWORK, http://www.vecan.net/energy-committees/ (last visited Apr. 2, 2014).
185. Anonymous survey response (on file with author).
186. *Id.*

### e. Property Assessed Clean Energy (PACE)

Vermont was one of the first states to deploy Property Assessed Clean Energy (PACE) programs, which attempt to address the challenge of insufficient capital for energy upgrades. Property owners that do not have sufficient cash to offer an upfront investment may struggle to obtain financing with easy qualification, an attractive interest rate, and a relatively long repayment term. Tying the repayment of an energy investment to property taxes can reduce investor risk and increases the availability of credit. According to one respondent, passing PACE legislation was relatively easy; the major challenge was finding financing.[187] Some financial institutions insisted on tying the financing to the mortgage instead of to property taxes.[188] However, despite initial challenges finding capital, the program's implementer (Efficiency Vermont) recently received a commitment from a lending institution for up to $1 million for PACE projects and is seeking more.[189] The desire to participate is high. By the end of 2012, 34 towns had voted to become PACE districts[190] and 26 had executed implementation agreements.[191]

### f. Taskforces and Working Groups

A final aspect of Vermont's energy governance is the use of taskforces and working groups to guide energy policy. The Thermal Efficiency Taskforce was created by the Public Service Department to determine how to approach thermal energy efficiency in Vermont.[192] Efficiency Vermont's programs to date have largely focused on electric efficiency. However, Vermont

187. *Id.*

188. *Id.*

189. Joe Banner Baird, *Vermont's 'PACE' Quickens Affordable Energy Upgrades*, BURLINGTON FREE PRESS, Oct. 15, 2013, http://www.burlingtonfreepress.com/article/20131015/NEWS07/310150039/Vermont-s-PACE-quickens-affordable-energy-upgrades.

190. VT. PUB. SERV. DEP'T, COMMERCIAL PACE 9 (PROPERTY ASSESSED CLEAN ENERGY) STUDY (2013), *available at* http://www.leg.state.vt.us/reports/2013ExternalReports/285688.pdf.

191. Anonymous survey response (on file with author).

192. *Thermal Efficiency Taskforce*, STATE OF VT. PUB. SERV. DEP'T, http://publicservice.vermont.gov/topics/energy_efficiency/tetf (last visited Apr. 2, 2014).

uses large amounts of fuel oil for heating.[193] The Taskforce compiled a report that it issued to the legislature to guide any future legislation.[194] Similarly, the Building Energy Disclosure Working Group was statutorily created to address the disclosure of energy efficiency of buildings.[195] The goal is to figure out how to make building energy performance information available to potential lessees and purchasers.[196]

## V. WHAT STANDS IN THE WAY?: CHALLENGES AND CAVEATS

Though we believe that Vermont's many accomplishments in energy policy can be replicated, there are at least six factors that partially limit the replicability of its policies and programs: its small population and liberal political system, its rural non-industrialized economy, rising affordability concerns, how it sells renewable energy credits, the situation with electricity trading, and the continued carbon intensity of its transportation sector.

### A. Population and Politics

The most unique element of Vermont—one difficult to copy or transplant elsewhere—is its small population base coupled with its "green" or "liberal" political ideals. The state's population of about 600,000 people is roughly the size of Denver, Colorado. Vermont's largest city, Burlington, has only 42,000 people.[197] Montpelier, the capitol, is the smallest in the country.[198]

193. THERMAL EFFICIENCY TASK FORCE, MEETING THE THERMAL EFFICIENCY GOALS FOR VERMONT BUILDINGS 5 (2013), *available at* http://publicservice.vermont.gov/sites/psd/files/Topics/Energy_Efficiency/TETF/TETF%20Report%20to%20the%20Legislature_FINAL_1_15_13_2.pdf.

194. *Id.*

195. WORKING GRP. ON BUILDING ENERGY DISCLOSURE, LEGISLATIVE REPORT (2011), *available at* http://www.leg.state.vt.us/reports/2012ExternalReports/274427.pdf.

196. *Id.*

197. *State and County Quick Facts: Burlington, Vermont*, U.S. CENSUS BUREAU, http://quickfacts.census.gov/qfd/states/50/5010675.html (last visited Apr. 3, 2014).

198. VINCE BOLDUC & HERB KESSEL, CTR. FOR SOC. SCI. RESEARCH AT SAINT MICHAEL'S COLLEGE, VERMONT IN TRANSITION: A SUMMARY OF SOCIAL ECONOMIC AND ENVIRONMENTAL TRENDS (2008), *available at* http://vtrural.org/

Montpelier is home to less than 10,000 people[199] and lacks even a Starbucks or a McDonalds. Out of 246 towns in Vermont, only nine are cities.[200] As one respondent stated, "[w]e are lucky in Vermont, because it's a small place where everybody knows each other."[201] Or, as another bluntly expressed, "we are a small state and I can't see of anything we have done that anybody would be looking to copy. People think that everybody will pay attention to us, when nobody does."[202]

From an ethnic standpoint, the state is 95.4% "white" but politically liberal and progressive.[203] One study declared that Vermont is "snugly cocooned from the fractious rhythms of the republic."[204] One of our respondents agreed, noting that "Vermont is politically unique. . . . We have a citizen led legislature, so some of these things make it possible to advance the kind of clean energy policies we have seen."[205] Conservatives tend to gravitate towards New Hampshire, attracted to its small tax rate and its "live free or die mentality," where Vermont often attracts "young, left-leaning and outdoors-loving professionals."[206] In the 2008 Presidential election, for instance, the state was a "democratic stronghold"—as figure 10 reveals, it was all "blue."[207] President Obama won every county in 2008 as

sites/default/files/content/futureofvermont/documents/VTTransitions_Full_noAppen.pdf.

199. *State and County Quick Facts: Montpelier, Vermont*, U.S. CENSUS BUREAU, http://quickfacts.census.gov/qfd/states/50/5046000.html (last visited Apr. 3, 2014).

200. BOLDUC & KESSEL, *supra* note 198, at 41.

201. Anonymous survey response (on file with author).

202. *Id.*

203. *State and County Quick Facts: Vermont*, U.S. CENSUS BUREAU, http://quickfacts.census.gov/qfd/states/50000.html (last visited Apr. 3, 2014).

204. Robert M. Vanderbeck, *Vermont and the Imaginative Geographies of American Whiteness*, 96 ANNALS OF THE ASSOC. OF AM. GEOGRAPHERS 641-59 (2006).

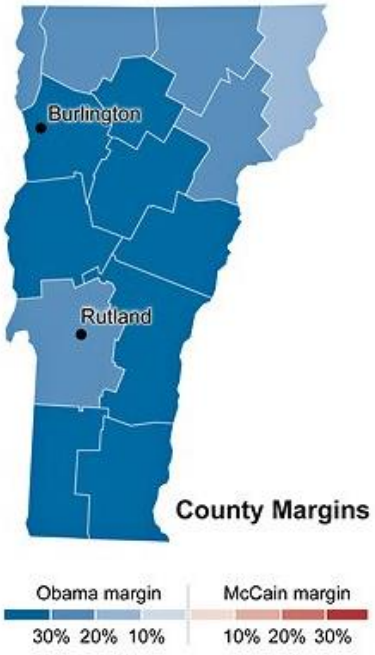
205. Anonymous survey response (on file with author).

206. Micah Cohen,*'New' Vermont Is Liberal, but 'Old' Vermont Is Still There,* N.Y. TIMES FIVETHIRTYEIGHT BLOG (Oct. 1, 2012, 2:31 PM), http://fivethirtyeight.blogs.nytimes.com/2012/10/01/new-vermont-is-liberal-but-old-vermont-is-still-there/?_r=0.

207. *Id.*

well as all but four towns.[208] President Obama's margins in Vermont were greater than any other state.

**Figure 10: 2008 Presidential Election Results for Vermont (by political party)[209]**




## B. Rural, Non-Industrialized Economy

A second factor separating Vermont from other states and countries is its rural, non-industrialized economy. Out of a labor force of 337,000, only 32,000 employees work in the manufacturing sector.[210] Major areas of economic activity include dairy farming, greenhouse and nursery products, and tourism and light mining for stone, sand, gravel, talc, marble, and

208. *Id.*
209. *Id.*
210. *Economy at a Glance: Vermont*, U.S. DEP'T OF LABOR, BUREAU OF LABOR STATS., http://www.bls.gov/eag/eag.vt.htm (last visited Mar. 23, 2014).

granite.[211] Three-quarters of Vermonters are employed in service sectors such as management, financial operations, and sales.[212] Only nine private sector establishments have more than 1,000 workers. Seventy-eight percent of establishments employ ten or fewer workers and the state's gross domestic product is the smallest in the country (at around $24.5 billion in 2007).[213] These elements cultivate a special set of values perhaps not seen elsewhere. As one respondent commented, "we are infused around an ethic of conservation and efficiency, self-sufficiency and frugality."[214] While efficiency plays a major role in this relatively low consumption, Vermont is also helped by low air conditioning demand due to its northern climate and by low use of electric heating.[215]

## C. Affordability

The slew of energy and climate programs mentioned above has created a complex regulatory environment with much bureaucracy. As a result, one respondent noted that "whenever you have a lot of process for a very small state you can make things more costly for customers; Vermont could be more nimble by incorporating people into the process without as much regulation."[216] Although Vermont has the lowest rates in New England for electricity, it is still ranked among the highest eleven states in the nation; electricity prices are about 16 percent higher than the national average.[217] Vermont's prices have recently increased substantially; in October 2012, the EIA reported Vermont's electricity prices had risen 6.8 percent from a year

211. THE COLUMBIA ELECTRONIC ENCYCLOPEDIA, VERMONT; ECONOMY (6th ed. 2012) *available at* http://www.infoplease.com/encyclopedia/us/vermont-economy.html#ixzz2XilOLpAc.

212. *See* VERMONT DEP'T OF LABOR, CURRENT EMPLOYMENT STATISTICS (2014), *available at* http://www.vtlmi.info/ces.pdf.

213. BOLDUC & KESSEL, *supra* note 198, at 41.

214. Anonymous survey response (on file with author).

215. *Profile Analysis*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/state/analysis.cfm?sid=VT (last visited Mar. 25, 2014).

216. Anonymous survey response (on file with author).

217. Richard Handelsman, *My Turn: Truths, Half-truths About Energy*, BURLINGTON FREE PRESS, Dec. 1, 2008.

before.[218] This increase was greater than any state east of the Mississippi.[219] The price increase has led some to question whether Vermont's policies are really affordable to customers, especially low-income households. One commentator even argued that, due to rising heating, gasoline, and electricity prices, Vermont has the "worst affordability gap nationwide."[220] The implication isn't just that people have trouble paying energy bills, but also that regulators now have what one respondent called "little stomach" for further rate increases.[221] As regulators stated, "to be really blunt . . . our appetite for making big goals has not met with an appetite to fund them."[222]

### D. Renewable Energy Credits

Vermont allows the unbundling of renewable energy credits (RECS) from electricity generation, which means that electrons can flow to one party but the green "credit" for them can go to another.[223] In most other states, these RECs are used for compliance with a Renewable Portfolio Standard. To demonstrate compliance, a utility must acquire and retire a sufficient number of RECs. Vermont's SPEED program, a voluntary RPS, does not require utilities to retire the RECs – they can sell the RECs to out-of-state entities to meet their RPS requirements.[224] This has generated considerable controversy. One respondent argued that Vermont has the "most fundamentally flawed renewable energy program in the

218. Guy Page, *Energy Policy is Key to Vermont's Future*, VTDIGGER (Jan. 13, 2013), http://vtdigger.org/2013/01/07/page-energy-policy-is-key-to-vermonts-future/.

219. *Id.*

220. Jim Coutts, *My Turn: Vermont's Energy Support Program is Long Overdue*, BURLINGTON FREE PRESS, June 28, 2009, at 7B.

221. Anonymous survey response (on file with author).

222. *Id.*

223. ED HOLT, RENEWABLE ENERGY CERTIFICATES AND GENERATION ATTRIBUTES (2003), *available at* http://raponline.org/docs/RAP_Holt_IssuesLetter-RenewableEnergyCertificatesAndAttributes_2003_05.pdf.

224. *Vermont Standard Offer for Qualifying Speed Resources*, ENERGY.GOV, http://energy.gov/savings/vermont-standard-offer-qualifying-speed-resources (last visited Apr. 8, 2014).

country."[225] As the RECs are sold to meet out-of-state renewable standards, Vermont does not actually have the "green" benefits of renewable power. One of our respondents further emphasized this point when they declared that the state has "brown power policies that are funded through what are essentially regressive rate policies."[226]

However, another respondent disagreed by stating, "SPEED has been a boon for Vermont rate payers because they have been able to pay for the infrastructure without the costs."[227] Instead, Vermont builds instate renewable generation and funds it through ratepayers in other states, who bear the financial burden of the RECs. Other states have reacted to this; Connecticut recently passed a law that does not allow double counted RECs to count for their RPS.[228] Another respondent declared "we all knew it was going to come to an end; it was good because we made money for a while."[229] Nevertheless, the respondent also noted "I don't feel comfortable with the program because I don't think it is honest or transparent."[230]

### E. Electricity Trading

One of the largest peculiarities about Vermont's energy system is the import of electricity from Hydro Quebec and the export of electricity from Vermont Yankee. Vermont gets approximately one third of its electricity from Hydro Quebec as a result of long-term contracts.[231] These contracts have been the subject of considerable controversy. Under these contracts,

225. Robert Maynard, *Vermont's "Fundamentally Flawed" Renewable Energy Program*, TRUE NORTH REPORTS.COM (April 1, 2013), http://truenorthreports.com/vermonts-fundamentally-flawed-renewable-energy-program#sthash.OlkOnnlI.dpuf.

226. Anonymous survey response (on file with author).

227. *Id.*

228. Jon Margolis, *Connecticut Law Exposes Vermont's Duplicity on Energy Credits*, VTDIGGER (June 18, 2013), http://vtdigger.org/2013/06/18/margolis-connecticut-law-exposes-vermonts-duplicity-on-energy-credits/.

229. Anonymous survey response (on file with author).

230. *Id.*

231. Bob Kinzel, *Shumlin Explores More Power From Hydro Quebec*, VPR (Sept. 9, 2013, 5:29 PM), http://digital.vpr.net/post/shumlin-explores-more-power-hydro-quebec.

utilities will lock in rates that are occasionally above market prices.[232] The amount of electricity obtained through these contracts poses challenges when these contracts end or are up for renewal.[233] Although Vermont could go to the wholesale power market, doing so would likely end up increasing use of out of state fossil fuels and increase the state's electricity related emissions.[234] One respondent claimed that long term contracts with Hydro Quebec were one of Vermont's greatest accomplishments, partly due to its emission free nature.[235] Similarly interesting is the status of the 620 MW Vermont Yankee nuclear power plant, which is the only one in Vermont.[236] For years, Vermont Yankee was a large source of electricity until the legislature intervened and tried to close the power plant.[237] Thus far, the effort has been unsuccessful.[238] For now, Vermont Yankee continues to operate but sells electricity out-of-state on the wholesale market. As one respondent stated, "we are xenophobic about building our own resources," implying that interstate and international trade in electricity play a distinctive role in Vermont's energy landscape.[239]

### F. Transportation

A final and arguably a glaring issue is the state's transportation policy. The sparsely populated state is one of the most "automobile dependent" in the nation, with the typical Vermonter using 545 gallons of gasoline per year, compared to

232. Anonymous survey response (on file with author).

233. *Id.*

234. *Id.*

235. *Id.*

236. *Vermont Nuclear Profile*, U.S. ENERGY INFO. ADMIN, http://www.eia.gov/nuclear/state/2008/vermont/vt.html (last updated September 2010).

237. Matthew L. Wald, *Appeals Court Blocks Attempt by Vermont to Close a Nuclear Plant*, N.Y. Times (Aug. 14, 2013), http://www.nytimes.com/2013/08/15/business/energy-environment/appeals-court-blocks-attempt-by-vermont-to-close-a-nuclear-plant.html.

238. *Id.*

239. Anonymous survey response (on file with author).

Manhattan residents, which average roughly 90 gallons.[240] While the electric power sector only accounted for 0.1% of the State's carbon emissions in 2010, transportation's share of emissions was 58.7%, which predominantly stemmed from petroleum.[241] Moreover, as Figure 11 shows, transportation is by far the largest sector of energy consumption.[242] As a result, one respondent confirmed that the state's transportation policy "trips all over" its efficiency and electricity goals.[243] Another noted that Vermont's dependency on fossil fuels for heating oil and transportation removes "$1 billion per year from the economy."[244] Transportation therefore remains somewhat of an anomaly compared to the progress the state has made in other sectors.

240. *See generally*, Bill Morris, *What's the Greenest Place in America? Hint: It Has 8 Million People*, AOL NEWS (Dec. 4, 2009), http://www.aolnews.com/2009/12/04/whats-the-greenest-place-in-america-hint-it-has-8-million-peo/.

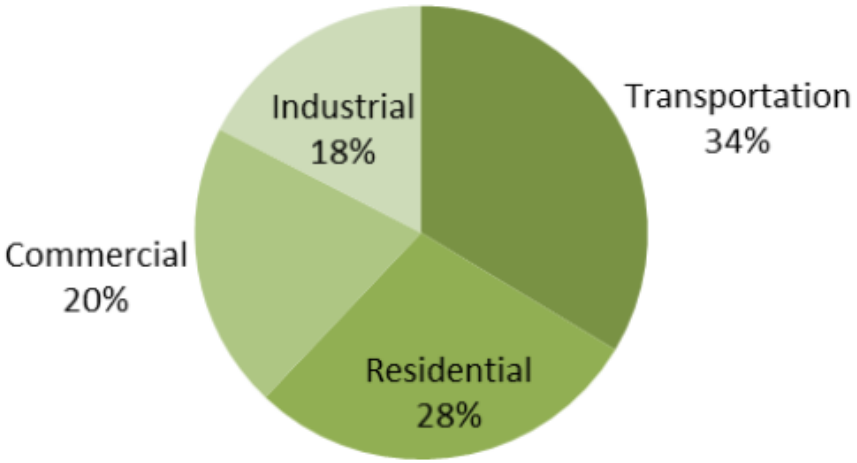
241. U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2012 WITH PROJECTIONS TO 2035 2 (2012), *available at* http://www.eia.gov/forecasts/aeo/pdf/0383(2012).pdf.

242. Karen Glitman, Address at the 2013 Energy Action Seminar: A Second Renaissance? Renewable Energy and Transportation, Oct. 14, 2013, *available at* http://www.uvm.edu/sustain/cef/cef-projects/2013energy-action-seminar.

243. Anonymous survey response (on file with author).

244. *Id.*

**Figure 11: Vermont Energy Use by Sector, in 2008**[245]




## VI. WHAT IS REPLICABLE? LESSONS FOR OTHER STATES AND COUNTRIES

Despite these challenges, we believe that six items are replicable beyond Vermont: least-cost planning that includes externalities, mandatory efficiency requirements, decoupling revenues from sales, geographic targeting, the state's emphasis on evaluation and verification, and stakeholder involvement.

### A. Least-Cost Planning and Externalities

One central lesson is that externalities must be included in energy prices. Vermont has least cost integrated planning that includes externalities.[246] A "least cost integrated plan" for a regulated electric or gas utility is a plan for meeting the public's need for energy services, after safety concerns are addressed, at the lowest net present value life cycle cost, including environmental and economic costs.[247] This inclusion of

245. Glitman, *supra* note 242.

246. Dworkin, *supra* note 111.

247. JEFF ASLAN, VERMONT ENERGY INVESTMENT CORP., LEAST COST INTEGRATED PLANNING IN VERMONT, *available at* http://psb.vermont.gov/sites/psb/files/

externalities is exceptional, since it means that energy prices attempt to account for social and environmental costs often excluded from consumers' bills. This emphasis on externalities may explain why Vermont places such an emphasis on meeting energy demand through a strategy of renewables, efficiency, and transmission upgrades.

### B. Mandatory Requirements

A second lesson from Vermont is that energy efficiency efforts should not be voluntary, but rather statutory and fully funded. In Vermont, energy providers are "required to meet the need for present and future demand for service which could not otherwise be provided in a more cost effective manner through energy conservation programs and measures and energy-efficiency and load management."[248] One respondent noted that the state uses its proceeds from selling carbon allowances under the RGGI program on efficiency programs.[249] Efficiency Vermont's funding is also "non-bypassable" through a mandatory "energy efficiency charge" (EEC) that is included in electric rates.[250] This implies that energy efficiency won't happen by itself; it needs strong regulations and policies to reach fruition.

### C. Decoupling Revenues from Sales

Vermont demonstrates the necessity of decoupling electricity and natural gas revenues from sales so that actors have an increased incentive to encourage energy efficiency. Traditional electricity ratemaking couples revenues with sales: a higher sale of energy leads to higher revenues for the utility and, therefore, higher profits and returns for investors. This creates a strong incentive *against* energy efficiency, which is logically seen as threatening profit since it reduces the amount of energy sold.

publications/Reports%20to%20legislature/EEU/Act89Sec29Report/Vermont%20Least-Cost%20Integrated%20Planning%20February%202013%20(2).pdf.

248. VT. STAT. ANN. tit. 30 § 248(b)(2) (2012).

249. Anonymous survey response (on file with author).

250. *State Energy Efficiency Policy Database*, AM. COUNCIL FOR AN ENERGY EFFICIENT ECON., http://aceee.org/sector/state-policy/vermont (last visited Mar. 23, 2014).

When state regulators encourage "decoupling," they separate utilities' sales from their revenues and profits. This is precisely what Vermont has done. Green Mountain Power's Alternative Regulation Plan, for instance, and Alternative Regulation Plan for Vermont Gas Systems, implemented revenue-per-customer decoupling, in 2006.[251]

### D. Geographic Targeting

Vermont does not implement energy efficiency efforts at the same scale and scope across the state. Instead, it targets specific geographic regions to maximize returns on investment and to reach the communities that are most in need. For instance, the Vermont Public Service Board has specifically targeted two communities for efficiency improvements for 2012 to 2014: St. Albans (home to 1,100 commercial/industrial accounts and 5,900 residential accounts), and Essex Junction and Colchester (home to 700 commercial/industrial accounts and 4,800 residential accounts).[252] Both regions are located in parts of the state where the transmission and distribution network is the weakest—it is at or near capacity, or has substations that need to be upgraded—and where energy prices have risen significantly.[253] The state has "enhanced" energy efficiency services for these areas through individualized account management strategies with a targeted focus on coincident summer peak demand reduction for the largest commercial and industrial customers, greater cost sharing of energy audits, special campaigns and promotions for certain technology replacements, and greater financial incentives and technical support to identify and implement measures that maximize coincident summer peak kW reduction.[254] Although

251. *See Alternative Regulation*, GREEN MOUNTAIN POWER, http://www.greenmountainpower.com/alternative-regulations/ (last visited Apr. 3, 2014); *Vermont Gas System's Proposed Renewal of Its Alternative Regulation Plan*, STATE OF VT. PUB. SERV. BOARD, http://psb.vermont.gov/docketsandprojects/gas/7537 (last visited Apr. 3, 2014).

252. EFFICIENCY VERMONT, ANNUAL REPORT 2012 23 (2013), *available at* https://www.efficiencyvermont.com/docs/about_efficiency_vermont/annual_reports/Efficiency-Vermont-Annual-Report-2012.pdf.

253. *Id.*

254. *Id.*

these efforts benefit the local community, they also have system-wide benefits by reducing transmission congestion.

### E. Evaluation, Measurement, and Verification

Energy policymaking in Vermont is a testament to its strong evaluation, measurement, and verification procedures. For instance, the evaluation of ratepayer-funded energy efficiency programs in Vermont relies on both legislative mandates (30 V.S.A. § 209) and regulatory orders (Process and Administration of an Order of Appointment), which means they are legally required. As one respondent explained:

> The Energy Efficiency Charge rates are set by the Board each year using the process and methodology set forth in Board Rule 5.300. Services are delivered by a non-utility entity operating under a three-year, performance-based contract with the Public Service Board. This performance contract has a fixed budget and 35 specified measures of performance. How well the contractor performs in meeting these measures determines how much it earns of the performance award set aside as an incentive for superior performance, payable at the end of the contract period. The definitions of performance indicators, their targets and their individual award values were all set through negotiations between the contractor and the Public Service Board.[255]

Energy efficiency plans have clear key performance indicators (like those shown in Table 4), and the state sets a Vermont Accreditation Procedure for Home Energy Rating System Providers to ensure that minimum standards are met for rater training, operating procedures and policies, software programs, and quality control.

In an attempt to keep energy stakeholders informed, the state publishes frequent reports. For example, the state publishes Building Life Cycle Cost software to provide economic analysis of proposed capital investments that are expected to reduce long-term operating costs of buildings or building systems

255. Anonymous survey response (on file with author).

and components.[256] It also distributes COMcheck-EZ software to simplify energy code compliance by offering a flexible computer-based alternative to manual calculations.[257] The state also funds studies to evaluate the potential for energy efficiency. The Public Service Department commissioned a study of the potential for electric energy efficiency to reduce electric consumption and peak demand throughout Vermont.[258] The study found that that energy efficiency could achieve 25.4 percent of forecasted kWh sales in 2031, and 19.9 percent of 2031 forecasted summer peak demand.[259]

**Table 4: Key Performance Indicators for Vermont Energy Efficiency Programs, 2012-2014** [260]

| **Key Quantifiable Performance Indicators (QPIs)** | **Funding Pool** | **2012 Results** | **3-year Goal** | **% of 3-year Goal Achieved** |
|---|---|---|---|---|
| Electric savings in megawatt-hours | Electric Efficiency Charge | 113,385 | 274,000 | 41% |
| Total Resource Benefits | Electric Efficiency Charge | $120,727,454 | $315,710,000 | 38% |
| Summer peak kilowatt (kW) demand reduction | Electric Efficiency Charge | 15,419 | 41,920 | 37% |

256. *Building Lifecycle Cost Software*, STATE OF VERMONT PUBLIC SERVICE DEP'T, http://publicservice.vermont.gov/topics/energy_efficiency/blcc (last visited Mar. 25, 2014).

257. *Id.*

258. *Energy Efficiency*, STATE OF VERMONT PUBLIC SERVICE DEP'T, http://publicservice.vermont.gov/topics/energy_efficiency (Mar. 25, 2014).

259. *Id.*

260. EFFICIENCY VERMONT, *supra* note 46, at 2.

| | | | | |
|---|---|---|---|---|
| Summer peak kW demand reduction in Geographic Targeting areas— Susie Wilson Road | Electric Efficiency Charge | 804 | 1,570 | 51% |
| Summer peak kW demand reduction in Geographic Targeting areas— Saint Albans | Electric Efficiency Charge | 584 | 1,800 | 32% |
| Ratio of gross electric benefits to spending | Electric Efficiency Charge | 3.3 | 1.2 | N / A |
| MMBtu savings | Heating & Process Fuels Revenues | 91,842 | 126,000 | 41% |

## F. Stakeholder Involvement and Inclusion

A final replicable element of Vermont energy policy is its emphasis on stakeholder involvement and inclusion. The decadal Comprehensive Energy Plan is a good example of how Vermont incorporates stakeholder input from across the state. In response to community concerns regarding the environmental impacts of large-scale wind energy projects in rural areas, in 2012, Governor Shumlin created the Energy Generation Siting Policy Commission to solicit feedback from dozens of communities about recommended siting procedures.[261] The Public Service Board (PSB) process for new energy projects allows individuals or affected parties to communicate their concerns. Although this focus on stakeholder involvement is generally beneficial, one respondent noted that the process can prevent distributed generation development. For larger DG projects, "businesses have to allow for feedback from abutting property owners, who can squelch or make delays in someone receiving a certificate of public good."[262]

261. VERMONT ENERGY SITING POLICY COMMISSION, http://sitingcommission.vermont.gov/ (last visited Apr. 3, 2014).

262. Anonymous survey response (on file with author).

## VII. CONCLUSIONS

First, though Vermont has achieved much in the areas of energy efficiency, renewable energy, and the smart grid, it only did so by consistent, concerted action. State planners utilized policies across sectors—including electric utilities, cooperatives, buildings, agriculture, and industry. As one of our respondents stated, Vermont affirms that "global warming is a complicated problem that will not be solved by any one action. Coordinated state efforts that leave no stone unturned are needed."[263]

Second, apart from the many policies enacted, Vermont emphasizes the importance of politics and strong political leadership—of involving a coalition of different stakeholders to make progressive energy and climate policy a reality. As one respondent commented, "to succeed, Vermont had to do multiple things simultaneously. They had to negotiate terms with public and private (IPP) utilities. They had to convince ratepayers it would reduce bills. And they had to convince the legislature to fund it, all at the same time."[264] Another remarked that "some of the policies came from the Governor (like smart grid), some from the PSB (like Efficiency Vermont) and some from the legislature (group net metering). Nevertheless, each were supported by a strong commitment to these policies by multiple constituencies."[265] A third respondent argued "a well-run program can reduce demand, save money, protect the environment and help mitigate climate change. But details matter, adjustments are always necessary and political support is key."[266] In this way, getting the politics right may be more important than getting the policy right.

Vermont continues this legacy. In June of 2013, Governor Shumlin signed the Sustainable Energy Loan Program into law, authorizing the Vermont Economic Development Agency to borrow $10 million from the treasury to offer low interest loans and loan guarantees for renewable energy and energy efficiency

263. *Id.*
264. *Id.*
265. *Id.*
266. *Id.*

projects.[267] The program intends to lower the cost of capital for clean energy projects on farms and businesses.[268] An additional $6.5 million will be administered by the Vermont Housing Finance Agency for residential efficiency programs.[269]

Third, however, is that there are elements of Vermont's approach to energy and climate policy that will not be effective everywhere. Vermont is a small, rural, liberal, white, non-industrialized state. It has seen its energy prices rise rapidly in the past decade, which implies that improving energy security and mitigating emissions comes with a price that consumers must bear. How it sells its RECs and trades electricity from Canada and to New York is unique, and its transportation sector remains predominately fossil fueled and accounts for a majority of the state's emissions.

Fourth and finally, there are elements of Vermont's approach that can be applied elsewhere. The state includes the cost of externalities in its integrated resource planning requirements, which better align costs with prices and promote cleaner forms of energy supply. To overcome barriers to energy efficiency, it makes it legally mandatory, and utilizes an autonomous, strongly staffed energy-efficiency utility (Efficiency Vermont). To provide a business incentive to pursue efficiency beyond Efficiency Vermont, the state decouples energy revenues from sales. To ensure its programs maximize their effectiveness, the state relies on rigorous verification and evaluation and geographic targeting. To ensure as many stakeholders are represented as possible, it involves them in energy decision-making and also employs decentralized taskforces, working groups, and cooperatives in energy policymaking. These features illustrate that despite being small from an economic and population standpoint, Vermont is able to outperform larger states, such as California and New York, and demonstrate that, with the right mix of policies and politics, almost anything is possible.

267. Peter Rothenstein, *Vermont Summit and New Legislation Focus on Financing Clean, Efficient Energy*, New England Clean Energy Council (June 26, 2013), http://www.cleanenergycouncil.org/blog/2013/06/26/vermont-summit-and-new-legislation-focus-on-financing-clean-efficient-energy/.

268. *Id.*

269. *Id.*

## APPENDIX I: LIST OF INTERVIEWEES

1. Patrick Parenteau, Professor of Law, Senior Counsel Environmental and Natural Resources Law Clinic, Vermont Law School
2. James H. Douglas, Former Governor of Vermont, Professor at Middlebury College
3. Michael Dworkin, Director of the Institute for Energy and the Environment, Vermont Law School, and former Chair of the Vermont Public Service Board
4. Steve Greenfield, Chief Operating Officer, Vermont Economic Development Authority
5. Donna Korpi, Owner, Green Mountain Energy
6. Ken Nolon, Manager of Power Resources, Burlington Electric Department
7. Peter W. Galbraith, State Senator, Chairman, Senate Energy and Natural Resources Committee
8. Mary Powell, Chief Executive Officer, Green Mountain Power
9. Johanna Miller, Energy Program Director, Vermont Natural Resources Council
10. Bob Walker, Director, Sustainable Energy Resources Group
11. Margaret Cheney, Vice Chair, Vermont Energy and Natural Resources Committee
12. Scudder Parker, Managing Consultant, Vermont Energy Investment Corporation
13. Scott Johnstone, Executive Director, Vermont Energy Investment Corporation
14. Dave Hallquist, Chief Executive Officer, Vermont Electric Cooperative
15. Chris Recchia, Commissioner, Vermont Department of Public Service
16. Karen Glitman, Director of Transportation Efficiency, Vermont Energy Efficiency Corporation
17. Kevin B. Jones, Smart Grid Project Leader, Institute for Energy and the Environment, Vermont Law School