---------- Forwarded message ----------
From: Sean Nolon
Date: Thursday, November 8, 2012
Subject: wind siting
To: Louise V Mccarren
Cc: Christa Shute

Commissioner McCarren,
It would be my pleasure to present to the commission. While my article deals with siting turbines, the framework I lay out could apply to other types of energy generation facilities, as well. Please let me know what information you would need from me.
Best regards,
Sean
Sean F. Nolon
Director, Dispute Resolution Program & Associate Professor of Law
Vermont Law School
PO Box 96, South Royalton, VT 05068
p(802) 831-1376
http://vermontlaw.edu/x6871.xml

On Nov 7, 2012, at 6:13 PM, Louise V Mccarren wrote:

Thank you. I will read the article. The task of the commission is for siting of all generation not just wind. our first meeting was a review of ANR, PSB and ACT250 processes. Would professor Nolon be interested in presenting to the commission?

On Wednesday, November 7, 2012, Christa Shute wrote:
> Louise,
>
> One of my professors (Sean Nolon) wrote a law review article on "A collaborative approach to developing wind policies and siting turbines." Attached is a law review article and an abbreviated version that was part of a newsletter. With your appointment to the wind siting commission I thought it would be helpful for you to have these articles. I have copied Professor Nolon on this email, his phone number is 802-831-1376 in case you or others wish to contact him directly.
>
> Hope you are well. See you December 3rd.
>
> Christa
>

Vermont Law School

Faculty Accepted Paper

Working Paper No. 11-19

Negotiating the Wind:

A Framework to Engage Citizens in Siting Wind Turbines

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NEGOTIATING THE WIND: A FRAMEWORK TO ENGAGE CITIZENS IN SITING WIND TURBINES

*Sean F. Nolon**

INTRODUCTION

The need for more renewable sources of energy is unequivocal and the call can be heard from many quarters.[1] Fossil fuel stocks are being depleted and what remains will be increasingly costly to extract and use.[2] The scientific community has documented the long-predicted arrival of climate change as a result of increased greenhouse gas production.[3] Renewable sources of energy must be addressed to limit the adverse impacts of these emissions, to live more sustainably, and to provide a hospitable planet for future generations.

Yet, despite the pressing need for renewable energy and proven technological capacity, the U.S. is struggling to replace the carbon dependent energy system with more renewable sources.[4]

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* Associate Professor of Law and Dispute Resolution Program Director, Vermont Law School. I wish to thank, Michael Dworkin, Donald Kreis, for conversations on the subject, Patrick Parenteau, Jason Czarnezki, for reviews of earlier drafts, participants at the Colloquium on Environmental Law at Vermont Law School, participants at the Benjamin N. Cardozo School of Law's symposium on environmental dispute resolution, Katelyn B. Bush for editing and research, and Antoinette Flora and Allison Silverman for their research assistance.

[1] *See* Leslie Kaufman, *In Kansas*, *Climate Skeptics Embrace Cleaner Energy*, N.Y. TIMES (Oct. 18, 2010), http://www.nytimes.com/2010/10/19/science/earth/19fossil.html; Laurie Goodstein, *Evangelical Leaders Swing Influence Behind Efforts to Combat Global Warming*, N.Y. TIMES (Mar. 10, 2005); Laurie Goodstein, *Living Day to Day by a Gospel of Green*, N.Y. TIMES (Mar. 8, 2007); CRAIG SHIELDS, RENEWABLE ENERGY: FACT AND FANTASIES (2010); *Pentagon Pushes Development and Usage of Renewable Energy*, FUTURISM NOW (June 6, 2010), http://www.civilianism.com/futurism/2010/06/pentagon-pushes-development-and-usage-of-renewable-energy/; Steven Hayward et al., *Post Partisan Power: How a Limited and Direct Approach to Energy Innovation Can Deliver Clean, Cheap Energy, Economic Productivity and National Prosperity*, *available at* http://www.aei.org/docLib/Post-Partisan-Power-Hayward-101310.pdf (last visited Mar. 3, 2011).

[2] This can be seen with the increase in deep water drilling, hydraulic fracturing techniques to get at natural gas in shale formations, tar sands deposits in Canada, mountain-top removal coal mining in Appalachia. The economic and environmental costs of these projects are well documented.

[3] *See* Patrick Parenteau, *Come Hell and High Water: Coping with the Unavoidable Consequences of Climate Disruption*, 34 VT. L. REV. 957, 957–60 (2010).

[4] Currently, 7% of U.S. energy comes from renewable sources. *See* http://www.eia.doe.gov/cneaf/solar.renewables/page/trends/rentrends.html (last visited Feb. 18, 2011).

Electronic copy available at: http://ssrn.com/abstract=1898814

The lack of progress is not for want of technological innovation—our ability to produce energy through solar, wind, hydro and geothermal sources has increased dramatically.[5] Other obstacles include the low cost of energy from fossil fuel sources, the lack of a unified energy policy, resistance to change from the fossil fuel industry, the need for new transmission lines to deliver electricity to population centers, and citizen opposition to siting of renewable energy facilities such as wind turbines, solar panels and dams.[6]

The limited purpose of this article is to address the obstacle of citizen opposition to the siting of wind turbines. While there is little empirical data available on the impact of citizen opposition, several high profile cases have captured the media's attention and highlighted the need for improved siting procedures. The framework proposed herein recommends dealing with siting opposition by involving citizens "upstream" in policy development as well as "downstream" in siting negotiations. This framework relies on federal-state-local partnerships that integrates citizens into a process that identifies areas appropriate for turbines, provides for mitigation of adverse effects, designates fossil fuel reductions, creates model leases and ordinances, provides for decommissioning, and enables siting negotiations at the local level.

The United States Department of Energy ("DOE") states that the U.S. could source twenty percent of its electricity from wind power by 2030.[7] In 2008, wind capacity grew by sixty-one percent, making it the most prevalent form of energy added to the nation's capacity.[8] Governors and legislatures of approximately twenty-four states have mandated that a percentage of energy used must come from renewable resources.[9] For many reasons, wind energy

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[5] *See, e.g., International Energy Outlook 2010–Highlights*, U.S. ENERGY INFORMATION ADMINISTRATION, http://www.eia.doe.gov/oiaf/ieo/highlights.html (last visited Feb. 3, 2011); State Renewable Energy Profiles, U.S. ENERGY INFORMATION ADMINISTRATION, http://ftp.eia.doe.gov/cneaf/solar.renewables/page/state_profiles/r_profiles_sum.html (last visited Feb. 3, 2011); Andreas Wiese et al., *Renewable Power Generation–A Status Report* (Dec. 13, 2010), http://www.renewableenergyfocus.com/view/14432/renewable-power-generation-a-status-report/.

[6] *See* Deborah Peel & Michael Gregory, *Positive Planning for Wind Turbines in an Urban Context,* 12 LOC. ENVTL. 343, 343–44 (2007) (noting that renewable energy policies are often frustrated by "implementation impasses" at the local level where siting of facilities can be stalled for many reasons).

[7] *See* Todd Woody, *Thar She Blows: A Gust of Energy*, GRIST (Jan. 22, 2010), http://www.grist.org/article/2010-01-22-a-gust-of-energy/.

[8] *See Renewable Energy Trends in Consumption and Electricity 2008 Edition*, U.S. ENERGY INFORMATION ADMINISTRATION, http://www.eia.doe.gov/cneaf/solar.renewables/page/trends/rentrends.html (last visited Feb. 18, 2011).

[9] *See States with Renewable Portfolio Standards*, U.S. DEPARTMENT OF ENERGY, http://apps1.eere.energy.gov/states/maps/renewable_portfolio_states.cfm (last visited Feb. 18, 2011).

Electronic copy available at: http://ssrn.com/abstract=1898814

presents an attractive and accessible source of energy to help meet these specific obligations as well as our general need for more renewable energy. When compared to other sources of energy, wind has a relatively small terrestrial footprint[10] and turbines have negligible impacts when compared to coal and nuclear. Aside from producing, servicing and constructing the turbines, the "cost" of these facilities is relatively low[11] as compared to other forms of energy generation.[12]

Wind sources, while temporally sporadic, are geographically well distributed throughout terrestrial and maritime jurisdictions of the United States. The temporal nature of wind resources makes it difficult to rely on wind as a constant source of energy. Energy is produced when the wind is blowing and that does not always match the times when energy is needed. Even though there have been massive improvements in wind turbine technology, allowing for more electricity output with smaller and less expensive units, wind energy is expensive and can vary greatly from site to site depending on wind speed and the topography of the land.[13] The most favorable terrestrial wind resources are not always located near population centers, making transmission an important consideration. These limitations can be addressed through a range of technological fixes.[14] For example, through technological advances wind power can cost between three and six cents per kilowatt-hour, making wind power cost-comparable, if not cost-competitive, with fossil fuel power plants.[15]

In addition to the limitations of expense, storage, and transmission, wind turbines present other limitations. Adverse environmental impact can result from the construction of, and to a lesser

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[10] Uma Outka, *The Renewable Energy Footprint*, ____ STAN. ENVTL. L.J. ___ (forthcoming 2011), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1711891.

[11] *Id*. at n.7 (citing Robert McDonald et al., *Energy Sprawl or Energy Efficiency: Climate Policy Impacts on Natural Habitat for the United States of America,* PLoS ONE 4(8) (2009)), *available at* http://www.plosone.org/article/info:doi/10.1371/journal.pone.0006802.

[12] While the per project capital costs are relatively low, wind power produces less electricity, making per unit cost higher than other forms of generation.

[13] *See* Christopher W. Fry, *Harvesting the Sky: An Analysis of National and International Wind Power*, 19 COLO. J. INT'L ENVTL. L. & POL'Y 427, 436–39 (2008).

[14] *See* Steven E. Stoft, *The Surprising Value of Wind Farms as Generating Capacity* (2008), *available at* http://ssrn.com/abstract=1250187.

[15] *Id*. The Department of Energy estimates that wind power in some sites has a baseline of 5–8 cents per kWh, but the goal is to reduce this to 3.6 cents per kWh by 2012. *See Large Wind Technology: Goal*, U.S. DEPARTMENT OF ENERGY, http://www1.eere.energy.gov/windandhydro/large_wind_tech.html (last visited Sept. 6, 2010).

Electronic copy available at: http://ssrn.com/abstract=1898814

degree, the operation of wind turbines.[16] While some of these impacts have technical solutions, most must be addressed through policy development and siting procedures. For example, linking "high wind" areas to population centers requires siting new transmission lines through undeveloped and sometimes sensitive habitat. Turbines may have impacts on avian and bat populations and habitat destroyed by construction and operation. Wind turbines also have national security and transportation implications because they can interfere with radar technology. Adequately addressing these impacts requires the involvement of citizens in decision-making processes that set wind energy policies and site the turbines. Accordingly, this Article deals directly with a central (and often overlooked) factor in successful policy development and facility siting: adequate and appropriate citizen involvement.

"Citizen involvement" as a label has different meanings depending on who is using it and the context in which it is used. In the context of the minimal governmental procedures that are required to make a legally defensible decision, it means notice and comment and possibly a public hearing. However, in the context of decision-making intended to fully incorporate a range of concerns, "citizen involvement" refers to a more inclusive, transparent and responsive process. Many agencies resist more robust levels of citizen involvement at the policy development stage, preferring to rely on the minimal processes with which they are familiar.

Resistance to this level of citizen involvement is endemic and springs from beliefs (and experiences) that engaging citizens takes too long, is too costly, and results in sub-optimal solutions.[17] The assumption is that a more streamlined decision-making process, guided and informed by knowledgeable bureaucrats, will produce

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[16] *See* Ronald H. Rosenberg, *Making Renewable Energy a Reality: Finding Ways to Site Wind Power Facilities*, 32 Wm. & Mary Envtl. L. & Pol'y Rev. 635, 665 (2008) ("Wind speed and availability can vary from day to day and, as a result, the amount of electricity produced can vary. Some critics have argued that utilities relying on wind power will have to develop or purchase costly reserve capacity to fill in if wind power is not available when it is expected."). *See also* Fry, *supra* note 13, at 436 (noting that advances in battery technology might help mitigate this problem, and large scale wind faces fewer problems than small-scale wind, but this "no-gust" issue is still one of the largest problems facing wind development today).

[17] *See* Jeffrey Lubbers, *Achieving Policymaking Consensus: The (Unfortunate) Waning of Negotiated Rulemaking*, 49 S. Tex. L. Rev. 987, 1000–06 (2008). *See also* Curtis Copeland, *Negotiated Rulemaking*, Congressional Research Service (Aug. 28, 2008), *available at* http://wikileaks.org/wiki/CRS-RL32452.

better and timelier results.[18] Adherents to minimal citizen involvement in decision-making view the citizens as uninformed and parochial and involving them will only give strength to Not-in-My-Back-Yard ("NIMBY") sentiment.[19] Simply dismissing citizen opposition as self-interested, NIMBY whiners ignore the two realities addressed in this Article: (1) that many facility proposals subject to citizen opposition will impose significant, uncompensated burdens on communities; and (2) that successful citizen involvement is more than a statement of principle—it must be implemented following the best practices of consensus building and collaboration.[20]

In Section I, this Article explores the promotion of wind energy by looking at the current system of incentives and regulations, including the authority to mitigate adverse impacts. In Section II, the Article looks at the role of citizens in siting generally, how involvement can turn into opposition, and how that opposition can be managed productively. Section III explores three approaches to citizen engagement that have been used for decades—participatory planning, negotiated rulemaking and facility siting. Finally, Section IV provides a framework for the federal government to work cooperatively with state and local governments to create comprehensive wind energy plans with significant citizen involvement. While this framework is ambitious and novel, the individual process components have all been applied successfully in other contexts.

Research generally on citizen involvement in administrative decisions[21] and specifically in participation in wind energy siting

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[18] KEITH WERHAN, PRINCIPLES OF ADMINISTRATIVE LAW § 1.5 (Thomson West 2008) (points out that in complex decisions, both processes are time-consuming, costly and that the minimal approach produces less creative solutions due to the adversarial climate).

[19] *See* Jody Freeman, *Collaborative Governance in the Administrative State*, 45 UCLA L. REV. 1, 13 (2007).

[20] These two realities are central components to the increasingly popular field of Dispute System Design (DSD). DSD contemplates how systems deal with recurring streams of disputes and outlines how system-wide engagement can be used to manage conflicts. This field of study has expanded over the last thirty years to include concepts from dispute resolution, group decision-making, organizational development and business management. Since the approval for these turbines takes place in a decision-making process that is already established, DSD provides a valuable framework for exploring how citizen can be more effectively involved. *See generally* WILLIAM L. URY, JEANNE M. BRETT & STEPHEN B. GOLDBERG, GETTING DISPUTES RESOLVED: DESIGNING SYSTEMS TO CUT THE COSTS OF CONFLICT (1988); CATHY A. COSTANTINO & CHRISTINA SICKLES MERCHANT, DESIGNING CONFLICT MANAGEMENT SYSTEMS: A GUIDE TO CREATING PRODUCTIVE AND HEALTHY ORGANIZATIONS (1996); *see also* Amy J. Cohen, *Dispute System Designs, Neoliberalism, and the Problem of Scale*, 14 HARV. NEGOT. L. REV. 51, 60–74 (2009).

[21] *See infra* Section III.B.

make the case for increased citizen involvement.[22] The unique contribution of this framework is a structure to include citizens in the full range of policy decision in a comprehensive manner. Current policies only provide for incomplete and piecemeal participation in decisions about wind energy policy and turbine siting. The effect is that siting decisions are procedurally detached from important policy decisions like where turbines are appropriate, what mitigation measures are effective, and how losses should be compensated. This framework proposes these procedural linkages among related decisions in an attempt to improve decision-making throughout the system. The premise is that citizens who are involved in developing a comprehensive wind policy will be more effective and productive participants in the siting decisions that implement those policies.

I. Regulating Wind Energy

At present, there is no cohesive nationwide policy to promote wind energy. This absence of a unified policy has been noted as one of the major reasons why wind energy has not realized its potential.[23] The current regime of laws and regulations provide limited authorities and incentives. While there are some successful components to encourage wind production, better coordination is needed overall if we want to take advantage of our wind resources.

A. Governmental Incentives

1. Federal Financial Incentives

A range of federal incentives for wind energy are available for local governments and private entities like individual property owners as well as owners of large wind generation facilities. Direct loan programs are available through the Tribal Energy Program,[24]

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22 *See infra* Section I.B.3.d.

23 *See* Tom Zeller, Jr., *Wind Power Growth Slows to 2007 Levels*, N.Y. Times (Oct. 29, 2010), http://green.blogs.nytimes.com/2010/10/29/wind-power-growth-slows-to-2007-levels/. *See* Patricia E. Salkin & Ashira Pelman Ostrow, *Cooperative Federalism and Wind: A New Framework for Achieving Sustainability*, 37 Hofstra L. Rev. 1049, 1081 (2009).

24 *See also Energy, Efficiency & Renewable Energy: Tribal Energy Program*, U.S Department of Energy, http://apps1.eere.energy.gov/tribalenergy/ (last visited Nov. 1, 2009) ("The Tribal Energy Program, administered by the DOE, provides financial and technical assistance, education, and training to tribes for the development of renewable energy resources.").

the Rural Energy for America Program,[25] and the Energy Efficiency and Conservation Block Grant program.[26] Monies provided under these programs can be used by eligible localities to fund a great diversity of renewable energy projects that are consistent with local priorities and goals.[27] Private entities, such as owners of large turbine installations, can choose between using the Production Tax Credit (PTC) or Investment Tax Credit (ITC). Wind generators find these incentives instrumental in the growth of the wind energy industry and argue that they are essential for them to remain competitive in the future.[28] Entities can recover investment in property, including small wind facilities, through depreciation deductions under the federal Modified Accelerated Cost-Recovery System.[29] For owners of smaller wind generation facilities with less than 100 kilowatts,[30] the Residential Energy Efficient Property Act[31] permits individuals to claim a credit of thirty percent of eligible property expenditures.[32] The federal government also provides a tax credit for those who invest in "clean renewable energy

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25 *See* Salkin & Ostrow, *supra* note 23, at 1081. *See* The Rural Energy for America Program, administered by the U.S. Department of Agriculture, and codified at 7 U.S.C. § 8107 (The Food, Conservation, and Energy Act of 2008 promotes energy efficiency and renewable energy for agricultural producers and rural small businesses through the use of (1) grants and loan guarantees for energy efficiency improvements and renewable energy systems, and (2) grants for energy audits and renewable energy development assistance). *See also* Database of State Incentives for Renewables & Efficiency, USDA–Rural Energy for America Program (REAP) Loan Guarantees, http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=US46F&State=federal&currentpageid=1&ee=1&re=1 (last visited Nov. 1, 2009).

26 *See* 42 U.S.C. §§ 17151–17158 (To qualify as the first type of governmental entity, if a city, it must have either 35,000 or more residents or it must be one of the top ten most populous cities in the state; if a county, it must have at least 200,000 residents or be one of the top ten most populous counties in the state. To qualify as an "eligible unit of local government-alternative-2," it must have a population of at least 50,000 as a city and a county must have a population of at least 200,000).

27 *See* Garrick B. Pursley & Hannah J. Wiseman, *Local Energy*, 60 EMORY L. REV. 4 (forthcoming 2011), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1567585##.

28 *See Policy, Transmission and Regulation: Production Tax Credit*, AMERICAN WIND ENERGY ASSOCIATION, http://www.awea.org/ei_policy_ptc.cfm (last visited Oct. 15, 2010). *See also* Salkin & Ostrow, *supra* note 23, at 1060.

29 *See* Salkin & Ostrow, *supra* note 23, at 1080.

30 *See* 26 U.S.C.S. § 48(c)(4) (2011).

31 *See* 26 U.S.C.S. § 25D (2011).

32 *Id*. at § 25D(a)(4). The amount of credit an individual can take cannot be an amount more than their total tax liability for the year, but there is a specific formula in determining whether or not they can claim a credit based upon their taxable income for a taxable year. *See* 25 U.S.C.S. § 25D(b)(1); 25 U.S.C.S. § 25D(c)(1)(A); 26 U.S.C.S. § 55 (2011).

bonds"[33] and loan guarantees for eighty percent or less on qualifying projects.[34]

2. State Renewable Portfolio Standards

A majority of states have adopted Renewable Portfolio Standards (RPS) that require utilities to source a percentage of electricity from renewable sources.[35] For example, Delaware will require twenty percent of its energy to come from renewable sources by 2019.[36] California has the most ambitious RPS, mandating that twenty percent of its electricity will come from renewable resources by 2010[37] and requiring all retail electric utilities to produce thirty-three percent of their electricity from renewables by 2020.[38] Interestingly, California takes a systemic view of the problem by limiting hazardous waste and pollution increases from renewable sources like solid waste incineration.[39] Even some states with an RPS, such as Alabama and Mississippi, encourage the use of renewable energy to meet the energy demands.[40] Wind is a key component of many states' renewable energy portfolio standards.[41]

B. Siting Wind Turbines

1. Federal Authority

The siting of wind turbines is a matter of state and local authority. The federal government does not have authority over the siting of wind generation facilities, unless federal land is involved.[42]

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33 *See* 26 U.S.C.S. § 54A; and 26 U.S.C.S. § 54D.

34 *See* 42 U.S.C.S. § 16511. To be a qualifying project, it must not emit, must reduce, or must sequester either greenhouse gas or air pollution, and use new or improved technology and must fall under the category of a renewable energy system. *See* 42 U.S.C.S. § 16513.

35 *See* Salkin & Ostrow, *supra* note 23, at 1050.

36 26 DEL. C. § 354 (2010).

37 *See Executive Order S-14-08 by the Governor of the State of California*, OFFICE OF THE GOVERNOR STATE OF CALIFORNIA (Nov. 17, 2008), http://www.gov38.ca.gov/executive-order/11072/ [hereinafter *Executive Order*]; *see also* CAL. PUB. RES. CODE § 25740 (2010).

38 *See Executive Order*, *supra* note 37.

39 *See* CAL. PUB. RES. CODE § 25741(b)(3) (2010).

40 *See* ALA. CODE § 29-2-290 (2011); MISS. CODE ANN. § 31-11-35 (2010). *See also Rules, Regulations & Policies for Renewable Energy*, DSIRE, http://www.dsireusa.org/summarytables/rrpre.cfm [hereinafter *Rules, Regulations*] (showing which states adopted laws regarding renewable energy use, via renewable energy portfolios or requirements for net metering).

41 *Rules, Regulations*, *supra* note 40.

42 Several federal agencies have developed guidelines for siting wind turbines on federally owned land. *See* Salkin & Ostrow, *supra* note 23, at 1077.

There are several important areas, however, where the federal government plays a role in the permitting process.

> [A] host of federal agencies may be involved in the wind farm permitting process including the Department of Energy ("DOE"), the Minerals Management Service ("MMS"), the United States Army Corps of Engineers, the Fish and Wildlife Service ("FWS"), the Bureau of Land Management ("BLM") the Environmental Protection Agency ("EPA"), the Department of Defense, the Federal Aviation Administration ("FAA") and the National Telecommunication and Information Administration ("NTIA").[43]

In a related area, the Energy Policy Act of 2005 granted the Federal Energy Regulatory Commission ("FERC") the authority to site energy transmission lines in "national interest electric transmission corridors."[44] Transmission lines play a crucial role in connecting supply to demand—delivering energy from turbines in high wind locations to population centers.

2. State and Local Siting Authority

In general, the principal authority in the United States for land use siting decisions is vested in local government, as delegated by individual state legislatures. While authority varies from state to state, the general pattern is that local and regional governments are also responsible for the siting of wind turbines.[45] In some states, such as in New York, location and operation of wind turbines is largely a function of local governments with little to no authority retained by the state.[46] Some large wind farms are treated as utilities and need additional approval from the state utility commissions on matters related to rate setting. Some states segregate wind projects based on size, sending larger turbines to regional or state siting boards or agencies and allowing local governments to

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[43] *Id*. at 129–30.

[44] *See* 16 U.S.C. § 824p(a) (2011). Areas qualify as "natural interest electric transmission corridors" if they are "experiencing electric energy transmission capacity constraints or congestion that adversely affects consumers." *Id*. However, under Piedmont Envt'l Council v. FERC, the courts have limited FERC's authority to approve transmission lines only in corridors where the state has not taken action. According to *Piedmont*, "taking action" can be a denial as well as approval. 558 F.3d 304, 313 (4th Cir. 2009). "Simply put, the statute does not give FERC permitting authority when a state has affirmatively denied a permit application within the one-year deadline." *Id.*

[45] *See* Patricia Salkin, *Renewable Energy and Land Use Regulation, Part II*, ALI-ABA Bus. L. Course Materials J. (2009), *available at* http://ssrn.com/abstract=1588766.

[46] *Id*.

approve smaller turbines.[47] Other states, such as Maine, use statewide siting boards to make all decisions regarding wind turbines.[48] In addition, some state legislatures have voted to ban turbines from significant landscapes.[49]

Depending on the authority of the siting board, turbines can be conditioned or denied based on a variety of reasons, such as impacts to biodiversity, the environment, human safety, aesthetics, cultural resources, noise, and light. Some states require environmental impact statements to be completed as part of the approval process. For example, the Minnesota Public Utilities Commission requires an analysis of the potential environmental and wildlife impacts, mitigation measures, and any adverse environmental effects that cannot be avoided.[50] In New York, the State Environmental Quality Review Act ("SEQRA") requires local government agencies to mitigate the adverse impacts of any proposed actions—like approving the siting of a wind turbine. SEQRA requires the completion of an environmental impact statement if a proposed action

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[47] New Hampshire law prohibits localities from unreasonably limiting wind installations: "[o]rdinances or regulations adopted by municipalities to regulate the installation and operation of small wind energy systems shall not unreasonably limit such installations or unreasonably hinder the performance of such installations." N.H. REV. STAT. ANN. § 674:63 (2010). The statute defines unreasonable behavior as excluding wind turbines from a municipality; using a generic ordinance to restrict tower height; requiring setbacks greater than 150% of a turbine's height; setting noise limits lower than fifty-five decibels; and fixing electrical and structural standards that are more restrictive than applicable state and federal building and electrical codes. *See id.* Minnesota Public Utilities Commission has the authority to permit wind farms over 5 MW. *See* STATE OF MINNESOTA PUBLIC UTILITIES COMMISSION, http://energyfacilities.puc.state.mn.us/wind.html (last visited Feb. 3, 2011). In Oregon, local governments can issue permits for turbines capable of generating up to 105 MW while projects exceeding 105 MW are permitted by the Oregon Energy Facility Siting Council. *See* OR. REV. STAT. § 469.300 et seq. (2009); *see also* Oregon Administrative Rules (OAR) Chapter 345, Divisions 1, 15, 20–23, 26, 27, and 29. On the other side of the spectrum, in "Texas, there are no state guidelines for wind turbine siting; counties can discourage but cannot prohibit wind power development. The Texas Parks and Wildlife Department will review a wind energy project against a draft set of guidelines for wildlife protection, if asked." WINDOW ON STATE GOVERNMENT, TEXAS COMPTROLLER OF PUBLIC ACCOUNTS, http://www.window.state.tx.us/specialrpt/energy/renewable/wind.php#106 (last visited Mar. 3, 2011). The 2007 Texas Legislature considered a bill, HB 2794, that would have required a permitting process for wind energy projects, but it did not pass. *Id.*

[48] *See Wind Power Siting Regulations and Wildlife Guidelines in the United States*, ASSOCIATION OF FISH & WILDLIFE AGENCIES (Apr. 2007) [hereinafter *Wind Power Siting Regulations*], *available at* http://www.batsandwind.org/pdf/afwastsitsum.pdf.

[49] North Carolina's State Legislature voted in 2009 to ban large turbines from the state's ridgelines over 3,000 feet. *See* Kate Galbraith, *North Carolina Moves to Limit Wind Projects*, N.Y. TIMES (Aug. 7, 2009), http://green.blogs.nytimes.com/2009/08/07/north-carolina-moves-to-limit-wind-projects/. *See also* Salkin & Ostrow, *supra* note 23, at 1071.

[50] *See Wind Power Siting Regulations*, *supra* note 48, at 25.

"is determined to have a potentially significant adverse environmental impact."[51]

3. Mitigating Adverse Impacts of Wind Turbines

In addition to the advantages of harvesting energy from the wind, there are significant impacts that must be addressed. The regulation of wind turbines is designed to address impacts that arise during construction and operation of wind turbines. An attempt to catalog the adverse impact on land use is incredibly complex and depends heavily on local circumstances, local and state land use patterns, zoning ordinances, cultural resources in the area, and other factors. For example, construction of wind turbines can cause interruptions in communication infrastructure (i.e., cell phone towers, fiber optic data cables),[52] and operation can impact national defense by interrupting radar capabilities.[53]

According to some anti-wind advocates, wind turbines are "gigantic wind machines . . . gut[ting] the landscape, killing wildlife, destroying culturally significant viewsheds, devaluing property, and creating major disturbances for those who live nearby."[54] A recent newsletter pondered the following possible impacts: damaged roads; increased traffic; changes to water supplies, streams and wetlands; blasting; habitat fragmentation; increased mortality of birds, bats and other wildlife and domestic animals; reduced quality of life; aesthetics; increased noise; human health; dangers to commercial aviation; reduced property values; lack of corporate accountability; catastrophic failure of turbines; injuries to community; and greenhouse gas emissions.[55] Opponents can find many reasons to make the case against wind turbines.

Generally, state and local governments have attempted to mitigate adverse wind turbine effects on wildlife and natural resources by conducting risk assessments prior to construction and imposing conditions on location, size, operation, construction and mainte-

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51 *Id.* at 34. *See also* N.Y. ENVTL. CONSERV. LAW § 8-0109 (2011).

52 *See* Rosenberg, *supra* note 16, at 668.

53 *See* Elizabeth Burleson, *Wind Power, National Security, and Sound Energy Policy*, 17 PENN ST. ENVTL. L. REV. 137, 141 (2009).

54 *See* Christopher E. Cotter, *Wind Power and the Renewable Portfolio Standard: An Ohio Analysis*, 32 U. DAYTON L. REV. 405, 415 (2007).

55 Vermonters for a Clean Environment, Year-End Report (2009); *see also* Victoria Sutton & Nicole Tomich, *Harnessing Wind is Not (By Nature) Environmentally Friendly,* 22 PACE ENVTL. L. REV. 91, 96–99 (2005).

nance of wind turbines.[56] Some of the specific conditions are described in more detail below.

a. Noise, Light, and Visual Impacts

Wind turbines create noise, cause shadow "flicker" and are highly visible on the landscape. The impact of the noise depends on the type of turbine, the manner in which it is operated, and the proximity to residences. Newer turbines are quieter than older models. The speed at which a turbine operates can also have an effect on the noise generated—the faster the turbine, the louder the noise.[57] Depending on their location, turbines can create shadow or light "flicker" on residences.[58] The effect of this "flicker" is alleged to be very aggravating and cause headaches, depression, and anxiety.[59] And finally, simply having to look at turbines on the landscape can be seen as an adverse impact. Some people view flashing lights and the white towers along ridgelines and open expanses as visual pollution that degrades a common resource and lowers quality of life.[60] Others take great pride in the towers, seeing them as symbols of our growing energy independence and commitment to a more sustainable future.

Several jurisdictions have taken action, through a variety of measures, to mitigate adverse aesthetic impacts. For example, the California Environmental Quality Act ("CEQA") allows the imposition of noise limits and set backs from property lines to mitigate the harm.[61] Minnesota's Pipestone County adopted an ordinance regulating turbines based on the state's model ordinance that re-

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[56] U.S. Fish and Wildlife Serv., Wind Turbine Guidelines Advisory Committee Report (Mar. 4, 2010), *available at* http://www.fws.gov/habitatconservation/windpower/Wind_Turbine_Guidelines_Advisory_Committee_Recommendations_Secretary.pdf.

[57] However, the faster the turbine, the more energy it produces. This obviously creates a tension between people who want slow turbines to reduce noise and those who want faster turbines to generate more electricity.

[58] Shadow flicker occurs when unnatural shadows from rotating wind turbines are cast. For a story on how noise and shadow flicker affect everyday life, see *Noise, Shadow Flicker from Wind Farms Causing an Uproar*, Watertown DailyTimes.com (Jan. 18, 2010), *available at* http://www.watertowndailytimes.com/article/20100118/NEWS03/301189978.

[59] *See generally* Nina Pierpont, Wind Turbine Syndrome (2009); *but see* David W. Colby et al., *Wind Turbine Sound and Health Effects: An Expert Panel Review*, American Wind Association (Dec. 2009), *available at* http://www.canwea.ca/pdf/talkwind/Wind_Turbine_Sound_and_Health_Effects.pdf.

[60] Avi Brisman, *The Aesthetics of Wind Energy Systems*, 13 N.Y.U. Envtl. L.J. 1, 78 (2005).

[61] U.S. Government Accountability Office (USGAO), Wind Power: Impacts of Wildlife and Government Responsibilities for Regulating Development and Protecting Wildlife, 23 (2005) [hereinafter *Wind Power*], *available at* http://www.gao.gov/new.items/d05906.pdf (citing Cal. Pub. Res. Code § 21100).

quires wind turbines to be set back 750 feet from property lines of homes. That model ordinance also has various formulae for calculating other set backs depending on the property use.[62] In Oregon, "regulations protect against impacts on the surrounding community by requiring that minimal lighting be used to reduce visual impacts," and wind power "must not adversely impact scenic and aesthetic values and is prohibited in certain areas, such as state parks."[63] These regulations that specifically address wind energy facilities state that the source of the noise, in this case, the wind turbine, must be at least 400 feet from any "quiet areas."[64]

Paint color and location can also minimize visual impact. For example, the Danish Wind Industry Association ("DWIA") (an entity that assists in planning efforts) asserts, "the choice of paint color may help improve the visual impact of wind farms,"[65] and

> [i]n flat areas, it is often a good idea to place turbines in a simple geometrical pattern which is easily perceived by the viewer. Turbines placed equidistantly in a straight line work well . . . In hilly landscapes it is rarely feasible to use a simple pattern, and it usually works better to [allow the] turbines [to] follow the . . . contours of the landscape.[66]

b. Wildlife and Natural Resource Impacts

The construction and operation of wind turbines can have a significant impact on a host of natural resources. Sediment-laden runoff from the construction site, as well as from service roads, can quickly destroy stream habitat.[67] Service roads fragment habitat endangering plant and animal communities.[68] This fragmentation can have adverse impacts on local and global migrations of avian and land-based fauna.[69] Service roads can also increase the rate of

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62 *See* Minnesota Model Wind Ordinance, *available at* http://www.ecowerc.com/downloads/MN-model-ordinance-wind.pdf (last visited Nov. 22, 2010).

63 *Wind Power*, *supra* note 61, at 26–28.

64 *See* Oregon Administrative Rules, OAR 340-035-0035, *available at* http://arcweb.sos.state.or.us/rules/OARs_300/OAR_340/340_035.html (last visited Feb. 18, 2011).

65 *See* Brisman, *supra* note 60, at 73–80.

66 *Id.* at 78.

67 Increased sediment loads visit a host of ill effects on aquatic ecosystems including habitat destruction from increased scouring, altered hydraulic flows that can rapidly change watercourses, and changed temperature gradients. *See Watershed Protection and Restoration*, CENTER FOR WATERSHED PROTECTION, http://cwp.org/your-watershed-101/watershed-protection-and-restoration.html (last visited Feb. 19, 2011).

68 *See generally* NATURE IN FRAGMENTS: THE LEGACY OF SPRAWL (Elizabeth A. Johnson & Michael W. Klemens, eds. 2005).

69 *See* Rosenberg, *supra note* 16, at 668–69.

introduction of invasive species into native populations. Traffic on service roads and the operation of the turbines inevitably increases species mortality.

States have come up with a variety of mechanisms to deal with these impacts on wildlife and natural resources. For example, in California, Alameda County approved a plan to reduce bird mortality at Altamont Pass by "removing some existing turbines, turning off selected turbines at certain times, implementing other habitat modification and compensation measures, and gradually replacing existing turbines with newer turbines."[70] Also in California, a project in Contra Costa County reduced the number of turbines, redesigned the turbines, and buried electrical lines to reduce avian deaths.[71] In Sherman County, Oregon, officials have required that turbine developers conduct an avian post-construction study.[72] Other states have studied wildlife impacts and have decided not to impose mitigation measures.[73]

c. Human Health, Safety, and Culture Impacts

Wind turbines may also have an impact on human health and culture related to the adverse impacts on wildlife and natural resources.[74] Runoff from a site can decrease water quality, construction and use of service roads can reduce air quality, ice can be thrown from rotating turbines, and cultural resources can be destroyed.[75] Construction may disturb burial grounds or battlefields. The placement of turbines may impact native rituals and practices.[76] Death rates from the construction of wind turbines are small, but something to be considered: fourteen people died in the mid-1990s from working on wind turbines or with wind energy.[77]

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70 *Wind Power*, *supra* note 61, at 24.

71 *Id.* at 24.

72 *Id.* at 27.

73 After a four-year, $800,000 avian impact study and a two-year bat study, Minnesota concluded that the impacts of wind turbines on bats and birds were minimal. "Therefore . . . state and local agencies in Minnesota are not requiring post construction studies for wind power development in the [southwestern part] of the state" where wind development is concentrated. *Id.* at 25.

74 Ironically, one of the driving factors behind the installations of wind turbines is the protection of human health that will hopefully reduce the consumption of fossil fuels and minimize the effects of climate change.

75 *See generally* Sutton & Tomich, *supra* note 55.

76 The WBUR Newsroom, *Salazar Meets With Mashpee Wampanoag Over Cape Wind Concerns*, WBUR.ORG (Feb. 2, 2010, 6:01 PM), http://www.wbur.org/2010/02/02/cape-wind-5.

77 Paul Gipe, *Wind Energy—The Breath of Life or the Kiss of Death: Contemporary Wind Mortality Rates*, WIND-WORKS.ORG, *available at* http://www.wind-works.org/articles/Breath-Life.html (last visited Sept. 7, 2010).

Overall there have been at least forty fatalities due to construction, operation, and maintenance of wind power equipment.[78] Fires from malfunctioning wind turbines have created problems in Australia where a turbine caught fire and was destroyed.[79] This incident has turned many Australians against the potential benefits of wind power.[80]

As wind turbine technology improves and more turbines are installed, the likelihood of casualty and death should be reduced. Likewise, preventative measures used during construction can reduce harm from increased sedimentation in waterways and reduced air pollution. Reducing impacts on archeologically significant locations requires a thorough environmental review process to uncover resources and preserve what is valuable. Similarly, when locating a tower will impact cultural resources, relocation should be considered. For example, there are some areas where wind turbines should not be installed due to their religious and cultural significance.

d. Impacts on Property Values

Depending on its location, a wind turbine can reduce property values of adjacent landowners. If the noise and visual impacts are significant, property could even be made uninhabitable. Conditions during the permit process can effectively minimize negative effects on property values. Increasing setbacks from property lines to minimize noise and light flicker, slowing the rotation speed in the evenings to reduce noise, and avoiding placements that cause light flicker should be considered first. However, when impacts cannot be avoided, wind turbine applicants should provide compensation for reasonable losses. Compensation can be calculated through many methods that have been successfully used in many environmental and real estate transactions. Applicants can make direct payments, agree to cover any value lost in the future, or provide for revenue sharing in the project. Compensation mechanisms do more than just make those who are injured whole; these mechanisms can also change opinions of the project. Empirical evidence suggests that compensation mechanisms and revenue sharing ar-

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[78] *Id.*

[79] *Wind Turbines are Inefficient and Potential Fire Risk*, THE CANBERRA TIMES (Aug. 3, 2009), *available at* http://www.canberratimes.com.au/news/opinion/letters/general/wind-turbines-are-inefficient-and-potential-fire-risks/1584850.aspx.

[80] *Id.*

rangements increase the overall perception of wind turbines.[81] Danish studies have found that economic involvement in wind energy projects increases community acceptance.[82]

A common fear among many communities is that turbines and towers will not be removed when no longer in use, left to rust on the landscape, and a reminder of a failed project.[83] Many communities address this problem ahead of time by planning for decommissioning. If not decommissioned properly, wind turbines can damage the environment, erode aesthetic features, and devalue property. Some states and countries have used a variety of measures to ensure that wind power sites are decommissioned properly.[84] In Minnesota, Pipestone County adopted a wind power ordinance that provides for decommissioning of wind turbines.[85] In Sherman County, Oregon, local zoning permits wind turbine approvals to be conditioned on decommissioning and removal provisions.[86]

While years of experience with wind turbines have provided many opportunities to minimize adverse impacts, as with any human development, some remain. Some wind proponents will look to the improvements in mitigation and be tempted to rely solely on the merits of those claims. More strategic proponents will recognize that technological fixes have limited effectiveness when dealing with communities. Instead, proponents will be more effective if their substantive fixes are subordinate to the creation of an inclusive, transparent and responsive process.[87] The next section explores the nature of citizen involvement and how opposition can be harnessed to improve the siting of wind turbines.

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[81] Patrick Devine-Wright, *Beyond NIMBYism: Toward an Integrated Framework for Understanding Public Perception of Wind Energy*, 8 WIND ENERGY 125, 133 (2005).

[82] *Id.*; *c.f.* Vicki Been, *Compensation Siting Proposals: Is It Time To Pay Attention?,* 21 FORDHAM URB. L.J. 787, 796–801 (1994) (referring to general surveys finding that involvement in monitoring had a greater impact on public perception of hypothetical hazardous waste treatment facilities).

[83] At South Point on the Island of Hawai'i, two rows of towers have not been removed despite the fact that they are no longer in use. This creates an eyesore on an otherwise inspiring landscape and is likely to engender some distaste for wind energy producers (as it did in this author).

[84] *See* Karen N. Scott, *Tilting at Offshore Windmills: Regulating Wind Farm Development Within the Renewable Energy Zone*, 18 J. ENVTL. L. 89, 111 (2006) (speaking specifically to the United Kingdom's plan for decommissioning wind power sites according to their 2004 Energy Act).

[85] *Wind Power*, *supra* note 61, at 24.

[86] *Id.* at 27.

[87] *See generally,* Sean F. Nolon, *The Lawyer as Process Advocate: Encouraging Collaborative Approaches to Controversial Development Decisions,* 27 PACE ENVT. L. REV. 103 (2009).

II. Citizen Involvement: From Opponents to Advocates

This section looks at the many different opinions of citizen involvement ranging from derogatory to salutary and explores the nature of opposition with an aim to understanding how processes can lead to constructive engagement. The goal is to develop a better appreciation of how citizens become opponents and some of the cognitive phenomena that define their experiences. Building off of this understanding, this section then explores how process options have been used to satisfy opponents' needs and interests.

A. The Conventional View of Citizen Involvement

To some applicants, citizen involvement is synonymous with opposition. The belief that opposition often serves as an impasse to implementing well-developed and planned wind energy infrastructure policies must be balanced with the reality that opposition plays an important civic function. The goal for proponents of wind turbine siting policies should be to design processes that minimize the destructive effects of typically adversarial processes that avoids fanning the flames of opposition and still put together a proposal that will meet their objectives. Citizen involvement should not just be an afterthought—an inconvenient consequence of participating in the approval process.

Before exploring the nature of citizen opposition, an exploration of the underlying assumptions is helpful to frame the circumstances under which opposition arises. Even the most disinterested observer of community dynamics is likely familiar with the notion of "Not-In-My-Back-Yard" ("NIMBY") opposition. These are citizens who seem to greet any development with staunch opposition. According to a simplistic and derisive vision of NIMBYs, they are people motivated solely by self-interest, afraid of change and uninformed of the benefits that result from new development.[88] Their protests over-emphasize the costs of a project, exaggerate the risks of negative impacts on the community, and treat any benefits as illusory and inadequate. NIMBYs are often characterized as selfish, simple-minded, ignorant, arrogant and parochial.

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[88] *See* Robert W. Lake, *Planners' Alchemy Transforming NIMBY to YIMBY: Rethinking NIMBY*, 59 APA J. 1, 87 (1993); *see generally* Gregory E. McAvoy, Controlling Technocracy: Citizen Rationality and the Nimby Syndrome (1999); Barry G. Rabe, Beyond NIMBY: Hazardous Waste Siting in Canada and the United States (1994).

Their efforts to highlight real and perceived risks are pursued with callous disregard for any community benefits that may result from the proposed project.[89] As many developers and government officials know, NIMBY campaigns should not be taken lightly; they are incredibly effective at stopping developments, for better or for worse.

An equally simplistic, but favorable vision of NIMBYs is that of David against Goliath. The courageous and resourceful citizens who take an unpopular cause defending valuable, but under-protected, community resources against well-funded, ruthless and rapacious corporations.[90] This is the NIMBY as savior who, at risk of great personal and financial loss, sets out to hold governmental officials accountable, to make sure that treasured community resources are not stolen, and rail against back-room deals that only line the pockets of a select few. There are many examples of citizens who have done "good" by opposing ill-conceived proposals.[91] Many of the pivotal moments in environmental law are the result of NIMBY-like opposition that produced broad benefits, for which many are thankful.[92] On balance, citizen opposition plays an important role in making wise use of community resources.

The siting of wind turbines provides an opportunity to observe the full landscape of oppositional behaviors. A number of groups have formed to oppose site-specific turbine projects.[93] The effec-

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[89] *See* Gary Abraham, *Concepts of Community in Environmental Disputes: Farmersville and Western New York's Garbage Wars*, 7 BUFF. ENVTL. L.J. 51, 54 (2000); S. FRED SINGER & DENNIS T. AVERY, UNSTOPPABLE GLOBAL WARMING 251 (2007); MICHAEL P. SANT, ROBERT J. FLAVELL & PATRICK F. FOX, NIMBY WARS: THE POLITICS OF LAND USE (2009).

[90] *See generally* ROBERT D. BULLARD, DUMPING IN DIXIE: RACE, CLASS, AND ENVIRONMENTAL QUALITY (1990) (discussing the imposition of unwanted facilities on a disempowered community); Clarice E. Gaylord & Elizabeth Bell, *Environmental Justice: A National Priority in* FACES OF ENVIRONMENTAL RACISM: CONFRONTING ISSUES OF GLOBAL JUSTICE 29–38 (Laura Westra & Bill E. Lawson eds., 2001).

[91] *See generally* JOHN CRONIN & ROBERT KENNEDY, JR., THE RIVERKEEPERS: TWO ACTIVISTS FIGHT TO RECLAIM OUR ENVIRONMENT AS A BASIC HUMAN RIGHT (1997); DEVRA DAVIS, WHEN SMOKE RAN LIKE WATER: TALES OF ENVIRONMENTAL DECEPTION AND THE BATTLE AGAINST POLLUTION (2002).

[92] The preservation of Storm King Mountain on the banks of the Hudson River and the effort to preserve and restore Mono Lake in Southern California are two of many examples. *See* David Sive, *The Litigation Process in the Development of Environmental Law*, 19 PACE ENVTL. L. REV. 727, 734 (2002); Craig Anthony (Tony) Arnold, *Working out an Environmental Ethic: Anniversary Lessons from Mono Lake*, 4 WYO. L. REV. 1, 48 (2004).

[93] For example, *see Better Plan Wisconsin*, http://betterplan.squarespace.com/ (last visited Feb. 3, 2011); *Alliance to Protect Nantucket Sound*, http://org2.democracyinaction.org/o/6891/content_item/threats-environment (last visited Feb. 3, 2011); *National Wind Watch: Wind Energy Opposition and Action Groups*, http://www.wind-watch.org/affiliates.php (last visited Feb. 3, 2011).

tiveness of these groups has been mixed, but, as efforts to site new turbines increase, these groups can be expected to respond with increased sophistication and effectiveness. To realize the potential for wind energy generation, the proponents must effectively engage this growing opposition and use it productively. Doing so requires a more nuanced appreciation of citizen involvement and the nature of opposition.

B. Citizen Opposition Explored

The traditional approach to dealing with opponents is first to rationally engage them through education. The assumption is that once the right facts are explained, they will see the wisdom of the proposal and drop their concern. Anyone who does not buy-in after attempts to educate is treated as irrational and should be marginalized in future interactions.[94] As a result, these tactics lead to increased hostility and an emphasis on discrediting the other side instead of focusing on the underlying facts.[95]

Many studies have revealed that NIMBYism is not fueled by ignorance and cannot be managed through a lens of rational decision-making that simply provides more information and education.[96] A more robust analysis shows how community opposition, while rooted in rational decision-making, is related to a wide range of psychological principles that have been more thoroughly explored in recent years. For example, research shows that community opposition is "related to social perception of risk, to the complex process of attribution of causes, and to perceived inequity."[97] The remainder of this section provides a structure for understanding the importance of these principles by looking at three central components of a typical siting decision: first, how the community responds to the applicant; second, the community's attach-

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[94] *See* MICHAEL O'HARE ET AL., FACILITY SITING AND PUBLIC OPPOSITION 85–90 (1983); Larry Susskind, *Overcoming The Not-In-My-Back-Yard (NIMBY) Syndrome*, MEDIATE.COM (Aug. 2010), http://www.mediate.com/articles/SusskindLbl20100823.cfm.

[95] SUSAN L. CARPENTER & W.J.D. KENNEDY, MANAGING PUBLIC DISPUTES: A PRACTICAL GUIDE FOR GOVERNMENT BUSINESS, AND CITIZENS' GROUPS 16 (2d ed. 2001).

[96] Eric R. A. N. Smith & Holly Klick, *Explaining NIMBY Opposition to Wind Power* 4 (2008), *available at* http://www.polsci.ucsb.edu/faculty/smith/wind.pdf ("The claims that project critics lack relevant knowledge and are responding emotionally or irrationally have been rejected by a number of studies.").

[97] E. Pol et al., *Psychological Parameters to Understand and Manage the NIMBY Effect*, 56 REVUE EUROPEENE DE PSYCHOLOGIE APPLIQUEE 43, 43 (2006).

ment to the status quo; and third, how the typical decision-making process ignores emotions, and what effect that has on the involved parties.

1. Responding in Kind

How an applicant prepares and presents a proposal will affect how the community responds to it.[98] If the applicant keeps the community at a distance, withholds critical information, surprises the community with new information, and makes attempts to marginalize dissenters, the community will likely respond in kind. In *The Evolution of Cooperation,* Robert Axelrod explains how competitive behavior from one side leads to reciprocal behavior from others involved in the interaction.[99] The tactics used by the proponents shapes tactics used by the opposition.

While the resulting escalation of hostility is well known to most people, there are several reasons why it is difficult for parties to avoid getting caught in this spiral. Four cognitive barriers that present the primary obstacles to overcoming the trap of competitive interaction include: (i) naïve realism; (ii) optimistic overconfidence; (iii) reactive devaluation; and (iv) mythical fixed pie.

According to naïve realism,[100] people believe that they see "the world as it is," causing them to over-weigh information that confirms their existing beliefs and under-weigh any disconfirming information. For example, in a study by The Cultural Cognition Project, a scientific report was given to two groups with different views on climate change. After reading the study, both groups believed that the report confirmed their pre-existing beliefs.[101] In an even more disturbing study, it was revealed that people will go to great lengths to minimize the effectiveness of communication that contradicts their beliefs.[102] A message about the dangers of smoking was played to a group of non-smokers and to a group of smok-

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98 Nolon, *supra* note 87, at 129–33.

99 Robert Axelrod, The Evolution of Cooperation 7–12 (1984).

100 *See* Richard Birke, *Neuroscience and Settlement: An Examination of Scientific Innovations and Practical Applications*, 25 Ohio St. J. on Disp. Resol. 477, 493 (2010) (also called *biased assimilation* and related to *confirmation bias* or *confirmatory evidence bias* where parties look for information that buttresses preexisting hypotheses in places likely to produce it).

101 *See* Christopher Joyce, *Belief in Climate Change Hinges on Worldview,* NPR (Feb. 23, 2010), http://www.npr.org/templates/story/story.php?storyId=124008307 (reporting on the findings of The Cultural Cognition Project, a group of scholars who study how cultural values shape public perceptions and policy beliefs). *See also The Cultural Recognition Project at Yale Law School*, http://www.culturalcognition.net/ (last visited Feb. 18, 2011).

102 Jonah Lehrer, How We Decide 207 (2009).

ers. The recording was designed to have static that could easily be removed by pressing a button. While listening to the message, it was the group of non-smokers who were more inclined to push the button and remove the static, while the smokers tended to leave the static in place. In the community context, naïve realism can cause opponents to overvalue behavior that confirms their pre-existing suspicions of the developer and local officials. "We all silence the cognitive dissonance through self-imposed ignorance."[103]

According to the second phenomena, optimistic overconfidence, parties assess elements of uncertainty optimistically to favor the outcomes they desire. In experiments where subjects are asked to assess their level of confidence in their answers, they consistently assign a higher percentage to their results than is, in fact, the case. For example, when subjects were asked to decide on a group of two-option questions for which they were seventy-five percent certain they chose correctly, they were only correct sixty percent of the time.[104] When negotiating in groups, we find the pattern changes slightly in two ways. First, under the right conditions, groups can make more accurate judgments than individuals,[105] and second, that groups can also suffer from overconfidence.[106] Similar to simpler studies, ninety-eight percent of the participants in group exercises felt that their results were better than the average.[107] This is even more pronounced when groups are engaged in cooperative interaction as compared to those engaged in competitive interactions.[108] Groups tend to amplify optimistic tendencies.[109] This is an important observation to consider when designing a dispute resolution process. If parties working in a group are too cooperative, and are not questioning their assumptions, it is possible that any agreement they reach will not reflect the sensibilities of the broader community. In these situations, a mediator can manage the process to ensure that there is a healthy mix of behaviors

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103 *Id.*

104 MARGARET A. NEALE & MAX H. BAZERMAN, COGNITION AND RATIONALITY IN NEGOTIATION 53 (1991).

105 *Id.* at 106 (citing Sniezek and Henry (1989)); *see also* JAMES SUROWIECKI, THE WISDOM OF CROWDS iii (2004).

106 NEALE & BAZERMAN, *supra* note 104, at 106.

107 *Id.*

108 *Id.* (citing Boje and Murnighan (1982)).

109 Cass R. Sunstein, *Deliberative Trouble? Why Groups Go to Extremes*, 110 YALE L.J. 71, 85–96 (2000).

that will lead to more accurate assessments. The same may not be true for groups whose efforts are not organized by a mediator.[110]

Reactive devaluation arises in the context where parties are evaluating the attractiveness of offers from other parties. For example, a citizen is evaluating the developer's offer to install siltation fences to protect water quality. The oppositional relationship among the parties produces two conditions: "(1) things that are offered are less valuable than things that are not offered; (2) offers from an opponent are evaluated according to the status of the offeree relative to the offeror."[111] If the proponent is perceived as an adversary, the proposal is likely to be devalued simply through association with the source of information.[112] For example, if a wind developer makes an offer to mitigate some impact, those in the community who view the developer with suspicion are likely to see the offer as insincere and inadequate. A neighbor might state, "If she is offering it, it must not be valuable." This is related to the third principle, known as the mythical fixed pie, which leads parties to believe that if one side gets something they want, the other side must give up something they want.[113] According to this principle, there is no room to create value and any attempt to do so will only disadvantage one side over the other. With these three phenomena unabated, the parties are likely to engage in a downward spiral of adversarial and destructive interactions that we have all seen before.[114] It is up to the applicant to manage the process in a different way—in a way that does not encourage an oppositional and adversarial framework.

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110 Cass Sunstein presents the case for group polarization in homogeneous groups but does not address the impact of an effective mediator who can work against polarization. A mediator who asks parties to explain why their assumptions might be wrong has the effect of decreasing overconfidence. *See id. See also* NEALE & BAZERMAN, *supra* note 104, at 55.

111 *See* Birke, *supra* note 100, at 495. *See also* NEALE & BAZERMAN, *supra* note 104, at 75–77, 106–07.

112 A study was conducted where a group of U.S. citizens was asked to assess the fairness of treaty provisions with Russia. The study found that the citizens' assessments were highly correlated with who the subjects were told suggested the provision. The subjects that were told the Americans suggested the provision were more likely to find the proposal fair. Subjects who were told the Russians suggested the provision were more likely to find the proposal unfavorable. *See* DEEPAK MALHORTA & MAX H. BAZERMAN, NEGOTIATION GENIUS 110–11 (2007).

113 NEALE & BAZERMAN, *supra* note 104, at 76; MALHORTA & BAZERMAN, *supra* note 112, at 111.

114 CARPENTER & KENNEDY, *supra* note 95, at 17.

2. Maintaining the Status Quo

Obviously, when wind turbines are proposed, they will impact the immediate and surrounding areas by placing large structures in shared vistas, building roads through working landscapes and increasing the local need for future transmission lines.[115] There is an ingrained bias in most of us towards maintaining the status quo. The bias is caused by a host of psychological phenomena, particularly *prospect theory, endowment effect pseudo/true sacredness and concession aversion.* Therefore, how parties view the resource that is being adversely affected and how they evaluate the alternatives should be taken into consideration when designing an application strategy. The process matters because parties' assessments of the proposal are closely linked to how the proposal is framed and presented.[116] The presentation will play a role in parties' perception of the risks and benefits.[117] "Many equivalent deals are accepted or rejected depending on the framing of the offer as opposed to the value of the offer."[118] In situations where parties are evaluating potential gains, they will tend to be more risk averse.[119] In situations where parties are evaluating potential losses, they will tend to seek more risk.[120] For example, gamblers are more likely to make higher bets when they are down than when they are up. While this is easily illustrated in a two-party context, in group negotiations, the interaction is more complex, making it more difficult to impose a dominant frame.[121]

Central to the concept of maintaining the status quo is our inclination to place higher value on things we feel we own.[122] Studies have shown that negotiators who possess an object adopt different reference points to those objects than others.[123] In the community context, if a group of residents feels a sense of owner-

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115 *See supra* Part I.

116 Geoff Ball, *What Works When: Matching Leadership Style to Conflict Type, in* MARGARET S. HERRMAN, RESOLVING CONFLICT: STRATEGIES FOR LOCAL GOVERNMENT 4–5 (1995).

117 This point builds off of work by Daniel Kahneman and Amos Tversky who won a Nobel prize for their work on prospect theory. *See generally* Daniel Kahneman & Amos Tversky, *Prospect Theory: An Analysis of Decision Under Risk,* 47 ECONOMETRICA 263 (1979).

118 Birke, *supra* note 100, at 497.

119 *Id.* at 519; LEHRER, *supra* note 102, at 70–81.

120 Birke, *supra* note 100, at 519; LEHRER, *supra* note 102, at 70–81.

121 Some research shows that the ability of a group to follow a dominant frame depends on the consensual norms of the group. *See* NEALE & BAZERMAN, *supra* note 104, at 105.

122 *See generally* Daniel Kahneman et al., *Experimental Tests of the Endowment Effect and Coase Theorem*, 98 J. POL. ECON. 1325 (1990).

123 LEIGH THOMPSON, THE MIND AND HEART OF THE NEGOTIATOR 18–19, 307–08 (4th ed. 2009).

ship over a common resource, like a viewshed a watercourse, or a park, they will place higher values on that resource than those who do not share the ownership sentiment. The applicability of this principle may be further complicated in the land use context by the fact that the applicant is often the actual owner of the land perceived as a community resource. In these situations, a principle labeled *pseudo/true sacredness* can cause the opposition to feel the loss more acutely and lead to more intense commitment to opposition.[124]

Another phenomenon that drives parties' preferences for maintaining the status quo is the fact that we place more value on losses than on gains.[125] "[P]eople typically require a potential gain of at least $100 to make up for exposure to a potential loss of $50 because the subjective impact of losses is roughly twice that of gains."[126] *Concession aversion* or *status quo bias* suggests that a party's preference for avoiding losses discourages them from making concessions.[127] Studies of siting decisions have shown that "residents are more likely to be concerned with the potential negative impacts from a waste facility than they are to be attracted by the benefits of the same magnitude."[128] Overcoming this principle may require the reframing of a siting decision as a gain instead of a loss.

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[124] The guiding conceptual framework is the sacred-value-protection model which maintains that: (a) moral communities tend to treat certain values as sacred, as though (at least at a rhetorical level) the community has an unbounded or infinite commitment to the values that precludes trade-offs, compromise, or other mingling with secular values or considerations; (b) members in good standing in the moral community are supposed to direct the moral outrage at those who mix secular and sacred values considerations (and indeed are supposed to engage in meta-norm enforcement: to punish those who fail to punish); (c) members of the moral community who have merely witnessed the profanation of sacred values are also supposed to engage in moral cleansing to purify the self and to reaffirm solidarity with the normative order.

Dr. Phil Tetlock, *Overview*, SOCIAL PSYCHOLOGY NETWORK, *available at* http://tetlock.socialpsychology.org/ (last visited Feb. 18, 2011).

[125] *See generally* Amos Tversky & Daniel Kahneman, *Loss Aversion in Riskless Choice: A Reference-Dependent Model,* 106 Q.J. ECON. 1039 (1991) (in consumer choice situations there is significant evidence suggesting that losses have greater impact on preferences than gains).

[126] Birke, *supra* note 100, at 520 (quoting Sabrina M. Tom et al., *The Neural Basis of Loss Aversion in Decision-Making Under Risk,* 315 SCIENCE 515, 515 (2007)).

[127] *See* Birke, *supra* note 100, at 497 (citing Russell Korobkin, *The Status Quo Bias and Contract Default Rules,* 83 CORNELL L. REV. 608 (1998)). *See also* Howard Kunreuther et al., *Siting Noxious Facilities: A Test of the Facility Siting Credo*, 13 RISK ANALYSIS 301, 303 (1993) (citing W. Samuelson & R. Zeckhauser, *Status Quo Bias in Decision Making*, J. RISK & UNCERTAINTY 1, 7–59 (1989)).

[128] Kunreuther et al., *supra* note 127, at 303 (citing C. Zeiss, *Community Decision-Making and Impact Management Priorities for Siting Waste Facilities*, ENVTL. IMPACT ASSESSMENT REV. 11, 231–55 (1991)).

Similarly, Ellsberg's paradox, which posits that we prefer known risks to unknown risks, suggests that some parties in a community dispute may prefer to take their chances with the required decision-making process instead of attempting to negotiate a solution.[129]

While knowing these principles are at work can provide an opportunity to reshape siting decisions, these situations are often so complex that it is difficult to determine which principles are engaged at any given time.[130] Applying the lessons to complex, multi-party, multi-issue negotiations can be challenging as most of the principles have been studied in the individual consumer choice context. Moreover, they have been identified through controlled experiments designed to isolate behaviors. Still, an awareness of these behavioral norms can be very helpful when planning to engage citizens in policy and siting decisions with potential opponents.[131] For example, it is valuable to recognize that citizens may be more concerned with the costs and risks of a project, not because they are selfish and simple-minded, but because they tend to perceive losses greater than the benefits. "The claims that project critics lack relevant knowledge and are responding emotionally or irrationally have been rejected by a number of studies."[132]

Fortunately, studies of community opposition, both generally and as applied to wind turbines, give us valuable information about the efficacy of legislative approaches to siting controversial facilities.[133] While siting decisions present obviously complex and variable conditions that shape opposition, there are some common themes and findings worth mentioning. Kunreuther and colleagues identify three motivating forces of opposition: disagreement about

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129 *See* Birke, *supra* note 100, at 494 (citing Daniel Ellsberg, *Risk, Ambiguity, and the Savage Axioms,* 75 Q.J. ECON. 643 (1961)).

130 *Id.* at 497.

131 Some studies have explored how these principles change in the group compared to individual context. *See, e.g.*, AMIRA GALIN ET AL., THE ENDOWMENT EFFECT IN INDIVIDUAL AND TEAM NEGOTIATIONS (Apr. 2006), *available at* http://y2007.recanati.tau.ac.il/Eng/_Uploads/dbsAttachedFiles/WP_8-2006_Galin_Gross.pdf (confirming some of Professor Sunstein's observations in *Deliberative Trouble*, *supra* note 107).

132 Smith & Klick, *supra* note 96, at 4.

133 *See generally* Michael Wheeler, *Negotiating NIMBYs: Learning from the Failure of the Massachusetts Siting Law*, 11 YALE J. ON REG. 241 (1994); Been, *supra* note 82; Devine-Wright, *supra* note 81; Pol et al., *supra* note 97; William R. Freudenburg & Susan K. Pastor, *NIMBYs and LULUs: Stalking the Syndrome*, 48 J. SOC. ISSUES, 39–61 (1992); Smith & Klick, *supra* note 96; Kunreuther et al., *supra* note 127; RABE, *supra* note 88; O'HARE ET AL. *supra* note 94, at 85, 90.

values and goals, maintaining the status quo, and lack of trust.[134] Similarly, Pol and colleagues attribute community opposition to social perception of risk, the complex process of attribution of causes, and to the perception of inequity.[135] Devine-Wright elaborates on these observations with a sweeping literature review suggesting that proximity to a facility and involvement in both decision-making and revenue sharing have significant impacts on the nature and extent of community opposition.[136] Finally, in his assessment of the failed attempt to improve the siting of hazardous water treatment facilities in Massachusetts, Michael Wheeler advises against restricting local authority, mandating negotiation among applicant and community, and imposing an arbitration mechanism if no agreement is reached. Before setting out a framework to improve decision-making, it will help to look at how the decision-making process does (not) deal well with most of these phenomena.

3. From Opponents to Advocates (or "How the Typical Decision-Making Process Ignores Emotions and What Can Be Done About It")

In *Descartes' Error*, Antonio Damasio makes the case that mind and body are inextricably linked and that our attempts to separate rational discourse from feelings and emotions inaccurately depict how the brain functions.[137] We can see this Cartesian error in the way most required decision-making processes operate. Through *notice* of an action and *opportunity to be heard* on the merits, the citizenry should be content to have the proposed action rationally explained. No space is created to deal with the feelings and emotions associated with the proposed action and any attempt to express them is met with ambivalence, if not hostility. While the last twenty years of scientific research have debunked the separation of mind and body,[138] society (and especially government) has been slow to adopt new practices that more accurately reflect the connection between rational thought and feelings.[139]

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134 *See generally* Kunreuther, *supra* note 127.

135 *See* Pol et al., *supra* note 97.

136 *See generally* Devine-Wright, *supra* note 81.

137 ANTONIO R. DAMASIO, DESCARTES' ERROR: EMOTION, REASON AND THE HUMAN BRAIN 245–52 (1994).

138 *Id.*; Birke, *supra* note 100, at 490 ("Rationality, in the strict, old-school sense of a robotic and effective utility maximizer, has fallen off its pedestal.").

139 There are, of course, exceptions where society has made the connection by instituting new practices that reflect the connection. One could argue that the intervener funding mechanism present in the California Environmental Quality Act recognized the value of more robust en-

Realizations about these links are critically important for improving the way wind turbines are sited. Since dealing with local opposition involves emotional as well as rational engagement, any process must address the emotions associated with the proposed action. The most effective way to affect emotional pathways is through involvement, engagement and empowerment.

By involving citizens in the process authentically, they will trust it more. The more parties trust in the process, the more likely they are to accept the outcome. Involvement has the effect of reducing opposition by dealing directly with the psychological phenomena identified in the previous section. Much of this has to do with how our brains process threats, both actual and metaphorical.[140] Since human brains were not created from scratch, but rather evolved from simpler platforms, our brains use identical pathways to process both simple (an actual threat) and complex (metaphorical threats) thought processes. For example, the feeling of disgust associated with smelling rotting meat is processed in the same location (the insula) as feelings that arise when experiencing a morally reprehensible act.[141] Similarly, our brains use the same areas to process actual and metaphorical threats.[142] The rustling of leaves that might suggest a tiger preparing to pounce fires a similar neurological pathway as the perceived threat of a proposed wind farm on a cherished ridgeline. By relying on redundant pathways, the brain links literal threats and the metaphorical threats, giving both the same level of importance and impact. It is no wonder we see such passionate displays of emotion when large projects are proposed.

Behavioral studies have also revealed some clues to pathways that can be used to soothe those fears. Because our brains process these seemingly different events (actual and metaphorical threats) through the same pathways, there are linkages in behavior that shed light on why citizen involvement processes can decrease opposition. Behavioral psychologists have found links between unrelated actions. Consider the following experiments:

> Volunteers were asked to recall either a moral or immoral act in their past. Afterward, as a token of appreciation, [experimenter]

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gagement beyond minimal "notice and comment." *See, e.g.*, Marc B. Mihaly, *Citizen Participation in the Making of Environmental Decisions: Evolving Obstacles and Potential Solutions Through Partnership with Experts and Agents*, 27 PACE ENVTL. L. REV. 151, 225 (2009).

140 *See* Robert Sapolsky, *This is Your Brain on Metaphors*, N.Y. TIMES (Nov. 14, 2010), http://opinionator.blogs.nytimes.com/2010/11/14/this-is-your-brain-on-metaphors/.

141 *Id.*

142 *Id.*

> offered the volunteers a choice between the gift of a pencil or of a package of antiseptic wipes. And the folks who had just wallowed in their ethical failures were more likely to go for the wipes.[143]
>
> [V]olunteers were told to recall an immoral act of theirs. Afterward, subjects either did or did not have the opportunity to clean their hands. Those who were able to wash were less likely to respond to a request for help (that the experimenters had set up) that came shortly afterward.[144]
>
> Volunteers would meet one of the experimenters, believing that they would be starting the experiment shortly. In reality, the experiment began when the experimenter, seemingly struggling with an armful of folders, asks the volunteer to briefly hold their coffee. As the key experimental manipulation, the coffee was either hot or iced. Subjects then read a description of some individual, and those who had held the warmer cup tended to rate the individual as having a warmer personality, with no change in ratings of other attributes.[145]

These experiments show how process has a direct effect on how we perceive a situation. They make a strong case that the substance of a proposal is just one of many factors considered by citizens when evaluating how to respond. Dr. Sapolsky points out that this neural confusion gives actions and symbols enormous power over our decision-making process. He explains how Nelson Mandela welcomed the leader of a large Afrikaans resistance group into his homey living room instead of a formal conference room. As a result, resistance between the two "melted away" and they were able to move on to the next chapter in governing South Africa.[146]

Applicants who are aware of the complex nature of cognition should embrace the need for well designed decision-making processes to effectively manage the complicated phenomena that is opposition. The process of proposing a wind farm begins long before the application is filed. The process must include opportunities for the citizen to process metaphorical threats in the same way that it would deal with an actual threat, to explore our aversion to particular ideas, and to reframe conflicting realities. Our brains will only be satisfied after we have had a chance to investi-

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143 *Id.* (citing Chen-Bo Zhong & Katie Lijenquist, *Washing Away Your Sins: Threatened Morality and Physical Cleansing*, 313 SCIENCE 1451, 1452 (2006)).

144 *Id.*

145 *Id.* (citing studies by Lawrence Williams and John Bargh).

146 Sapolsky, *supra* note 140.

gate further. It is arguable that robust and authentic involvement in the decision-making process satisfies this need for investigation. An effective approval process must provide similar opportunities for the participants to investigate on their own. The following section provides a framework for how that process can be structured to allow for that involvement on multiple levels.

III. Citizen Involvement in U.S. Public Policy

A. History and Overview

Historically, citizen involvement in governmental decision-making has consisted of providing notice of a proposed action and giving an opportunity for citizens to be heard.[147] Since the 1960s, the United States has expanded opportunities for citizens to be more informed in the official decision-making process. The National Environmental Policy Act, the Freedom of Information Act, the Administrative Procedure Act, and the Toxic Release Inventory are a few examples of laws that have increased opportunities for citizen input and have increased transparency. However expansive they may have been perceived, these provisions still represent minimal efforts to increase citizen involvement in decision-making processes. Efforts to involve citizens directly in governmental decision-making have showed great promise and produced modest successes. However, not all levels of government have fully embraced such processes.[148] Specifically, three approaches to citizen involvement have produced promising results over the last few decades: participatory planning, negotiated rule making and consensus building techniques. These approaches can be generally grouped under the title of Collaborative Governance.[149]

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147 *See* Werhan, *supra* note 18, at § 3.

148 There are, of course, exceptions illustrated by the ascendance of AmericaSpeaks, the National Coalition of Dialog and Deliberation, and a host of other organizations and efforts that are working to increase citizen participation in U.S. governance.

149 *See, e.g.,* Lisa Blomgren Bingham, *Collaborative Governance: Emerging Practices and the Incomplete Legal Framework for Citizen and Stakeholder Voice*, 2009 J. Disp. Resol. 269, 273–77 (2009). This label, first used in the legal literature by Jody Freeman, in *Collaborative Governance the Administrative State*, has been used narrowly, referring only to negotiated rulemaking, and broadly, referring to a wide range of collaborative approaches to public policy. The framework that follows adopts the broad definition of Collaborative Governance, including a wide range of approaches ranging from participatory planning, negotiated rulemaking, negotiation and mediation.

B. Collaborative Governance

While agencies provide an increasingly dangerous and complex world with much needed expertise and efficiency, their introduction into the civic structure has created a more complicated system of governance. Agencies, by design, move the nexus of decision-making further away from the citizens. This has the effect of making decisions both more remote and more corruptible.[150] To counter this trend, the U.S. has seen an increase in judicial and legislative intervention into the regulatory process in an effort to increase accountability and transparency. Some have argued that this interference has led to an "ossification" and "malaise" that have obstructed agencies from fulfilling their statutory obligations.[151] Enhanced citizen involvement has been advocated as one of the many cures to these ills.[152]

Under the banner of Collaborative Governance,[153] Deliberative Democracy,[154] and Dispute System Design,[155] a host of models have emerged to engage citizens more effectively in governmental decision-making. While these approaches have produced successes,[156] systemic obstacles and cultural biases have slowed their widespread use.[157] Recent efforts of the Obama administration have given exposure to the importance of open government and

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150 *See generally* Robert W. Hamilton, *Procedures for the Adoption of Rules of General Applicability: The Need for Procedural Innovation in Administrative Rulemaking*, 60 CALIF. L. REV. 1276 (1972); WERHAN, *supra* note 18, at 24.

151 *See* Thomas O. McGarity, *Some Thoughts on "Deossifying" the Rulemaking Process*, 41 DUKE L.J. 1385, 1386 (1992); Phillip J. Harter, *Negotiating Regulations: A Cure for Malaise*, 71 GEO. L.J. 1, 2–3 (1982) [hereinafter Harter, *Malaise*].

152 *See generally* Harter, *Malaise*, *supra* note 151; *see generally* Freeman, *supra* note 19; Lawrence Susskind & Gerard McMahon, *The Theory and Practice of Negotiated Rulemaking*, 3 YALE J. ON REG. 133 (1985); Bradley C. Karkkainen, *Environmental Lawyering in the Age of Collaboration*, 2002 WIS. L. REV. 555 (2002); David Fontana, *Reforming the Administrative Procedure Act: Democracy Index Rulemaking*, 74 FORDHAM L. REV. 81 (2005).

153 *See generally* Freeman, *supra* note 19; Philip J. Harter, *Collaboration: The Future of Governance*, 2009 J. DISP. RESOL. 411 (2009).

154 *See generally* Lawrence Susskind, *Deliberative Democracy and Dispute Resolution*, 24 OHIO ST. J. ON DISP. RESOL. 395 (2009); *see also* THE DELIBERATIVE DEMOCRACY HANDBOOK: STRATEGIES FOR EFFECTIVE CIVIC ENGAGEMENT IN THE 21ST CENTURY (John Gastil & Peter Levine eds., 2005).

155 *See* Freeman, *supra* note 19.

156 *See generally* Laura I. Langbein & Cornelius M. Kerwin, *Regulatory Negotiation versus Conventional Rulemaking: Claims, Counterclaims, and Empirical Evidence*, 10 J. PUB. ADMIN. RESOL. THEORY 599 (2000). *See also* Jody Freeman & Laura I. Langbein, *Regulatory Negotiation and the Legitimacy Benefit*, 9 N.Y.U. ENVTL. L.J. 60, 63–68 (2000).

157 *See* Jeffrey Lubbers, *Achieving Policymaking Consensus: The (Unfortunate) Waning of Negotiated Rulemaking*, 49 S. TEX. L. REV. 987, 996–1005 (2008).

have explored the use of technology to assist in that effort.[158] Groups such as America Speaks, the National Coalition for Dialog and Deliberation and the International Association for Public Participation have been promoting and documenting a wide range of collaborative approaches to governance.

This Article will focus specifically on three practices that can help to create an implementable wind energy policy: participatory planning, negotiated rule making, and siting negotiations. The proposed framework in Section IV explains how each approach should be used to accomplish a designated goal as part of a comprehensive citizen involvement plan.

Participatory planning can be used to poll a large, representative group of citizens to identify their priorities on appropriate locations for wind turbines, the amount of wind power desired, and the rate at which fossil fuel use should be phased out. Negotiated rule making can be used to convene a discrete group of affected parties in their effort to reach agreement on the contents of model ordinances, recommended lease provisions, compensation mechanisms, appropriate mitigation measures, and decommissioning provisions. Finally, siting negotiations can be used to ensure that the siting process for individual turbines is tailored to local conditions.

1. Participatory Planning

Participatory planning refers to practices that engage citizens to serve a central advisory role in making important and often complicated policy decisions that do not require specified technical experience or knowledge. These processes have been used to provide valuable information about how to manage financial resources,[159] set energy priorities,[160] manage natural resources,[161] and enable disadvantaged populations to assess their current circum-

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[158] *See President Barack Obama, Open Government Initiative*, *available at* http://www.whitehouse.gov/open (last visited Feb. 20, 2011).

[159] James S. Fishkin et al., *Deliberative Democracy in an Unlikely Place: Deliberative Polling in China, available at* http://cdd.stanford.edu/research/papers/2006/china-unlikely.pdf (last visited Feb. 18, 2011).

[160] For information on deliberative polling efforts in Vermont, Nova Scotia, Texas and Nebraska, see *The Center for Deliberative Democracy, Deliberative Polling: Energy Choices*, http://www.cdd.stanford.edu/polls/energy/ (last visited Feb. 18, 2011).

[161] *See* Yves Renard & Vijay Krishnarayan, *Participatory Approaches to Natural Resource Management and Sustainable Development: Some Implications for Research and Policy*, *available at* http://www.canari.org/docs/275renard.pdf (last visited Feb. 18, 2011).

stances.[162] Some of the labels for these techniques include participatory planning, citizen juries, deliberative polling,[163] participatory budgeting,[164] and citizen boards/advisory committees.

As compared to negotiated rulemaking, participatory planning approaches are not used to reach agreement among a discrete group of stakeholders, but to identify priorities among broad swaths of the community. These approaches can be used to identify appropriate areas for wind turbines, the amount of wind energy desired, and if desired, the amount of fossil fuels to be reduced. In fact, deliberative polling—a popular form of participatory planning—has already been used in Texas to gauge the public's interest in building out the renewable energy infrastructure.[165]

2. Negotiated Rule Making

Negotiated rulemaking is generally defined as a supplemental process in which representatives from agencies and affected interest groups negotiate the terms of a proposed administrative rule.[166] Historically, it has been used at the federal and state levels of government, but it has applicability at the local level as well. The Negotiated Rulemaking Act of 1990 provides the basic structure for agencies to design and implement appropriate processes.[167] This practice has been successfully employed in the U.S. with varying frequency since it was introduced in the early 1980s.[168] Negotiated

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162 *See Building Bridges Between Citizens and Local Governments Through Participatory Planning and Managing Conflicts and Differences,* UN-HABITAT, http://www.unhabitat.org/content.asp?typeid=19&catid=533&cid=4474&activeid=4471 (last visited Feb. 18, 2011).

163 *See generally* JAMES S. FISHKIN, DELIBERATION: NEW DIRECTIONS FOR DEMOCRATIC REFORM (1991).

164 A case study prepared by Prof. Deepti Bhatnagar and Animesh Rathore at the Indian Institute of Management (Ahmedabad) and Magüi Moreno Torres and Parameeta Kanungo at the World Bank (Washington, DC) suggests that participatory budgeting can lead to improved conditions for the poor. *See Participatory Budgeting in Brazil, available at* http://www.siteresources.worldbank.org/INTEMPOWERMENT/Resources/14657_Partic-Budg-Brazil-web.pdf (last visited Feb. 18, 2011). Participatory budgeting was also used in Chicago. *See Chicago's $1.3 Million Experiment in Democracy*, YES MAGAZINE (May 27, 2010), http://www.permaculture.org.au/2010/05/27/chicagos-1-3-million-experiment-in-democracy/.

165 *See The Center for Deliberative Democracy, supra* note 160.

166 *See* Curtis W. Copeland, *Negotiated Rulemaking*, CONGRESSIONAL RESEARCH SERVICE (Aug. 28, 2006), *available at* http://www.assets.opencrs.com/rpts/RL32452_20060918.pdf (describing it as a supplemental process "in which representatives of federal agencies and affected parties work together in a committee to reach consensus on what can ultimately become a proposed rule.").

167 *See* 5 U.S.C. §§ 561 et. seq. (2011).

168 Lawrence Susskind & Gerard McMahon, *The Theory and Practice of Negotiated Rulemaking*, 3 YALE J. ON REG. 133, 159–65 (1985); *see generally* Harter, *Malaise*, *supra* note 151; Matthew J. McKinney, *Negotiated Rulemaking: Involving Citizens In Public Decisions*, 60 MONT. L.

rulemaking was seen as a way to deal with what seemed like a never-ending cycle of regulations being adopted and then being overturned after years of legal appeals.[169] Instead of being limited to the minimal process required for promulgating rules with notice, public comment, and publication of a rule that would then be subject to a lawsuit, many agencies supplemented this required process to get input earlier. This supplemental process came to be called Negotiated Rulemaking or "reg-neg."

Negotiated rulemaking brings interested parties around the table early on, before the rule has been drafted and before the required regulatory approval process is triggered, to see if the affected parties can reach agreement. By setting up a negotiating forum before drafting the rule, the agency can engage those who are most likely to be affected by (and most likely to challenge) a rule. The nature of this negotiation is drastically different than the nature of the formal rule making process because the parties have an opportunity to talk to each other instead of directing all comments through the agency. They can share information about what is important to them and what is not. They are free to collectively explore and evaluate different regulatory possibilities. If all the parties can reach agreement, then the text of their rule becomes the proposed rule that is then subject to the required regulatory process.

The benefits of reg-neg include greater access to key information, ability to rank and trade off interests to maximize value, and opportunities to interact with and educate other stakeholders and bureaucrats.[170] The regulatory negotiation process also facilitates more informed, workable, and pragmatic rules than traditional rulemaking provides.[171] Other studies have identified the following benefits: more interaction builds relationships and increases commitment to a successful result, reg-neg is a powerful vehicle for learning, and a majority of participants consider their contributions to have major or moderate impact on the outcome.[172] For example, reg-negs were effective in negotiating permit modifications

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REV. 499, 513–35 (1999); *contra* Cary Coglianese, *Assessing Consensus: The Promise and Performance of Negotiated Rulemaking*, 46 DUKE L.J. 1255, 1321–36 (1996); *but see* Philip J. Harter, *Assessing the Assessors: The Actual Performance of Negotiated Rulemaking*, 9 N.Y.U. ENVTL. L.J. 32, 54–56 (2000); *see also* Freeman & Langbein, *supra* note 156, at 60.

169 WERHAN, *supra* note 18, at 24–26.

170 *See generally* Daniel J. Fiorino, *Regulatory Negotiation as a Policy Process*, 48 PUB. ADMIN. REV. 764 (1988).

171 *Id.*

172 Freeman & Langbein, *supra* note 156, at 82–101.

under the Resource Conservation Recovery Act ("RCRA"), setting emissions standards for wood stoves, and implementing underground injection controls.[173] Parties involved in the permit modifications under RCRA felt as though they would not have been able to reach the consensus that they did with the conventional approach to EPA rulemaking.[174] The parties considered the open access to information as one of the strengths of using reg-neg. That same open access to information can be used in wind siting negotiations. All parties involved would have the opportunity to express their opinions and why those opinions are important.

Negotiated rulemaking is certainly not appropriate for all situations. When deciding appropriateness, factors taken into consideration should also include the opportunity for trade-offs among parties, the level of conflict, and the importance of gathering information from affected parties, among others. As described further in the next section, reg-neg can be helpful to develop policy on model ordinances, required lease provisions, compensation mechanisms, and decommissioning.

3. Facility Siting Negotiations

In addition to citizen engagement in policy development, a successful turbine siting policy must include opportunities for citizens to participate in siting decisions. This level of involvement is necessary so that mitigations are tailored to meet local conditions and should take the form of pre-application negotiations. To be successful, such negotiations should create a cooperative environment that is designed to build relationships, enhance communication, share information, and generate solutions.[175]

Creative solutions are needed to successfully mitigate the adverse impacts of turbines. The adversarial climate created by the required process creates a structural barrier to identifying creative solutions. Processes that demand adversarial interactions, like the required decision-making process, create barriers to creative solutions.[176] In an adversarial process, communication among the par-

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[173] Fiorino, *supra* note 170, at 766–67.

[174] *Id.* at 766.

[175] Too many options, however, will make it more difficult to choose. *See generally* SHEENA IYENGAR, THE ART OF CHOOSING (2010) (referencing an experiment where too many choices make choosing more difficult because it amplifies self doubt); Chris Guthrie, *Panacea or Pandora's Box?: The Costs of Options in Negotiation*, 88 IOWA L. REV. 601, 603–06 (2003).

[176] *See* Freeman, *supra* note 19, at 11 (citing Harter, *Malaise*, *supra* note 151, at 19–23). Specifically, Harter identifies these grievances about the regulatory process: (1) agencies and private parties tend to take extreme positions; (2) parties may be reluc-

ties is either non-existent or misleading.[177] The parties become more focused on their differences than on their similarities, simulating a sense of oppositeness.[178] The parties are inclined to be suspicious and hostile instead of interacting in the trusting exchanges that can foster joint efforts and rewards.[179] Finally, the parties tend to believe that a conflict will only be resolved by one side imposing a solution on the other.[180] This encourages the belief that one's power is enhanced by minimizing the legitimacy of the other parties' desires and priorities.[181] Creating a cooperative environment allows participants to enter into a different relationship with each other and the dispute. Decision theorists have long recognized that complex negotiations are best handled through cooperative approaches that encourage more holistic perspectives from the participants, which allow for creative exploration of underlying interests, and the evaluation of options that are appropriate to reach a satisfactory outcome.[182]

The types of issues that are appropriate to negotiate in the siting context include mitigation of adverse impacts on biodiversity, water quality, noise and aesthetics, compensation for lost property value and nuisance, monitoring, and decommissioning of facilities once out of use. Monitoring (of construction, operation and decommissioning) and compensation are held out as the most in-

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> tant to show data that may be abused or reveal weaknesses; (3) it is difficult for parties to join forces to directly address factual and policy questions; (4) parties have difficulty expressing true concerns for fear of losing on minor issues without gaining concessions; (5) parties raise every issue with equal emphasis and raise more issues than may be necessary in order to preserve them for later; (6) parties present their concerns to the decisionmaker rather than directly to each other; (7) the issues in controversy may be limited to those within the jurisdiction of the forum though they may not be what truly separates the parties; (8) adversarial processes are unsuitable for resolving polycentric disputes involving many parties and many possible outcomes; (9) parties engage in defensive research to bolster the factual record supporting their positions; (10) the adversarial process breeds specialists whose expertise is the process itself and encourages actual decisionmakers to abdicate responsibility to them; and (11) dialogue bout and exploration of creative solutions to resolve vexing problems is inhibited.

Id.

177 MORTON DEUTSCH, THE RESOLUTION OF CONFLICT: CONSTRUCTIVE AND DESTRUCTIVE PROCESSES 29 (1975).

178 *Id.*; *see also* Jeffrey R. Seul, *Settling Significant Cases*, 79 WASH. L. REV. 881, 907–12 (2004) (discussing how litigation tends to cause one side to assume the other groups' views are more homogenous and extreme than they really are).

179 DEUTSCH, *supra* note 177, at 29–30.

180 *Id.* at 30.

181 *Id.*

182 HOWARD RAIFFA ET AL., NEGOTIATION ANALYSIS: THE SCIENCE AND ART OF COLLABORATIVE DECISION MAKING 392–93 (2002).

fluential issues from the perspective of the community. Surveys of local communities reveal that provisions to include citizens in the design and monitoring of industrial facilities are highly persuasive at changing perspectives from neutral to favorable.[183] Other scholars, following a rational actor model, argue that the compensation issues should be the focus of negotiations.[184] The reality is that some turbine siting negotiations will be incredibly complicated and difficult and must quilt together a host of issues in order to make a passable attempt to avoid impasse.

Due to the varied nature of negotiations, some will take the form of "deal making" processes while others will involve more "dispute resolving" orientations.[185] In either event, these negotiations should follow a basic structure that starts with gathering information, identifying interests, generating options, evaluating those options and then implementing any agreement that is reached.[186] Ideally, one party should be designated as a process manager to shepherd the negotiation through this structure. In substantively complex negotiations where relationships are strained, the parties should strongly consider using a process manager who is a neutral party with skills in mediation and facilitation.

Finally, siting negotiations should not be seen as a substitute for the required decision-making process. They should be used before the required process begins, or early on, as a way to negotiate a concept that will meet as many interests as possible. That concept can then be converted into an application and submitted to the appropriate decision-making body. In this way, the siting negotiations are intended to supplement the required decision-making process. Such negotiations do not, in any way, subvert the required process.[187] In fact, by utilizing these pre-application negotiations the required process is likely to function more efficiently and produce satisfying results for all involved.

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183 *See* Been, *supra* note 82, at 796–800.

184 O'Hare et al., *supra* note 94, at 85, 90; *but see* Wheeler, *supra* note 133, at 278–80 (pointing out how the Massachusetts' compensation scheme was perceived as an effort to "bribe" the community into accepting a facility).

185 *See generally* Frank E.A. Sander & Jeffrey Rubin, *The Janus Quality of Negotiation: Dealmaking and Dispute Settlement*, 4 Negot. J. 109 (1988).

186 *See generally* Christopher Moore, The Mediation Process: Practical Strategies for Resolving Conflict (3rd ed. 2003).

187 This commonly cited, but uninformed criticism, reflects a failure to understand how collaborative processes fit into the required process. *See* William Funk, *Bargaining Toward the New Millennium: Regulatory Negotiation and the Subversion of the Public Interest*, 46 Duke L.J. 1351, 1356 (1996).

IV. A Framework for Citizen Engagement in Siting Wind Turbines

The U.S. has enough wind capacity to generate a significant amount of our domestic energy yet our progress to realize that potential is limited. One problem is the lack of a comprehensive federal policy to promote wind power.[188] Telephone, highway, electricity generation infrastructure, and, more recently, cell phone and Internet infrastructure have benefited from coordinated and comprehensive federal laws and regulations. Obviously, the federal government will play an important role in the build out of our wind power generation infrastructure; the question remains as to how. Many of the proposed solutions fail to incorporate the involvement of citizens. For example, some advocates suggest increased involvement of administrative agencies,[189] the creation of new administrative agencies with sweeping approval authority,[190] or top-down statutory mechanisms that limit local control.[191] A missing component in many of these proposals is recognition of the need for governmental coordination with effective citizen involvement.

As noted by scholars and practitioners, building out our renewable energy infrastructure requires participation from all levels of government.[192] The need for this level of coordination is well established in other areas of environmental policy.[193] The federal government is best suited to identify the contours of appropriate policy, create incentives, and provide technical assistance to those

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188 *See* William H. Meadows, *Letter: Wind and Solar Energy*, N.Y. Times (Nov. 1, 2010), http://www.nytimes.com/2010/11/02/opinion/l02energy.html (stating that, "The smart path to a sustainable energy future means moving from a scattershot approach of project-by-project permitting to clear policies that guide companies to the right places, with early public engagement and consistent environmental review."); *see also* Zeller, *supra* note 23.

189 *See* Rosenberg, *supra* note 16, at 642.

190 *See generally* Susan Lorde Martin, *Wind Farms and NIMBYs: Generating Conflict, Reducing Litigation*, 20 Fordham Envtl. L. Rev. 427 (2010).

191 *See* Salkin & Ostrow, *supra* note 23, at 1082–97 (proposing a federal law similar to the Telecommunications Act that limits local governments' authority to exclude wind turbines); *see also* Alexandra B. Klass, *Property Rights on the New Frontier: Climate Change, Natural Resources Development, and Renewable Energy* (2010), *available at* http://works.bepress.com/alexandra_klass/8 (Wind turbine siting should be subject to state-wide siting and permitting structure "with much more limited local government involvement.").

192 *See* Pursley & Wiseman, *supra* note 27.

193 *Id.* at n.224 (quoting Daniel B. Rodriguez, *The Role of Legal Innovation in Ecosystem Management: Perspectives from American Local Government Law*, 24 Ecology L.Q. 745, 747–48 (1997)) ("[t]he necessity of inter-governmental collaboration is a settled principle in the emerging literature on biodiversity protection.").

who are willing to participate. State governments are the best entities to designate appropriate areas and develop guidance (with citizens) on model local ordinances, draft regulations, and decommissioning. Local governments are best suited for siting turbines because they are most likely to know what is best for their area and know what is appropriate for their constituents. Without more intergovernmental coordination wind energy policy will continue to produce disappointing results. Our current approach does exactly that—it relies on state renewable portfolio standards and on temporary federal incentive programs, and provides little guidance or support to local governments making the siting decisions.[194]

A. Federal Incentives

A successful federal model could offer greater federal tax incentives than currently exist, subsidies to landowners and producers, technical assistance for policy development and siting decisions, and risk abatement to qualifying states. In order to qualify, states would need to implement a robust citizen involvement program in at least three crucial aspects of wind turbine siting: (1) designating regions that are appropriate for different sizes of wind turbines; (2) addressing adverse impacts through model ordinances, leases, compensation provisions, decommissioning, and mitigation measures; and (3) enabling siting negotiations at the local level.

This model of providing incentives to encourage state and local action has been used successfully in the past. The Coastal Zone Management Act ("CZMA") offers model approach for providing incentives.[195]

> Congress enacted the Coastal Zone Management Act to help preserve natural and man made resources of coastal areas while promoting economic development of those areas. The program does not mandate that states develop their own plan, but provides policies to guide those states that decide to create a plan. States that develop Coastal Management plans consistent with the policies enumerated by the Department of State may receive

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[194] *See* Pursley & Wiseman, *supra* note 27, at n.26 (making the case that local governments should no longer be ignored by cooperative federalism approaches).

[195] Coastal Zone Management Act of 1972, 16 U.S.C. § 1451 et. seq. (2011).

> funding to complete portions of their plans. Once a state adopts a plan, compliance is mandatory.[196]

A structure similar to the CZMA could be adopted to encourage the goals of this framework.

1. Incentives

While the current system of federal incentives outlined in Section I provide some support for wind turbines, many of these programs are short-term and limited in scope. To effectively encourage the construction of wind turbines, investors need to have more opportunity to recover costs and to receive a return on their investment. Nuclear power plants, with the catastrophic risk of a core meltdown, would never be built without federally backed liability insurance. Similar assurances should be made to wind turbine operators to level the playing field. In addition, direct financial incentives for wind energy, like those available to oil refineries and other conventional fuel producers, should be expanded beyond the current portfolio of production tax credits and other incentives.

2. Subsidies

In addition to tax incentives and related devices, the federal government is in an ideal position to offer direct subsidies to wind energy producers. These subsidies can be through direct grants for planning, construction and operation. Funding for these grants can come from a variety of sources, including existing and future taxes on fossil fuel energy producers, and revenue from any carbon trading mechanism implemented in the future. Conventional fossil fuel producers benefit from a host of subsidies that decrease the cost of exploration, extraction, production and energy generation. It has been observed that these subsidies artificially depress the cost of energy production, thus making it harder to finance renewable energy projects. For example, in Italy, where the cost of electricity is three to four times as high as in the U.S., energy generated from wind turbines cost the same, if not less, than energy generated from fossil fuels.[197]

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[196] *See* Sean F. Nolon & Cozata Solloway, *Preserving Our Heritage: Tools to Cultivate Agricultural Preservation in New York State*, 17 PACE L. REV. 591, 641 (1997).

[197] Elisabeth Rosenthal, *Ancient Italian Town Has Wind at its Back*, N.Y. TIMES (Sept. 28, 2010), http://www.nytimes.com/2010/09/29/science/earth/29fossil.html?_r=1&ref=Windpower.

3. Substantive and Procedural Assistance

To make the right decisions about where turbines should go, communities need substantive assistance and process assistance. Substantive assistance can include information about the location of adequate wind resources, best available turbine technologies, a database of existing and model local wind ordinances, sample leases for landowners, and best practices for mitigating adverse environmental impacts. Process assistance comes in the form of decision-making practices that can be used for gathering large groups of citizens for a participatory planning exercise, convening a citizen committee to help with siting a turbine, or running meetings for a negotiated rulemaking process.

4. Municipal Risk Abatement

In most states, the siting of wind turbines is a local matter. Local and regional governments are, most often, the subdivision of government that must either approve or deny an application to construct a wind turbine. In controversial situations, the losing party often challenges these decisions. These judicial appeals are expensive, time consuming, and often have a chilling effect on actions taken in the future. While some of these decisions deserve to be challenged, many are filed to harass and intimidate local boards. One way for any wind energy plan to assist local governments is to allow for the recovery of legal fees for prevailing parties.[198] There are "more than 100 different federal statutes with a 'fee shifting' provision permitting the trial court to award reasonable fees and costs if plaintiff has substantially prevailed."[199] These provisions help local boards make the difficult decisions necessary to implement a wind energy plan. Boards that are sued for denying applications inconsistent with the state plan should be able to recover legal fees and costs if they prevail. Such provisions encourage good faith applications, discourage frivolous lawsuits, and insulate local governments from intimidation.

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[198] Prevailing parties under the Clean Water Act and Section 1983 causes of action can petition the court for an award of attorney's fees and the costs of experts.

[199] Martin E. Halstuk & Charles N. Davis, *The Public Interest Be Damned: Lower Court Treatment of the Reporters Committee "Central Purpose" Reformulation*, 54 ADMIN. L. REV. 983, 1005, n.126 (2002).

B. Qualifying State Programs

These incentives should only be made available to states that meet the goals of the program. In order to qualify, states must adopt a wind turbine siting policy that incorporates significant citizen involvement into the following tasks: identifying areas that are appropriate for different sizes and densities of turbines, identifying best practices for mitigating adverse impacts, and enabling the negotiation of wind turbine siting decisions at the local level. As part of the second requirement—mitigating adverse impacts—states should draft model ordinances that regulate the placement of turbines, draft model leases for land owners to use when contracting with turbine companies, provide for decommissioning of defunct turbines, set goals for energy production from wind power and identify corresponding reductions in fossil fuel use, and establish a public-private entity to provide process and technical support to local siting commissions.

Normal policy making requires a minimal level of public participation to meet the statutory and constitutional requirements of due process while this framework sets a higher bar. To comply with the federal structure, these policy provisions must be adopted through the use of citizen engagement techniques such as participatory planning and negotiated rulemaking. Participatory planning techniques can be used to designate areas appropriate for wind turbines while negotiated rulemaking can be used to identify appropriate mitigation measures.

Texas used deliberative polling, a form of participatory planning, to identify citizens' energy policy priorities. In a report titled, *Listening To Customers: How Deliberative Polling Helped Build 1,000 MW of New Renewable Energy Projects in Texas*, the authors present a case study for how participatory planning techniques can be used to shape energy policy and produce results.[200] Similar techniques can be used very effectively to engage citizens in wind energy policy. Specifically, participatory planning can be used in identifying appropriate areas for wind turbines, appropriate turbine technologies, the amount of wind energy desired as well as other sources of energy.

Negotiated rulemaking approaches can be used to help reach agreement on mitigation measures, compensation mechanisms,

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[200] For information on deliberative polling in Texas, visit The Center for Deliberative Democracy, http://www.cdd.stanford.edu/polls/energy/ (last visited Feb. 20, 2011).

decommissioning, model ordinances, and sample leases. Reg-neg provides the appropriate structure for reaching agreement among stakeholders on the adverse impacts of wind turbines and appropriate mitigation measures. Section I.B above identifies some of the mitigation measures already in use. Mechanisms to compensate for lost property value (both real and perceived) can be very effective to address local opposition. Through reg-neg, parties can explore successful approaches used in other contexts or invent their own approaches. Decommissioning can be addressed through a number of strategies, such as establishing a trigger for decommissioning, posting of bonds to fund dismantling the turbines, and establishing a public review board to monitor progress.[201] The structure found in the Negotiated Rulemaking Act can be used to identify a representative group of affected parties and help them reach agreement on the types of impacts and appropriate mitigation measures.[202]

Once policy priorities are identified and agreements reached on model ordinances, mitigation measures and recommended lease provisions, state legislatures and agencies should convert these findings into laws, regulations and guidelines. This process of conversion would obviously follow the procedures and practices required by law to ensure that the policies adopted are consistent with reasoned deliberation, statutory authorizations and constitutional limitations.

Siting negotiations are a key ingredient in this framework and are necessary to provide local citizens with an opportunity to be involved in the decision-making process.[203] In addition to the above requirements, states must ensure that siting decisions allow the opportunity for negotiation. This opportunity can be available on an ad hoc basis or, as some states provide, through the creation of a local siting board. (A draft overview of a local advisory siting board is included for reference as Appendix A). Citizen involvement in policy development is valuable but very distinct from involvement at the siting stage. At the siting stage, local citizens must have an opportunity to review the proposal, assess the mitigation measures, provide input on conditions, and participate in mon-

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201 *See* O'Hare et al., *supra* note 94, at 67–89.

202 5 U.S.C. §§ 563–568 (2006).

203 *See* Deborah Peel & Michael Gregory Lloyd, *Positive Planning for Wind Turbines in an Urban Context,* 12 Loc. Env't 343, 343–44 (noting that renewable energy policies are often frustrated by "implementation impasses" at the local level where siting of facilities can be stalled for many reasons).

itoring of the facility. Fortunately, the theory and practice of siting negotiations have been thoroughly explored to provide an instructive and effective road map for action.[204] Experience with siting mechanisms for hazardous waste treatment facilities in Massachusetts,[205] Wisconsin,[206] and Alberta[207] reveals valuable information about what to do and what not to do.

While this Article does not attempt to catalog the best practices for negotiated agreements, there are a few lessons worthy of mention. In *Facility Siting and Public Opposition*, the authors identify four conditions that must be present for successful voluntary exchanges in a siting negotiation: (1) each party must possess something to trade; (2) "deals" must be possible that are better than "no deal"; (3) each party must trust that the other will honor its promises; and (4) each party must believe the above is true.[208] Past siting legislation in Massachusetts revealed that local governments are not likely to accept an erosion of their land use authority and should not be forced into mandatory negotiations.[209] Lessons from past experience provide valuable guidance on the basic elements of siting negotiations. Much like agreements reached at the policy level, any agreement reached during a siting negotiation must become part of the wind turbine application and be subject to the rigors of the required decision-making process.

CONCLUSION

Despite demonstrated need and available technology, the promise of wind energy has yet to live up to its potential. As a society, we see the benefits of renewable sources of energy but struggle to implement our vision through siting of new facilities. In

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204 *See generally* LAWRENCE SUSSKIND & JEFFREY CRUIKSHANK, BREAKING THE IMPASSE: CONSENSUAL APPROACHES TO RESOLVING PUBLIC DISPUTES (1987). For further reading on resolving land disputes, see The Lincoln Institute of Land Policy, http://www.lincolninst.edu/subcenters/resolving-land-use-disputes/learn-more/reading_detail.asp?id=3 (last visited Feb. 18, 2011). *See also Case Study: State County Collaboration Leads to Successful Wind Farm Siting,* POLICY CONSENSUS INITIATIVE, *available at* http://www.policyconsensus.org/casestudies/docs/OR_wind.pdf (last visited Feb. 18, 2011) (detailing a case study involving a wind farm in Oregon). *See also* Nolon, *supra* note 87, at 114; Patrick Field, Ona Ferguson & Sean Nolon, NEGOTIATING LAND (forthcoming Lincoln Institute for Land Policy 2011).

205 *See* Wheeler, *supra* note 133, at 255–83.

206 *See* Been, *supra* note 82, at 819–22.

207 *See* RABE, *supra* note 88, at 58–86.

208 O'HARE ET AL., *supra* note 94, at 90.

209 Wheeler, *supra* note 133, at 273–76.

some instances, this gap results from opposition caused by applicants' and regulators' emphasis (read: *over*emphasis) on the substance rather than the process of decision-making. Applicants often enter an approval process expecting that doling out concessions will adequately address citizen opposition. The resulting opposition is often as much a product of *what* was proposed as *how* it was proposed.[210] Attending to procedural needs as well as substantive needs can offer some solace to weary and suspicious citizens and provide the substrate on which a satisfactory solution can be reached.

What this commitment to the minimal level of citizen involvement fails to acknowledge is that citizens are also looking for assurances that regulations will be effective and that applicants can be trusted. Citizens want to be assured that their vision of the community will be protected. Applicants and regulators who fail to make those assurances through the robust involvement of citizens will continue to struggle when siting wind turbines, or any renewable energy facility. They will find that the general societal support enjoyed by renewable resources may not translate to site-specific support. Pairing substantive mitigation (such as setbacks, buried wires, property loss compensation) with procedural mitigations that encourage more citizen involvement (such as participatory planning, reg-neg, and siting negotiation) has been used to bridge this divide between general support and local opposition. For the purposes of siting wind turbines, collaborative approaches should be the centerpiece of any governmental policy aimed at improving wind turbine siting.

[210] I do not suggest that all opposition is solely a product of poor process. There are many wind turbine proposals and projects that are so offensive substantively that no process would serve as a cure.

Appendix A

Draft Local Siting Board

When an eligible wind project is proposed, the application to the principal decision-making body shall not be complete until an advisory board has been assembled to deliberate over the details of the proposal. The board will be convened following best practices of collaborative decision-making. A designated party with appropriate experience and training in mediation and group decision-making shall manage the process. This process manager shall be the unanimous choice of the group. Members shall be appointed by the local elected legislature and shall, at a minimum, represent the following interests: the applicant, adjacent property owners, biodiversity, water protection, aesthetic concerns, and the generation of renewable energy. The local government shall provide adequate technical and advisory support as the group deliberates. Funding for the board shall be provided by the escrow payments from the applicant to the town or some other fiduciary agent. It is recommended that board members receive a modest honorarium. Decision-making of the board shall be by consensus. The board shall deliberate for at most three months. Regardless of whether an agreement is reached, the application may be submitted to the decision-making body after this three-month period. If a consensus agreement is reached, the decision-making board can use that agreement as a basis for its decision. If consensus is not reached, the decision-making board will review the application using its normal procedures.

Revamped Article X Could Be Advantageous For Wind Developers In New York

Elizabeth Grisaru & Terresa Bakner, Thursday 30 June 2011 - 00:00:00

The New York State Senate and Assembly passed the Power NY Act of 2011 on June 22. This legislation ends a long-standing stalemate over power plant siting. The bill enacts a new Article X of the New York Public Service Law (PSL), replacing a statute that lapsed in 2003. The new Article X establishes a centralized certification process for electric generating facilities. All parties expect Gov. Andrew Cuomo, D-N.Y., to sign the bill into law.

The legislation's reach is broad. With limited exceptions, all proposed generation projects exceeding 25 MW, regardless of fuel source, will be included in the new process. Existing facilities that seek modification can do so as long as it would not result in an increase in capacity of more than 25 MW. In addition, facilities constructed on lands devoted to industrial uses are limited to a generating capacity of 200 MW or less.

The new Article X shares many of the features of the old statute: It creates a siting board composed of state agency commissioners and public members; provides intervenor funding for municipalities and local parties; consolidates and coordinates state environmental review and permitting requirements; and provides authority for the siting board to override "overly burdensome" local laws.

The legislation also addresses some matters that were unclear under the prior law. For example, it provides greater detail on issues such as coordinating permitting authority with the New York State Department of Conservation (NYSDEC) on federally delegated programs, such as the Clean Air Act.

The bill also clarifies that connecting transmission lines that do not qualify for Public Service Commission review under Article VII of the PSL will now be subject to the new Article X.

Developers should note that the siting board will not begin accepting applications until after NYSDEC promulgates regulations addressing environmental justice issues and setting standards for power plant carbon-dioxide emissions. The legislation directs NYSDEC to issue these rules within 12 months of the law's enactment. The siting board is also required to issue regulations within the same deadline.

In the interim, projects may proceed under existing law. Any projects that are under a state or local application process on or before the effective date of the new regulations will have the option to continue under that process or opt in to the new process.

Once the siting board is up and running, developers will be offered a pre-application mechanism similar to the practice under the prior law. Applicants, agencies and intervenors can stipulate the scope of the studies to be undertaken and then submitted with the application.

A project sponsor's preliminary scoping statement will be subject to public comment and review,

and developers will be required to provide intervenor funding to ensure substantive public participation in the pre-application phase.

The legislation describes the information that will be reviewed as part of the permitting process and the evaluations that the siting board must make in considering an application. Project developers will be asked to submit information on facility design, environmental and health impacts, economic factors and available alternatives, as well as a determination of any disproportionate impact on a community that would give rise to environmental justice concerns. Developers must also provide additional intervenor funds in the application phase, at least half of which is to be disbursed to municipal parties.

The bill sets a one-year time frame for review and action on a completed application, but the siting board has authority to extend the schedule by another six months.

Expedited processing of an application is available when an existing major electric generating facility would like to expand or add a new facility adjacent to the existing facility, so long as the project results in a reduction in adverse air and water impacts and an improved heat rate.

The new Article X will also require the siting board to make specific findings. Many of these evaluations address the same issues that were assessed under the prior law. Several relate to the identification of the expected environmental impacts of a project. As part of its overall decision, the siting board must be able to conclude that adverse impacts have been avoided or minimized to the maximum extent practicable.

The legislation also requires the siting board to determine whether a project serves the public interest and that it is a "beneficial addition to or substitution for" other electrical generation. This latter standard is new and will have to be interpreted by the siting board, either in its own rulemaking or in future cases.

In addition, the new Article X makes provisions for post-decision challenges and imposes procedural and substantive limits on potential claims. The bill prohibits the use of intervenor funds for litigation purposes. It also provides that aggrieved parties must seek rehearing with the siting board before approaching the courts.

Judicial challenges must be brought in the courts of the Appellate Division, bypassing the trial-court level, within 30 days from the issuance of the siting board's decision on the application for rehearing. The bill also provides for deferential review under the "substantial evidence" standard.

Finally, the new Article X largely divests the state courts of jurisdiction to determine any cases that seek to stop or delay construction of a generation facility that has received a certificate from the siting board.

Energy project developers and financiers may see numerous advantages to the new Article X process, as it provides a clear road map to guide the decision-making process and puts some restrictions on project opponents' ability to delay certificated projects through litigation.

At the same time, there are new elements to the legislation that will need to be developed and interpreted by the siting board through its own rulemaking process over the next 12 months. Developers looking to participate in project siting in New York should pay close attention to the siting board's next steps.

Elizabeth Grisaru is counsel and Terresa Bakner is a partner at Whiteman Osterman & Hanna, an Albany, N.Y.- based law firm. They can be reached at egrisaru©woh.com and tbakner©woh.com.

this content item is from North American Windpower
(http://www.nawindpower.com/e107_plugins/content/content.php?content.8172)

-

From: vt-cms-support@egov.com [vt-cms-support@egov.com]
Sent: Sunday, December 30, 2012 3:15 PM
To: Margolis, Anne
Subject: Comment from Siting Policy Commission site

Submitted on Sunday, December 30, 2012 - 16:15
Submitted by anonymous user: [174.63.16.209]

Name: Thomas A. More, PhD.
Town: South Burlington
Organization: USDA Forest Service (retired)
Title: Research Forester

2) Energy Sources and/or Facilities:
- Wind
- Other Energy Sources, Facilities or General Comment

3) Comment :

In the mid-1990s, the US Forest Service developed its Scenery Management System (SMS) to address aesthetic impacts of clear cuts and other harvesting. The SMS is now regularly used in the preparation of more general EISs. It requires the development of visibility maps and ratings along multiple dimensions (and gives the rating system). I know it has been successfully applied to wind energy projects in Minnesota, and suspect it could provide a useful template for Vermont. The USFS computer system is closed to the public, but the document has been scanned and is available through an outfit called Rawlings Forestry at this link:
http://library.rawlingsforestry.com/fs/landscape_aesthetics/

Alternatively, you can search under Forest Service Scenery Management System. I don't know who, but someone on the staff of the Green Mtn. NF in Rutland will be trained in using the SMS and could help train ANR staff in its use.

--Thomas A. More

-

From: Justin Turco
Sent: Thursday, December 13, 2012 10:49 PM

Subject: America's Most Favored Industry

Is there anyone who DOESN'T think America spends too much money? We do!

We need to quit spending money WE DONT HAVE!

Cutting spending on highly variable, intermittent and inefficient wind energy would be a great place to start.

This is a really good article. Robert Bryce does his homework. Please give it a look.

Respectfully,

Justin Turco
Ira, Vermont

-

From: Vanessa Mills Holmquist
Sent: Sunday, December 16, 2012 10:48 AM
Subject: Sheffield and First Wind article of Dec 2010

Please consider this article.

This is one more reason **among many** that with regard to ridgeline destruction and industrial-/utility-scale wind, we need to **force** a code of conduct upon developers while alsos heavily scrutinizing the actual need **and** broad scope of impacts on our state, associated with this sort of large-scale development.

Respectfully submitted
Vanessa Mills Holmquist

From the Caledonian Record - December 2010
Truck Carrying Explosives Overturns in Sheffield

By Todd Wellington
Staff Writer

SHEFFIELD - A truck carrying 18,000 pounds of explosive material went off New Duck Pond Road in Sheffield and rolled over Monday morning.There were no injuries or explosions, but the road was shut down for most of the day.

The 2004 Mack bulk tanker operated by Jonathan Ingerson, 25, Whitehall, N.Y., was heading up a steep hill about 7 a.m. when it lost traction in snowy conditions and slid backward into a ditch before tipping over onto the driver's side.

The truck, owned by Maine Drilling of Blasting of Gardiner, Maine, was on its way to the Sheffield

wind farm construction site with nearly 2,000 gallons of 1.5 blasting agent used for construction demolition. The tank was not ruptured in the crash, none of the explosive material leaked from the truck and there were no blasting caps on the truck.
Maine Drilling and Blasting officials say the material is a gooey liquid similar in texture to tapioca. They said the blend is so stable and posed so little risk of accidental explosion that the decision was made to just leave the blasting agent in the tank while two commercial wreckers pulled the truck from the ditch.

The truck did leak anti-freeze into a nearby stream. That leak was contained and cleaned up by the Sheffield-Wheelock Fire Department and the state hazardous material response team.

Vermont State Police said an investigation of the crash is being conducted by a Department of Motor Vehicles commercial vehicle inspector. The truck went off the road about a mile from its destination.

Maine Drilling and Blasting vice president Mitch Green was on the scene by 11 a.m. and said he was there to investigate the crash and to make sure the site was properly cleaned up. “We take this very seriously,” said Green.

The Sheffield-Wheelock Fire Department was initially dispatched to the scene at 7:15 a.m. after receiving a report of a rollover about half a mile north of the New Duck Pond/Old Duck Pond Road intersection near the Interstate 91 underpasses.
The dirt roads were slippery with a coating of fluffy new snow at the time of the crash and temperatures were around 30 degrees.

The road was quickly shut down with barricades set up at the intersection. An employee of Maine Drilling and Blasting said he was directed to prevent anyone from coming within 1,000 feet of the scene.

Another truck, a dual-wheel, one-ton pickup towing a trailer load of light-duty pipe, stopped at the foot of Old Duck Pond Road at the intersection of Route 122 in Sheffield. A heavy-duty construction forklift was unloading the trailer with partial loads of pipe and driving the pipe several miles uphill and unloading it at another construction site after the truck was apparently unable to climb the hill. Trucks from the The Sheffield Highway Department were called in to sand the slippery roads.

An emergency rescue van from the Lyndonville Fire Department was also dispatched to the scene. According to Lyndonville Fire Chief Greg Hopkins, the rescue van is well equipped to deal with haz-mat materials and was dispatched to stand by at the scene to assist the Sheffield-Wheelock Fire Department, if necessary. Another crew from the Lyndonville Fire Department stationed a fire truck and crew at the Sheffield-Wheelock fire station to cover for them. Sheffield-Wheelock firefighters cleared the scene just after 4:30 p.m.

The Sheffield wind farm is being developed by the Boston-based First Wind company. Maine Drilling and Blasting is a subcontractor on the project.
First Wind spokesman John Lamontagne said his understanding was that the truck slid on ice.

“Safety is a top priority for First Wind,” he said, “and we take pains to ensure that our contractors – from everything to engineering to construction and operations – working on our projects are qualified and have excellent safety records. Thankfully no one was injured. We applaud the Sheffield Fire Department’s quick response to the accident.”

Staff writers Jim Jardine and Amy Ash Nixon contributed to this story.

▪

From: Rob Pforzheimer
Sent: Wednesday, December 12, 2012 10:02 PM
Subject: NH Union Leader Editorial-View-killing windmills: Blame the politicians

http://www.newhampshire.com/article/20121212/OPINION01/121219766

NH Union Leader.com

December 11. 2012 11:58PM
View-killing windmills: Blame the politicians

EDITORIAL
What started with a small, 12-turbine project in Lempster in 2008 has turned into a run on New Hampshire's ridgelines by large energy companies that want to cover our hills with scores of windmills. Some of them would reach 400 feet tall, 125 feet taller than New Hampshire's tallest building, City Hall Plaza in Manchester. As the scarring of New Hampshire hilltops accelerates, the politicians who promoted this have a lot to answer for.

In 2007, the Democratic-controlled Legislature passed a bill sponsored by Sen. Martha Fuller Clark, D-Portsmouth, which created the state's Renewable Portfolio Standard (RPS). Legislators mandated that at least 16 percent of the state's energy production come from new "renewable" sources such as wind power by 2025 (25 percent from all renewable sources). Suddenly, New Hampshire needed windmills.

The law has cost more than views. Public Service of New Hampshire calculates that the RPS mandate has cost it $58.3 million since 2008. It projects another $19.2 million hit in 2013 alone. Ratepayers bear that burden.

Washington shares the blame. Federal tax credits for power produced by windmills go to huge energy corporations such as Spain's Iberdrola, the company behind several New Hampshire wind farms. A recent study by the Northbridge Group of Concord, Mass., concluded that the tax subsidy "encourages wind developers to locate wind farms with little regard to consumer demand, as long as they can be placed on line and their power brought to market to collect the subsidy," the National Center for Policy Analysis reported this week.

Do-gooders trying to force us to switch from coal to wind power have encouraged the industrialization of scenic New Hampshire ridgelines. That industrialization will not stop until these perverse government incentives are removed.
Comments

To improve the chance of seeing your comment posted here or published in the New Hampshire Union Leader:
- Identify yourself. Accounts using fake or incomplete names are suspended regardless of the quality of posts.
- Say something new, stay on topic, keep it short.
- Links to outside URLs are discouraged, if used they should be on topic.
- Avoid comments in bad taste, write well, avoid using all capital letters
- Don't cite facts about individuals or businesses without providing a means to verify the claim
- If you see an objectionable comment please click the "Report Abuse" button and be sure to tell us why.

Note: Comments are the opinion of the respective poster and not of the publisher.

Michael King said:
Well, all you do gooders voted for Fuller Clark so this is what you get. The new Gov shoud step in and shove down the throats these windmills. Take the property around Newfound Lake by emminant domain. We are required to get 16% renewable well this is one way to do it. Just start taking property from folks, blocking the view who cares, the greenies want it that way. Keep voting in those Dems demanding we ignore our own resources that we have in this country and force this green policy that don't work on the rest of us so they can feel good. I mean doesn't feel good mean a lot more than hard working folks property?
(Report Abuse)
December 12, 2012 5:48 am

Jim Buttolph said:
It's even worse than the editorial suggests. The last line implies that coal is our primary source of power here in NH. False. NH's electrical generation is 50% nuclear (Seabrook doesn't release a smidgen of greenhouse gas and isn't going anywhere), 25% natural gas (emits only about half as much carbon as coal, imported from the hostile nation of Canada, and increasingly produced right here in the USA) and the rest a combination of other renewables like biomass, solar, hydro, and a little coal and fuel oil. So windfarm power, which is erratic and tends to be absent when we need it the most (i.e. heat waves), "offsets" power on our current system that is already among the least offensive in terms of so-called "greenhouse gas" emissions. These things are truly all pain and no gain. The more you learn, the worse it gets.
(Report Abuse)
December 12, 2012 6:42 am
John Mercier said:

Michael King... Constitutional restrictions against it; not to mention no way to finance it. Jim Buttolph... The RPS works on each utility's sourcing mix; not the general State mix. So nuclear (mostly sold to Vermont) doesn't play very big role in the 'offset' process.
(Report Abuse)
December 12, 2012 7:38 am

Chris Herbert said:
Just thank your lucky stars no one's found coal deposits in New Hampshire! That said, the Union Leader should run an in-depth series of articles that takes an unbiased look at our state's particular situation and explains our options. We know that so-called 'negawatts'-electricity not used-is the single most cost effective way to clean up our energy use. Do we have incentives in place to encourage this type of efficiency? Are we encouraging utilities to make money by selling less power than more? Can we encourage geothermal use at the commercial/residential level. How about incentives that encourage solar use at the commercial/residential level? And finally, stop ignoring the the main reasons we need to use more advanced energy systems: They're healthier for everyone and the more we use the more we reduce our trade deficits. Windmills may or may not be the most effective, and efficient, way to increase our use of advanced energy, but an unbiased (I'm not sure the UL can do this, frankly) analysis would be a big public service.
(Report Abuse)
December 12, 2012 8:50 am

frederick hughes said:
Oh, I know. They are just so, well unsightly. That's if you own a camp out on Winni or Newfound lakes. I swear, this state has become a bunch of sissy's! I can only imagine what the people of Holland used to

say. "Hans, you can't put that wind mill there. I won't be able to watch Gertrude hang out her privy wear." Holy milkballs NH. Take a step towards the future. Don't be a "freeze brain" and cry like little baby's when a reputable company which has more money than you have comes along and builds what they want on their land. Not yours. Nuff said? As an old boss used to say, "You don't like it.....there's the door."
(Report Abuse)
December 12, 2012 9:41 am

Dean Frazier said:
Don't you think its a bit hypocritical for this paper to complain about the unsightly wind turbines, but to champion the beautiful Seabrook power plant on our coastline and the very attractive factories and industrial buildings that line our river valleys? By all means, argue the economic feasibility of such projects, but be consistent with your other arguments.
(Report Abuse)
December 12, 2012 9:56 am

Jennifer Littell said:
If New Hampshire's mountains had coal the Union Leader and gang would have so much earth moving equipment in state that in 10 years the state would rename itself East Kansas.
(Report Abuse)
December 12, 2012 10:15 am

Jim Wiegand said:
No energy source is as destructive to the environment or as costly as Wind Energy. For birds the insidious mortality footprint from wind farms reaches thousands of miles. For the people, the fraud footprint from every wind farm extends right back to Washington DC. They have been seen for what they are and it is ugly. The wind industry does not realize it yet, but their days are numbered.
(Report Abuse)
December 12, 2012 12:42 pm

Gary Way said:
Windmill opponents just don't get it-- the windmills are the view!!! I nearly went off 93 the other day rubber necking at the long line of spinning windmills on the Tenney Mountain ridge.... What an amazing sight!!! These windmills proudly display New Hampshires commitment to clean energy..... and tourists will remember that way more than a roadside display of where the Old Man used to be!!!
(Report Abuse)
December 12, 2012 2:26 pm

Jim Buttolph said:
John Mercer - you are confusing how power is priced & purchased with how it is produced. Wind power is balanced into the actual mix of what is powering the grid at that moment, regardless of who bought the power mix. The sale of the power has nothing whatsoever to do with where the electrons flow and from what source. But you do raise a good point. Someone needs to drive a stake through the heart of RPS.
(Report Abuse)
December 12, 2012 2:27 pm

WAYNE STANLEY said:
@frederick hughes said "Holy milkballs NH. Take a step towards the future." *** The future being the use of medieval technology, the windmill.
(Report Abuse)
December 12, 2012 2:30 pm

Chris Herbert said:
Jim Wiegand. You got to get around some. I recommend you drive through W. Virginia's coal production areas. They're turning Appalachia into a polluted wreck. If the federal government ever actually enforced its rules, coal operations would be shut down because they are illegal enterprises.
(Report Abuse)
December 12, 2012 4:11 pm

Jim Wiegand said:
The Wind farm foot print is huge and immediate. Coal production does not cut the heads off eagles that happen to fly through a turbine 2000 miles away from where they nest. Coal operations are not hiding bodies. The disappearing bird populations over the last 2 decades have not come from coal. My fight is with the wind industry and what they are doing so quickly to the world.
(Report Abuse)
December 12, 2012 7:57 pm

From: Rob Pforzheimer
Sent: Thursday, December 13, 2012 10:04 AM
Subject: reduced electricity use in NE

ISO - New England says demand for electricity is down and will be flat in the next decade. So why are we permitting and subsidizing inefficient, environmentally destructive, bird and bat killing, property and quality of life destroying, divisive, industrial wind factories THAT WE DON"T NEED, and that do nothing to lower emissions.

Rob Pforzheimer
Sutton, VT

Efficiency said to cut power use, costs

By STEPHEN SINGER http://www.rutlandherald.com/article/20121213/NEWS03/712139871
The Associated Press | December 13,2012

HARTFORD, Conn. — Improved energy efficiency will help keep electricity use flat in New England in the next decade, allowing customers to save on utility bills and power companies to scrap costly transmission upgrades, the grid operator said Wednesday.

The region’s six states spent $1.2 billion from 2008 to 2011 to boost energy efficiency, ISO-New England told reporters in a briefing. Spending on energy efficiency is expected to increase to $5.7 billion from 2015 to 2021.

The Holyoke, Mass.-based grid operator said energy efficiency has more than doubled since 2008 in an annual auction to win commitments from generators and others for power available three years from now. The result is that electricity use previously projected to rise by 0.9 percent annually between 2012 and 2021 will instead be flat.

The increased efficiency also will help utilities save money by skipping transmission upgrades. ISO-New England said the region can defer 10 transmission upgrades that earlier studies showed were

needed to ensure reliability. Deferring the upgrades will save an estimated $260 million, it said.

In 2010, New England's six states sponsored more than 125 energy efficiency programs offering financial incentives to promote efficient electrical devices, ISO-New England said.

Stephen J. Rourke, vice president for system planning at ISO, said replacing incandescent lighting with compact fluorescent bulbs is the "easiest and least expensive" way to cut energy use. Savings are multiplied as apartments, office buildings, factories, schools, hospitals and other large energy users install efficient heating and air conditioning, he said.

Seth Kaplan, vice president for policy and climate advocacy at the Conservation Law Foundation, a regional environmental group, said the report shows that efforts to conserve energy work. He said the group welcomes the ISO-New England report.

"This is a very big deal," he said. "The system needs to know what the demand is."

Nationally, demand for electricity is leveling off as residential power use falls, experts say, reversing a long upward trend. More efficient lighting and electric devices are partly credited for the change. New homes also are being built to use less electricity, and government subsidies for home energy savings programs help older homes use less power. Rourke said the weak economy also has contributed to reduced electricity use.

New England used about 130,000 gigawatt-hours of electricity last year. One gigawatt-hour can serve about 1 million homes for one hour.

From: Rob Pforzheimer
Sent: Thursday, December 13, 2012 10:38 AM
Subject: Falmouth's First Abandoned Turbine House

Letter to the Editor: Falmouth's First Abandoned Turbine House

One former Falmouth resident explains why she left her home that is less than a half a mile from the NOTUS turbine.

By Sara Mannal

Falmouth has its first abandoned turbine house. Mine. After making every attempt to survive in all too close proximity to the WEBB/NOTUS/TELEDYNE wind power facility our conclusion is clear. We cannot mitigate, compromise, take it for the team or fight the inevitable forever and maintain good health and quality of life. We have been forced take action and it hurts, big time.

We have cashed in all our savings and moved to Cataumet. The new house is one of the cheapest sold this year. We worked all summer like first time fixer upper homeowners just to make it liveable. Its nothing near the dream house we designed, built and adored 10 years ago. However, compared to living with the effects of the turbine it is heaven.
I sleep again most of the time and am able to think clearly and function again. Some of the time my husband sleeps too, but neither of us are the same. It is pretty hard to think about our future now. All our lifes financial worth is tied up in the turbine house. Retirement is only a few years away and we won't have much to live on. That is unless justice still matters, which seems out of reach right now.

There is no experience that compares to first hand experience. You can tell a soldier all about war in a classroom but until they are in the line of fire it is all academic.
Our home was made my war zone. We choose peace. Peace has a high price and is worth it. Those in the line of fire know the truth, the rest is just mental gymnastics and spin. We have some very active and cruel spin doctors on the job in Falmouth.

These health and life changers happen exactly the same way all over the world where these multi megawatt turbines go up too close to homes. Real science is proving the medical issues and is beginning to be recognized. Just like second hand smoke there will be decades of denial and excuses with an eventual decision in favor of the victims. Of this I have no doubt. After all I am one of the first group of victims. Just bother to believe we aren't making this up for heavens sake. Why would we?

It's not looking good, but I pray for Falmouth and this turbine dilemma. This is apivotal moral decision. It looks like the town fathers (and a certain town mother for sure) are determined to keep the war going until they get a win. All wars cost too much and there are no true winners.

Town meeting cannot handle it either. Falmouth needs a town wide vote and a chance to educate each individual voter on the turbine dilemma. This problem is bigger than anyone realizes and I can guarantee it will never go away as long as those things are still running.

The privately owned WEBB/ NOTUS/TELEDYNE turbine, identicle to the other 2, runs unabated, 24/7 full time and without investigation or much mention in the news. It gets just as many complaints. It has driven me out of my home and others out of their jobs in the tech park. Unfortunately, I know why they skate through untouched. Money talks loudest in Falmouth.

The selectmen and board of health members have been instructed not to talk to the turbine victims. So they just dance, give lip service , dodge us and run from the truth.
Not one of them has a clue first hand what we are experiencing or the kind of torture they continue to inflict.

Sue Hobart, Cataumet

From: Rob Pforzheimer
Sent: Thursday, December 13, 2012 10:21 AM
Subject: America's Most Favored Industry

DECEMBER 13, 2012 4:00 A.M.

HTTP://WWW.NATIONALREVIEW.COM/ARTICLES/335512/AMERICA-S-MOST-FAVORED-INDUSTRY-ROBERT-BRYCE#

America's Most Favored Industry

A lame-duck Congress will decide the wind-energy-production tax credit's future.

By Robert Bryce

In the history of American business, it's difficult to find an industry that has enjoyed more political favoritism than the wind-energy sector now enjoys.
The wind industry gets subsidies, mandates, and a de facto exemption from prosecution under some of America's oldest wildlife laws. And the wind-energy lobby is doing all it can to make sure that this favoritism is maintained.

With the lame-duck session of Congress now under way, the American Wind Energy Association and its allies on Capitol Hill have begun a lobbying effort to extend the Production Tax Credit, the 2.2-cent-per-kilowatt-hour subsidy that the wind sector has received for about two decades. A bill that would extend the tax credit is pending in the House of Representatives. It has 119 co-sponsors, including 25 Republicans.

On Wednesday, Senator Chuck Grassley, an Iowa Republican, released a statement supporting the extension of the tax credit, saying, "If we're going to have a discussion of which industries merit federal support and which don't, the discussion needs to be intellectually honest."

Grassley makes a good point. Let's look at the facts.

First, there are the subsidies. According to the Energy Information Administration, in 2007, total subsidies for the oil-and-gas sector amounted to about $1.9 billion per year, or about 3 cents per million British thermal units (BTU) of energy produced. Recall that the production tax credit is 2.2 cents per kilowatt-hour, which is $6.44 per million BTU of energy produced. (One kilowatt-hour of electricity contains 3,412 BTU.) Therefore, on a raw, per-unit-of-energy-produced basis, subsidies to the wind sector are more than 200 times as great as those given to the oil-and-gas sector. Put another way, the *subsidy* for 1 million BTUs of wind energy is nearly two times the *market price* of the same amount of natural gas: On Wednesday the spot price of natural gas was about $3.40 per million BTUs.

We can also calculate the subsidies using data from the Congressional Budget Office. The CBO estimates that tax preferences for renewable-electricity production in 2011 totaled $1.4 billion. The vast majority of that money went to the wind-energy sector, which produces about 60 times as much electricity as the solar-energy sector. (Note that the $1.4 billion figure does not include any of the $3.25 billion in tax-free grants that were given to the wind-energy sector by the Treasury Department under section 1603 of the American Recovery and Reinvestment Act between 2009 and 2011.)
In 2011, according to the BP Statistical Review, all non-hydro renewable-energy production in the U.S. averaged 909,000 barrels of oil equivalent (BOE) per day. Therefore, according to the CBO and BP data, the tax preferences for wind energy totaled about $1,540 per BOE per day.

How does that compare with oil and gas? The CBO found that tax preferences for the fossil-fuel sector totaled $2.5 billion in 2011. That year, domestic oil-and-gas production totaled 19.736 million BOE per day. (Oil accounted for 7.8 million BOE per day and natural gas accounted for nearly 11.9 million.) These numbers imply that the tax preferences for the oil-and-gas sector cost taxpayers about $127 per BOE per day.
So at $1,540 per BOE per day, the wind sector is getting subsidies that are about twelve times as great as the tax preferences provided to the oil-and-gas sector.

Lobbyists for renewable energy, along with their allies at the Sierra Club and other environmental groups, like to point out that the oil-and-gas sector gets favorable tax treatment. The numbers above show that that's true. But there are no requirements for consumers to buy gasoline or natural gas. And that takes us to the issue of mandates.
Up until last year, the corn-ethanol industry benefited from both a mandate and a subsidy. Congress

ended the corn-ethanol subsidy, but the mandate remains. That mandate requires gasoline retailers to blend an increasing volume of corn ethanol into their fuel. And the ethanol industry continues to get support for the mandate from the Obama administration despite objections from a wide variety of lobby groups over the effect that the corn-ethanol requirement has on food prices.

Meanwhile, the wind industry continues to enjoy both a subsidy and a mandate. (Twenty-nine states and the District of Columbia are subject to mandates for renewable-electricity production, which will likely mean higher-priced electricity for as many as 220 million Americans.) If there are any other industries that have a similar arrangement, I haven't heard of them.

Finally, the wind sector has an effective exemption from prosecution under two of America's oldest wildlife-protection laws: the Migratory Bird Treaty Act and the Eagle Protection Act. A violation of either law can result in a fine of $250,000 and/or imprisonment for two years.

According to the U.S. Fish and Wildlife Service, some 440,000 birds per year are being killed by wind turbines, but the Obama administration — like the Bush administration before it — has never prosecuted the wind industry for violating the law.
Last year, the *Los Angeles Times* reported that some 70 golden eagles per year are being killed by wind turbines located at Altamont Pass in central California. That finding follows a 2008 study funded by the Alameda County Community Development Agency, which estimated that about 2,400 raptors, including burrowing owls, American kestrels, and red-tailed hawks — as well as about 7,500 other birds — are being killed every year by the turbines at Altamont

In February, *Los Angeles Times* reporter Louis Sahagun reported that eight golden-eagle carcasses have been found at the Pine Tree wind project, a two-year-old facility owned by the Los Angeles Department of Water and Power. At least six of the eagles had been struck by turbine blades. Sahagun reports that these deaths give Pine Tree "one of the highest avian mortality rates in California's wind farm industry. The death rate per turbine at the $425 million facility is three times higher than" at Altamont.

In October, the American Bird Conservancy and several other environmental groups called on federal authorities to intervene to stop the carnage at the Criterion Wind Project in Maryland. An environmental assessment of the facility found that in just seven months it had killed 1,093 bats and 448 birds. The American Bird Conservancy calls it America's "most deadly wind power development."

There is a pernicious double standard at work here. Over the past two decades or so, the Interior Department has broughthundreds of cases against the oil-and-gas industry and the electricity-generation sector for violations of the Migratory Bird Treaty Act and the Eagle Protection Act. Just last year, the U.S. Fish and Wildlife Service filed criminal indictments against three drillers who were operating in North Dakota's Bakken field. One of those companies, Continental Resources, was indicted for killing a single bird, a Say's phoebe.

Meanwhile, the Interior Department has indicated that it may issue permits to the wind industry that will guarantee certain wind projects are exempted from enforcement of the Migratory Bird Treaty Act and Eagle Protection Act for a period of up to 30 years.
So, by all means, let's do as Senator Grassley wishes and have an "intellectually honest" discussion about America's most-favored industry. Further, let's agree with Denise Bode, the chief executive of the American Wind Energy Association, the wind sector's main lobby group, who recently said that her industry doesn't "need tax incentives forever." That's certainly good to hear. The tax credit for wind energy is set to expire at the end of this month. Congress should let it do so.

— Robert Bryce is a senior fellow at the Manhattan Institute.

▪

From: Rob Pforzheimer
Sent: Sunday, December 16, 2012 1:21 PM
Subject: Turbine noise and infrasound on Windwise.org tonight

Listen live tonight, 7-8 PM. Call in number 213 943 3683 Or listen latter: http://www.windwiseradio.org/
Tonight's WWR broadcast will include Dave, Lisa, and Harley with the Windswept News.

Richard James
We will have Richard James of E-coustics Solutions on to talk about his experiences with turbine noise and infrasound.

▪

From: Annette Smith
Sent: Monday, December 17, 2012 8:51 PM
Subject: Peak Keepers Discuss Industrial Wind Power | Center for Media and Democracy

Thoughtful discussion relevant to the siting commission.
I hope you will watch it.

http://www.cctv.org/watch-tv/programs/peak-keepers-discuss-industrial-wind-power

Peak Keepers Discuss Industrial Wind Power

SUMMARY

- Production Date: 12/14/2012
- Length: *1:02:01

DESCRIPTION

A 1 hour program with a panel of Vermont scientists who are part of Peak Keepers, focused on a discussion about the need to protect and promote Vermont's mountain ecosystems, a natural resource that is under threat. Included on the panel is Sue Morse of Keeping Track, naturalist and author, Charles Johnson, Middlebury College geology professor Will Amidon, and well-known botanist Dr. Steve Young. Moderator is Tom Slayton.

AIRTIMES
1 Tuesday December 18, 2012 at 11:00 PM
2 Wednesday December 19, 2012 at 4:00 AM

3 Wednesday December 19, 2012 at 10:00 AM
4 Wednesday December 19, 2012 at 4:00 PM
5 Friday December 28, 2012 at 9:30 PM
6 Saturday December 29, 2012 at 2:30 AM
7 Saturday December 29, 2012 at 8:30 AM

▪

From: Vanessa Mills Holmquist
Sent: Sunday, December 16, 2012 10:50 AM
Subject: Fwd: THE DARK SIDE OF "GREEN": WIND TURBINE ACCIDENTS, INJURIES AND FATALITIE...

Subj: THE DARK SIDE OF "GREEN": WIND TURBINE ACCIDENTS, INJURIES AND FATALITIES RAISE SERIOUS SAFETY CsONCERNS

THE DARK SIDE OF "GREEN": WIND TURBINE ACCIDENTS, INJURIES AND FATALITIES RAISE SERIOUS SAFETY CONCERNS

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- serious accidents
- tragedies
- turbines
- wind industry
- wind turbine

Printer-friendly version

Wind turbine collapse-WindWatch, Trent Brome

By Miriam Raftery

April 4, 2012 (San Diego's East County) – Today marks the "International Protest Day Against Wind Power" with 765 websites participating.

A dark side of the wind industry that many media outlets have failed to report on is the thousands of documented cases of serious accidents. These include numerous documented cases of turbines falling over, blades flying off, injuries to workers and the public, and at least 99 reported fatality accidents.

Of the deaths, 67 were wind industry and direct supporters workers or small turbine operators and 32 were public fatalities.Wind turbine fire

How many tragedies have occurred worldwide is a well-kept secret within the wind industry. In the United Kingdom alone, however, Renewables UK, an industry trade association, has admitted to 1,500

wind turbine accidents/incidents in the UK alone during the past five years, the *London Telegraph* Reported

http://www.telegraph.co.uk/news/uknews/8948363/1500-accidents-and-incidents-on-UK-wind-farms.html.

Those included 300 injuries and four deaths—in just one small part of the world.

A partial database of accidents , injuries and deaths through December 2011 has been compiled at the Caithness Wind Farm Information Forum:http://www.caithnesswindfarms.co.uk/page4.htm

According to the Caithness database, which estimates it represents only 9% of actual accidents (based on the RenewablesUK figures), an average of 128 accidents per year have occurred from 2007-2011, up from just 6 a year back in 1992-1996 due to the growing number of wind turbine installations.

Among the most grisly tragedies was that of John Donnelly, a worker killed in Oregon in 1989 when a lanyard that as supposed to prevent falls for turbine workers became entangled, dragging him into the spinning machinery. According to Paul Gipe, an advocate of wind power who authored an article on fatalities, the medical examiner described Donnelly's demise as death by "multiple amputations", witnessed by a horrified coworker.

Another Oregon worker, Chadd Mitchell, young father of two, was killed when a wind turbine tower he was in collapsed to the ground in Sherman County after the turbine's rotor went into "overspeed," the *Oregonian* reported on February 6, 2010. Siemens Power was fined for safety violations, and the family filed a lawsuit.

Other deaths have included electrocutions, falls, crush injuries, construction accidents, and a Minnesota man who was nearly cut in half by a chunk of ice knocked off a turbine tower in 1994. Three suicides have also been linked to turbines, including a worker who hanged himself, a parachutist, and a farmer who killed himself after neighbors protested a turbine he put on his property.

Caithness also has documented 221 separate incidences of blade failure, with pieces of blades documented to have flown over 1,300 meters—or 4,266 feet (4/5 of a mile). Blade pieces have gone through roofs and walls of nearby buildings.

At least 121 structural failures have been recorded too, including entire wind turbines that have crashed to the ground. The website www.windaction.org documents many of these. Turbines have crashed to the ground in school yards, near homes, roads and walking paths where only by sheer luck was no one underneath when the multi-ton structures collapsed. In the Palm Springs area, a turbine spinning out of control forced closure of a major highway. There are also concerns about many turbines still standing – where failures such as cracked foundations and sinkage have been observed.

Wind turbine fire, Australia, WindWatchAround 168 wind turbine fires have been documented. Some sparked brush fires and left some fire departments helpless to watch as oil in turbine components burned hundreds of feet in the air—out of reach of hoses—whirling burning debris across the landscape.

There are also many instances of ice throws hurling chunks of ice off blades—94 times in 2005 alone. Another 93 transport accidents involving turbines have been reported, including one turbine section that rammed through a house and another that knocked a utility pole through a restaurant.

Disturbingly, *EnergyBiz Magazine* reported in its March/April 2011 edition that "More troubling for wind fleet owners and operators is that many turbines are coming off warranty. The end of last year

marked the first time in U.S. history that more wind turbines were operating out of warranty than were covered, according to *Wind Systems* magazine, while many more are approaching the end of their warranties. Hidden costs of maintenance have climbed sharply, though some promising technologies may help reduce those costs, *Energy Biz*noted.

Still the issues raise troubling questions: who will be responsible for catastrophic failures when warranties have run out? Are local boards making decisions regarding turbinesplacement sufficiently educated on the risks?

Farm surrounded-IllinoisHow far away from a wind turbine is a safe setback distance? Locally, some proposed industrial wind projects would place turbines within a half mile of homes, on up to three sides of the dwellings, in Ocotillo. In McCain Valley, Iberdrola's Tule Wind proposes setbacks from roads of only 1.1 times the height of the turbine - or around 455 feet maximum.

In Kansas, Rose Bacon, a member of the Governor's Energy Task Force, became so concerned about lack of teeth in regulations and vulnerability of inexperienced local officials in small towns facing proposals from international wind companies that she likened the scenario to the "wildcatter days in the oil business," the *McPherson Sentinel* reported in 2005.

Below are some specific examples of serious incidents documented through the above websites, where many more incidents can also be found.
A wind turbine crashed to the ground at a wind farm near The Dalles, Oregon in August 2007, killing one worker and injuring another, Associated Press reported.

- A blade from a wind turbine at Lister Hospital in the United Kingdom flew off and hit a car just one month after becoming fully operational in September 2011, the *Comet*reported.

- California Highway Patrol shut down Highway 58 for several hours to protect motorists from a runaway wind turbine in the Tehachapi area. "The runaway wind turbine, when it deteriorates or explodes, can send scrap metal and steel up to a mile away," CHP Officer Ed Smith said, the Tehachapi News reported.

- A wind turbine plunged nearly 200 feet to the ground near I-10 in North Palm Springs after going into "overspeed", KPSP news reported on May 1, 2009.

- An Iberdrola wind turbine caught fire on May 14, 2009 at Locust Ridge wind farm in Pennsylvania; the fire was blamed on a gear box problem.

- A 187-ton wind turbine crashed to the ground at the Fenner wind farm in New York after breaking off at its base. Enel shut down the entire 20-turbine wind farm in Madison, County New York in June 2010 for at least six months, the *Oneida Daily Dispatch* and other newspapers reported.

- Large chunks of seven turbine blades broke off at the Allegheny Ridge Wind Farm in Pennsylvania, with pieces flying over 500 feet, the *Patriot News* reported in May 2007. Spanish wind-energy company Gamesa blamed insufficient glue for the failures.

- In Dolfor, United Kingdom, a turbine exploded and fell to the ground near walking tracks, leading the *Shropshire Star* to conclude In January 2012, "Turbines should be nowhere near

public footpaths."

- At Perkins High School in Ohio, blades on a month-old turbine broke apart while spinning, sending fiberglass pieces up to 40 yards (120 feet) away in February 2009. In December 2010 a blade again detached; fortunately school was not in session.

- A wind turbine crashed down near Western Reserve High School in Berlin Center in April 2011 in Ohio, WKBN news reported.

- At Fakenham High School in the United Kingdom, students witnessed a 40-foot wind turbine crash onto the school's playing field and crush a contractor's van in December 2009, Windaction.org reported.

- Redriven Power recalled blades after turbines therw blades onto an Ohio high school and an organic fig farm in northern California, *Eastern AgriNews* reported in May 2009.

- A General Electric turbine collapsed at an Altona, New York wind farm, the Press-Republican reported, after neighbors heard explosions and the turbine caught fire.

- In Norway, a blade from a Suez Energy North American V-90 wind turbine was hurled about 1,600 feet, landing near a home's back door, the *Journal Pioneer* reported in December 2008.

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Let's not forget the animals

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These giant blenders...unlike anything before them, kill thousand of birds and bats. Eagles are being wiped out in California. Along the coast endangered raptors are being killed in large numbers. In california...burrowing owls were estimated to be killed at up to 184% of the population? That means not only local population but surrounding populations. How many years can you kill like that? Endangered slowly reproducing birds are being wiped out. It is only matter of time for birds like Cranes, Falcons, Condors as these turbines that spin over 100 mph will wipe them out. It is already happening with over 100 Golden Eagles dying every year in California! NJ has only 25 breeding pairs of Peregrine Falcons and a one was killed in the first year of operation of new 5 Turbines array. Many more are planned and underway...That shouldn't take too many years with only 50 birds in a small state...a bunch of Osprey which are also endangered their were killed along with a host of interesting birds.
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It's worth noting that the Caithness mortalities information includes a bunch of tiny windmills, non-industrial wind mills, that are installed for very localized power for homes and farms. Depending on where you draw the line, one third to two thirds of fatalities are associated with non-industrial efforts. Including these in the statistics is just misleading.

No one has ever been killed or injured by a wind turbine that failed. Claiming otherwise is just lying. Wind has an amazing safety record. Every form of generation has construction and maintenance accidents.

Set back discussions are reasonable, but mostly for wind turbine noise attenuation. Ontario's 359/09 mandates setbacks of a minimum of 550 meters (about 1925 feet) for smaller wind turbines, and 1500 meters (about 5250 feet) for large ones or collections based upon noise guidelines aiming for 40 dBA in inhabited bedrooms. With those set backs, the likelihood of anyone being injured by the vanishingly small percentage of turbine failures or ice throws is the equivalent of winning the lottery; only those with no grasp of statistics would consider it possible.

For comparison, coal kills roughly 13,000 people a year in the United States alone due to particulate matter emissions. If you really want to reduce deaths, putting up a lot more wind turbines is a pretty good way to to do it.

By your own definition, setbacks locally are not safe.
On April 6th, 2012 miriamg says:
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area.

I agree that suicides are not the companies' fault which is why I specified that some of the deaths were not accidents. It's also true that some of the Caithness data is for smaller wind turbines, but since a lot of schools are throwing these things up that's relevant for some readers. They don't have it broken down by turbine types, but there are also a lot of failures with the larger industrial ones, including some that are very recent.

As for fatal accidents I expect we will see more as more and more of these get built close to homes, roads, schools, parks, etc. unless we begin to impose more reasonable setbacks. I agree, coal is the worst of all energy forms -- but that doesn't mean we should just throw up wind farms everywhere with no concern for taking reasonable safety precautions or looking at the other consequences.

And while wind has killed far fewer people than coal, that doesn't mean it's the best option out there. Rooftop solar is approaching price parity now due to lower prices, and other than the utility companies I haven't heard anyone objecting to rooftop solar - it's the cleanest and safest option, not an eyesore, doesn't kill wildlife, and even if it cost a bit more many would say it's worth it to avoid despoiling our beautiful scenic areas and making people feel stressed or ill near turbines.

The wind energy business is a sham
On April 5th, 2012 billslycat says:
INDUSTRIAL WIND TURBINES DO NOT PROVIDE CLEAN ENERGY! Not one coal or gas plant the world over has been decommissioned because of IWTs...and eliminating our dependence on fossil fuels is their whole purpose. To quote an expert: “Because wind blows intermittently, electric utilities must either keep their conventional power plants running all the time to make sure the lights don’t go dark, or continually ramp up and down the output from conventional coal-or gas-fired generators (called “cycling”). But coal-fired and gas-fired generators are designed to run continuously, and if they don’t, fuel consumption and emissions generally increase.” This is happening worldwide, and in places like Colorado and Texas where CO2 and power plant pollution have increased since installing wind farms:

http://www.forbes.com/2011/07/19/wind-energy-carbon.htmlhttp://www.denverpost.com/headlines/ci_15081808
http://www.clepair.net/IerlandUdo.html
http://www.thespec.com/news/ontario/article/610422--cost-of-green-energy...
http://articles.baltimoresun.com/2011-07-25/news/bs-ed-wind-farms-201107...

The wind industry is built on crony capitalism, it is the only way it can exist. Taxpayer money builds them and power companies are mandated to buy wind generated power at much higher rates than conventionally produced power. There is no true benefit, except to wind power companies, politicians and lobbyists.

Unspeakably ugly, unsafe,
On April 4th, 2012 craig s. maxwell says:
Unspeakably ugly, unsafe, inefficient and terribly destructive; but otherwise, wind turbines are a great idea, right?

C Maxwell
On April 5th, 2012 caarecengi says:
Consider this: these turbines produce a LOT of power and energy with virtually no polluting by-products. Ugly? That's subjective. Unsafe? Let's see - we kill more birds in a year with automobiles than with wind turbines. We kill more humans every month that we do with these devices nationwide in a 5-year span.

I guess the alternative is to keep using fossil fuels until we're paying $20 a liter...

In fact, they don't produce

On April 6th, 2012 craig s. maxwell says:

In fact, they don't produce a "lot" (lower case) of power. They are terribly inefficient. http://www.city-journal.org/2012/22_1_environmentalism.html

Yes, they are ugly. And, no, aesthetics are not subjective. You say a city dump is, to some people, just as beautiful as Yosemite Valley? Uh, *right.* (Well, maybe to a patient in a mental ward.) Or, try selling Playboy on the idea of a Rosie O'Donnell centerfold.

From: Rob Pforzheimer
Sent: Sunday, December 16, 2012 10:04 AM
Subject: THE DARK SIDE OF "GREEN": WIND TURBINE ACCIDENTS, INJURIES AND FATALITIES RAISE SERIOUS SAFETY CONCERNS

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- failures
- fatalities
- injuries
- international protest
- serious accidents
- tragedies
- turbines
- wind industry
- wind turbine

Wind turbine collapse

WindWatch
Trent Brome

By Miriam Raftery

April 4, 2012 (San Diego's East County) – Today marks the "International Protest Day Against Wind Power" with 765 websites participating.

A dark side of the wind industry that many media outlets have failed to report on is the thousands of documented cases of serious accidents. These include numerous documented cases of turbines falling over, blades flying off, injuries to workers and the public, and at least 99 reported fatality accidents.

Of the deaths, 67 were wind industry and direct supporters workers or small turbine operators and 32 were public fatalities.Wind turbine fire

How many tragedies have occurred worldwide is a well-kept secret within the wind industry. In the United Kingdom alone, however, Renewables UK, an industry trade association, has admitted to 1,500 wind turbine accidents/incidents in the UK alone during the past five years, the *London Telegraph* reportedhttp://www.telegraph.co.uk/news/uknews/8948363/1500-accidents-and-incidents-on-UK-wind-farms.html. Those included 300 injuries and four deaths—in just one small part of the world.

A partial database of accidents , injuries and deaths through December 2011 has been compiled at the Caithness Wind Farm Information Forum:http://www.caithnesswindfarms.co.uk/page4.htm

According to the Caithness database, which estimates it represents only 9% of actual accidents (based on the RenewablesUK figures), an average of 128 accidents per year have occurred from 2007-2011, up from just 6 a year back in 1992-1996 due to the growing number of wind turbine installations.

Among the most grisly tragedies was that of John Donnelly, a worker killed in Oregon in 1989 when a lanyard that as supposed to prevent falls for turbine workers became entangled, dragging him into the spinning machinery. According to Paul Gipe, an advocate of wind power who authored an article on fatalities, the medical examiner described Donnelly's demise as death by "multiple amputations", witnessed by a horrified coworker.

Another Oregon worker, Chadd Mitchell, young father of two, was killed when a wind turbine tower he was in collapsed to the ground in Sherman County after the turbine's rotor went into "overspeed," the *Oregonian* reported on February 6, 2010. Siemens Power was fined for safety violations, and the family filed a lawsuit.

Other deaths have included electrocutions, falls, crush injuries, construction accidents, and a Minnesota man who was nearly cut in half by a chunk of ice knocked off a turbine tower in 1994. Three suicides have also been linked to turbines, including a worker who hanged himself, a parachutist, and a farmer who killed himself after neighbors protested a turbine he put on his property.

Caithness also has documented 221 separate incidences of blade failure, with pieces of blades documented to have flown over 1,300 meters—or 4,266 feet (4/5 of a mile). Blade pieces have gone through roofs and walls of nearby buildings.

At least 121 structural failures have been recorded too, including entire wind turbines that have crashed to the ground. The website www.windaction.org documents many of these. Turbines have crashed to the ground in school yards, near homes, roads and walking paths where only by sheer luck was no one underneath when the multi-ton structures collapsed. In the Palm Springs area, a turbine spinning out of

control forced closure of a major highway. There are also concerns about many turbines still standing – where failures such as cracked foundations and sinkage have been observed.

Wind turbine fire, Australia, WindWatchAround 168 wind turbine fires have been documented. Some sparked brush fires and left some fire departments helpless to watch as oil in turbine components burned hundreds of feet in the air—out of reach of hoses—whirling burning debris across the landscape.

There are also many instances of ice throws hurling chunks of ice off blades—94 times in 2005 alone. Another 93 transport accidents involving turbines have been reported, including one turbine section that rammed through a house and another that knocked a utility pole through a restaurant.

Disturbingly, *EnergyBiz Magazine* reported in its March/April 2011 edition that "More troubling for wind fleet owners and operators is that many turbines are coming off warranty. The end of last year marked the first time in U.S. history that more wind turbines were operating out of warranty than were covered, according to *Wind Systems* magazine, while many more are approaching the end of their warranties. Hidden costs of maintenance have climbed sharply, though some promising technologies may help reduce those costs, *Energy Biz*noted.

Still the issues raise troubling questions: who will be responsible for catastrophic failures when warranties have run out? Are local boards making decisions regarding turbine placement sufficiently educated on the risks? Farm surrounded-IllinoisHow far away from a wind turbine is a safe setback distance? Locally, some proposed industrial wind projects would place turbines within a half mile of homes, on up to three sides of the dwellings, in Ocotillo. In McCain Valley, Iberdrola's Tule Wind proposes setbacks from roads of only 1.1 times the height of the turbine - or around 455 feet maximum.

In Kansas, Rose Bacon, a member of the Governor's Energy Task Force, became so concerned about lack of teeth in regulations and vulnerability of inexperienced local officials in small towns facing proposals from international wind companies that she likened the scenario to the "wildcatter days in the oil business," the *McPherson Sentinel* reported in 2005.

Below are some specific examples of serious incidents documented through the above websites, where many more incidents can also be found.
A wind turbine crashed to the ground at a wind farm near The Dalles, Oregon in August 2007, killing one worker and injuring another, Associated Press reported.

- A blade from a wind turbine at Lister Hospital in the United Kingdom flew off and hit a car just one month after becoming fully operational in September 2011, the *Comet*reported.

- California Highway Patrol shut down Highway 58 for several hours to protect motorists from a runaway wind turbine in the Tehachapi area. "The runaway wind turbine, when it deteriorates or explodes, can send scrap metal and steel up to a mile away," CHP Officer Ed Smith said, the Tehachapi News reported.

- A wind turbine plunged nearly 200 feet to the ground near I-10 in North Palm Springs after going into "overspeed", KPSP news reported on May 1, 2009.

- An Iberdrola wind turbine caught fire on May 14, 2009 at Locust Ridge wind farm in Pennsylvania; the fire was blamed on a gear box problem.

- A 187-ton wind turbine crashed to the ground at the Fenner wind farm in New York after breaking off at its base. Enel shut down the entire 20-turbine wind farm in Madison, County New York in June 2010 for at least six months, the *Oneida Daily Dispatch* and other newspapers

reported.

- Large chunks of seven turbine blades broke off at the Allegheny Ridge Wind Farm in Pennsylvania, with pieces flying over 500 feet, the *Patriot News* reported in May 2007. Spanish wind-energy company Gamesa blamed insufficient glue for the failures.

- In Dolfor, United Kingdom, a turbine exploded and fell to the ground near walking tracks, leading the *Shropshire Star* to conclude In January 2012, "Turbines should be nowhere near public footpaths."

- At Perkins High School in Ohio, blades on a month-old turbine broke apart while spinning, sending fiberglass pieces up to 40 yards (120 feet) away in February 2009. In December 2010 a blade again detached; fortunately school was not in session.

- A wind turbine crashed down near Western Reserve High School in Berlin Center in April 2011 in Ohio, WKBN news reported.

- At Fakenham High School in the United Kingdom, students witnessed a 40-foot wind turbine crash onto the school's playing field and crush a contractor's van in December 2009, Windaction.org reported.

- Redriven Power recalled blades after turbines therw blades onto an Ohio high school and an organic fig farm in northern California, *Eastern AgriNews* reported in May 2009.

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I toured the Tule Wind site yesterday with Iberdrola. They said the setback from roads will be just 1.1 times the height of the turbine. Turbine heights can be a max of 456 feet - so 461 feet from roads. That's

not even close to the 1925 you yourself recommend - and this is a public road in a federal recreation area.

I agree that suicides are not the companies' fault which is why I specified that some of the deaths were not accidents. It's also true that some of the Caithness data is for smaller wind turbines, but since a lot of schools are throwing these things up that's relevant for some readers. They don't have it broken down by turbine types, but there are also a lot of failures with the larger industrial ones, including some that are very recent.

As for fatal accidents I expect we will see more as more and more of these get built close to homes, roads, schools, parks, etc. unless we begin to impose more reasonable setbacks. I agree, coal is the worst of all energy forms -- but that doesn't mean we should just throw up wind farms everywhere with no concern for taking reasonable safety precautions or looking at the other consequences.

And while wind has killed far fewer people than coal, that doesn't mean it's the best option out there. Rooftop solar is approaching price parity now due to lower prices, and other than the utility companies I haven't heard anyone objecting to rooftop solar - it's the cleanest and safest option, not an eyesore, doesn't kill wildlife, and even if it cost a bit more many would say it's worth it to avoid despoiling our beautiful scenic areas and making people feel stressed or ill near turbines.

The wind energy business is a sham
On April 5th, 2012 billslycat says:
INDUSTRIAL WIND TURBINES DO NOT PROVIDE CLEAN ENERGY! Not one coal or gas plant the world over has been decommissioned because of IWTs...and eliminating our dependence on fossil fuels is their whole purpose. To quote an expert: “Because wind blows intermittently, electric utilities must either keep their conventional power plants running all the time to make sure the lights don’t go dark, or continually ramp up and down the output from conventional coal-or gas-fired generators (called “cycling”). But coal-fired and gas-fired generators are designed to run continuously, and if they don’t, fuel consumption and emissions generally increase.” This is happening worldwide, and in places like Colorado and Texas where CO2 and power plant pollution have increased since installing wind farms:

http://www.forbes.com/2011/07/19/wind-energy-carbon.htmlhttp://www.denverpost.com/headlines/ci_15081808
http://www.clepair.net/IerlandUdo.html
http://www.thespec.com/news/ontario/article/610422--cost-of-green-energy...
http://articles.baltimoresun.com/2011-07-25/news/bs-ed-wind-farms-201107...

The wind industry is built on crony capitalism, it is the only way it can exist. Taxpayer money builds them and power companies are mandated to buy wind generated power at much higher rates than conventionally produced power. There is no true benefit, except to wind power companies, politicians and lobbyists.

Unspeakably ugly, unsafe,
On April 4th, 2012 craig s. maxwell says:
Unspeakably ugly, unsafe, inefficient and terribly destructive; but otherwise, wind turbines are a great idea, right?

C Maxwell
On April 5th, 2012 caarecengi says:
Consider this: these turbines produce a LOT of power and energy with virtually no polluting by-products. Ugly? That's subjective. Unsafe? Let's see - we kill more birds in a year with automobiles than with wind turbines. We kill more humans every month that we do with these devices nationwide in a 5-

year span.
I guess the alternative is to keep using fossil fuels until we're paying $20 a liter...

In fact, they don't produce
On April 6th, 2012 craig s. maxwell says:
In fact, they don't produce a "lot" (lower case) of power. They are terribly inefficient. http://www.city-journal.org/2012/22_1_environmentalism.html
Yes, they are ugly. And, no, aesthetics are not subjective. You say a city dump is, to some people, just as beautiful as Yosemite Valley? Uh, *right.* (Well, maybe to a patient in a mental ward.) Or, try selling Playboy on the idea of a Rosie O'Donnell centerfold.

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From: Rob Pforzheimer
Sent: Friday, December 21, 2012 9:06 AM
Subject: NH Legislator wants halt to more wind farms
http://www.unionleader.com/article/20121220/NEWS06/121229964

December 19. 2012 11:10PM
Legislator wants halt to more wind farms

By DAN SEUFERT
Union Leader Correspondent

BRISTOL - A state representative has proposed legislation calling for a moratorium on all wind-power construction in New Hampshire until the state's energy plan is updated to consider the growing number of proposed projects.

Rep. Harold "Skip" Reilly, R-Grafton County, submitted House Bill 391 on Wednesday. It says that the state's Site Evaluation Committee "shall issue no certificate" until the state's energy plan, which was enacted in 2002, has been revised.

The bill has several co-sponsors and will go to committee when the Legislature starts its new session in January, Reilly said.

"When they came up with the energy plan, they were dealing mostly with natural gas and other forms of alternative energy," he said. "It's time now to re-evaluate where we are going and come up with a comprehensive energy plan."

The bill is in response to proposed wind-power projects in the Newfound Lake/Mount Cardigan area.

Spanish wind company Iberdrola Renewables has just completed a 24-turbine, $120 million 48-megawatt wind farm project in Groton.

Groton selectmen signed a 15-year agreement with the company that will pay the town $528,000 - roughly equivalent to Groton's most recent town budget - in the first year. Each of the project's 24 wind turbines will net the town $22,000 in the years that follow. The SEC issued permits for that project.

Iberdrola is about to begin the state permitting process for its second project in the area, the 37-turbine Wild Meadows Wind Power Project on leased land in the towns of Alexandria, Danbury, and Grafton.

Meanwhile, EDP Renewables of Portugal is proposing a wind farm in the towns of Groton, Alexandria, and Hebron, according to EDP Renewables Project Manager Jeffrey Nemeth. The project would build 15 to 25 turbines along ridgelines near where the three towns meet, just northwest of Newfound Lake and to the east of Mount Cardigan State Park.

The proposed projects have drawn protests from local residents, who fear that the views in the Newfound Lake and Mount Cardigan area would be damaged by the towers, which are lit at night and are about the size of a 40-story building. Residents worry that the local tourist economy would be depressed by the project, and fear environmental effects, such as the potential sound levels from the turbines.

The Newfound Lake Association has come out against the Wild Meadows project, as has nearby Bridgewater's board of selectmen.

Reilly said he researched the newest proposed projects and found that they would not contribute much, if anything, to the state.

"We are exporting a lot of energy as it is, but we are not using that electricity and I don't see that we would get anything out of these projects," he said. "The companies, and a few land owners, are who benefits from this. Our electric rates aren't helped at all."

"They want to use our land and views, and we get nothing," he said.

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From: Rob Pforzheimer
Sent: Saturday, December 22, 2012 10:32 AM
Subject: Massachusetts Renewable Energy Goals Fall Short
Posted on December 22, 2012 at 5:44 am http://falmouth.patch.com/blog_posts/massachusetts-renewable-energy-goals-fall-short

Massachusetts Renewable Energy Goals Fall Short

Massachusetts wants commercial wind energy to play a role in its clean energy future. Governor Patrick has committed Massachusetts to a goal of installing 2,000 Megawatts of wind energy before 2020.
Two reasons look to stop the renewable energy goal of land based commercial wind turbines. The residential property owners who live around them and the excessive operation and maintenance costs of the turbines. These two reasons alone must be deducted from the 2020 renewable energy goal.
First, each time a new megawatt commercial wind turbine gets installed another local citizens' group in that town quickly forms to curtail the operation of the turbines because of noise, shadow flicker, ice throw and real estate property devaluations. Groups of pro-wind residents living near wind turbines within weeks become anti- wind as soon as the 400 foot turbines start to spin**.** The operators of the turbines quickley find themselves in front of local boards and court.

Second, performance of wind turbines in New England showing that the economic life expenses of onshore wind turbines is very short in some cases between 3 and 5 years, not the 20 years projected by the wind industry and government projections.

The average load factor of wind turbines declines substantially as they get older, probably due to gear box failure. By as early as 5 years of age the contribution of an average New England wind turbine to meeting electricity demand has declined .

Many of the gear box driven megawatt turbines installed after 2008 will need expensive gear box replacements every 3 to 5 years. This raises the question of is it rarely economic to operate a wind turbine for more than 6 to 10 years? After 10 years they must be replaced with a new turbine or keep replacing major components .

Many investors, private owners and cities and towns expecting a return on their investment over 20 years will fall short of expectations. The gear box failures and the costs of a special crane to lift the gear boxes in and out contribute to the massive repair costs.

2 Comments:

Bill Carson
1 hour ago
In the past three years we've seen brand new wind turbines have catastrophic failures. The Princeton,Massachusetts wind turbine ,gear box cost $600,000.00 for repairs.The Portsmouth High School ,Rhode Island gear box and blades cost near one million not repaired up for sale. The Otis ANG base turbine gear box in process of going bad government won't release repair estimate.The Charlestown,Massachusetts turbine tipped on foundation out of service months after start up.One Kingston wind turbine with a crack in the blade during installation.
Thousands of citizens and groups demanding shut downs because on noise issues, infra sound ,shadow flicker in Falmouth,Fairhaven,Kingston,Scituate and Plymouth. Noise is wind turbine torture !

http://firstrunfeatures.com/trailers_windfall.html

5 minutes ago
The absurdity of believing that all renewables are inherently good... simply because they are deemed renewable, is doing a disservice to the future of our state and the sustainable future possible for our children. The concept of Wind energy installations being ~shoe-horned~ into residential areas is asinine.

From: Rob Pforzheimer
Sent: Wednesday, December 26, 2012 9:26 AM
Subject:

"For years our politicians continued to fall for this racket, as they ruthlessly bent the planning rules to ensure that nothing stood in the way of the turbines." Sound familiar?

By **Curt Devlin**
http://www.southcoasttoday.com/apps/pbcs.dll/article?AID=/20121226/OPINION/212260302/-1/NEWS

Curt Devlin lives in Fairhaven.
December 26, 2012 12:00 AM

In a headline above the fold on Monday, Dec. 17, The Standard-Times touted a "Tougher turbine bylaw proposed" for Fairhaven. This new proposal, concocted by Fairhaven Planning Director Bill Roth and Planning Board Chairman Wayne Hayward in an almost complete vacuum of information, is only slightly more restrictive than the current "anything goes" bylaw. It is far from the toughest, but it is certainly one of the stupidest. That is saying something in Fairhaven, known for superlative performance in the stupid category. It's a sure sign that the selectmen will approve it and the Town Meeting will ratify it. If you think this is harsh, take a look at the existing bylaw.

Far from offering residents any real protection, this latest proposal will have the likely outcome of inviting smaller turbines, in larger numbers, that can still be legally sited in very close proximity to residents. Current zoning bylaws in Fairhaven permit citing turbines in every type of zone as a so-called municipal project. There is currently no legal restriction that would prevent private property owners from citing an industrial wind turbine in the midst of any neighborhood in town. Nothing in the new proposal will change this cozy little arrangement appreciably.

According to The Standard-Times article, the most recent proposal "gives the Planning Board discretion to make exceptions for turbines producing more than 600 kilowatts and closer to residences than four times blade height." This little plum should be seen for exactly what it is, a sly little power grab by Wayne Hayward. He would like nothing better than holding court while wind developers and residents come, hat in hand, to plead for some consideration. Earlier this year, Hayward could be heard whining about the budgets cuts imposed on the Planning Board. This "discretion" would give him a bargaining chip in future budget debates.

For all the good it has done, Fairhaven would be better off simply abolishing the Planning Board. Then we could use the budget surplus to hire a professional town planner, instead of making due with the planner we have now.

There is a mountain of unassailable scientific evidence that infrasound and low-frequency noise from turbines sited near residences cause serious illness. Long-term exposure to this dangerous form of sound energy causes very serious and often irreversible health consequences such as heart damage, cancer and acute neurological deterioration. As much as 70 percent of those exposed for 10 years or more will suffer from at least some serious adverse health effects.

If town planning officials really wanted to protect people from such dangers, they would carefully restrict turbines based upon the emission of low frequency sound, as measured inside residential homes where it is at its worst. When I tried to point this out to Bill Roth at one of the earlier meetings, he said "I don't want to hear anything about decibels." Of course, not! That would force him to grapple with the real issue. If safe sound constraints (in decibels) were put in place, it would offer people real protection and put an end to turbines in Fairhaven. No turbines emit safe levels of infrasound.

One of the existing 400-foot turbines is just 1,600 feet from one family home. That's four times the height — exactly what Bill Roth and Wayne Hayward are proposing. At that distance, one member of the family was so badly affected that he moved out to escape the torment. The turbines are literally tearing this family apart. Add another turbine refugee to the list.
Recently, the minister of Energy in the U.K., John Hayes, announced a complete moratorium on any further onshore wind farms, anywhere in Britain. That is what a tougher policy on turbines looks like. This comes in a country desperate for energy independence in the face of waning domestic fossil fuel supplies, where wind has been the centerpiece of energy policy for two decades. The British journalist from the Daily Mail, Christopher Booker, observed: "For years our politicians continued to fall for this racket, as they ruthlessly bent the planning rules to ensure that nothing stood in the way of the turbines." Sound familiar?

Wind developers will be delighted with this new proposal thanks to Hayward and Roth; but if you think it will protect the health and safety of residents, or their property value; don't kid yourself. In fairness, several of the Planning Board members have raised these concerns only to be routinely ignored by Bill Hayward. Rene Fleurent, for example, has repeatedly expressed great concern about health and safety issues posed by turbines; but these concerns fall on deaf ears. Once the Board of Selectmen approves it, your public comments will fall on deaf ears, too. That is Hayward's approach to planning: ready, fire, aim.

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From: Rob Pforzheimer
Sent: Wednesday, December 26, 2012 1:11 PM
Subject: Obama's wind-production tax-credit swindle
http://www.washingtontimes.com/news/2012/dec/26/obamas-wind-production-tax-credit-swindle/?page=all#pagebreak

MARTIS AND CHRISTENSON: Obama's wind-production tax-credit swindle
Serves big business, hurts the environment

By Kevon Martis and Tauna Christensen

Wednesday, December 26, 2012

Enlarge Photo
Illustration Wind Tax by John Camejo for The Washington Times more >

Regarding the federal deficit, President Obama famously said, "I will not support any plan that puts all the burden for closing our deficit on ordinary Americans [and yet does not ask] the biggest corporations to pay their fair share." Now, however, Mr. Obama vigorously supports at least one policy that violates that pledge: the federal production tax credit (PTC) for wind energy.

Conceived in 1992 as a means to spur the construction of wind-energy facilities that could compete with monopoly-owned conventional fossil-fuel power plants, this hefty tax credit mostly has benefited the same monopoly: conventional nuclear and fossil-fuel-fired electricity producers.

With wind plants totaling 9,289 megawatts of capacity, Florida-based NextEra Energy/FPL (aka Florida Power & Light) is the largest recipient of this tax credit. Of course, NextEra is only the largest, not the only, corporate beneficiary of taxpayer largesse. Nonetheless, the largesse it receives is huge.

Primarily because of the PTC's generous tax benefit, BusinessWeek reports, from 2005 to 2009 "FPL has paid just $88 million in taxes on earnings of nearly $7 billion." That gave FPL a tax rate of merely 1.25 percent over that period. Most corporations average a 30 percent tax rate. At that rate, FPL's tax obligation would have been more than $2 billion.

This $2 billion tax avoidance is a result of the company's "taking advantage of incentives to develop renewable resources."

One might argue that these lavish tax credits are warranted, as they supposedly level the playing field between startup producers of "clean" wind energy and established "dirty" conventional energy producers. Yet NextEra/FPL is the eighth-largest power producer in the United States, with the bulk of its generation coming from fossil or nuclear sources.

The company owns the largest fossil plant in the United States, the recently completed West County Energy Center's combined-cycle gas turbine (CCGT) plant, located on a 220-acre site in the environmentally sensitive Everglades.

Curiously, the price tag for this facility is also $2 billion, nearly equal to the value of NextEra/FPL's combined tax credits from 2005 to 2009.

NextEra/FPL boasts that its huge number of PTC-driven wind-generation plants have "allowed FPL to avoid building 13 medium-sized power plants since 1980." Ignoring the fact that intermittent wind turbines never can replace steady, reliable fossil plants, it appears that FPL more honestly could have stated the impact of the PTC thus: The wind-energy production tax credit funded the construction of America's largest fossil-fuel generation plant, located in the heart of the environmentally sensitive Florida Everglades.

NextEra's huge wind-turbine fleet seems impressive. When adjusted for wind's on-again, off-again nature, however, the United States' largest fleet of wind turbines will have an average capacity of perhaps 2,700 megawatts (ranging from zero to 9,000 megawatts hourly and daily) yet will cost $18 billion.

Had this $18 billion instead constructed eight gas turbine plants like NextEra/FPL's new one in the Everglades, the company would have nearly 30,000 megawatts of dependable capacity versus wind's paltry and unreliable 2,700 megawatts. Moreover, gas turbines, unlike wind turbines, actually could replace dozens of coal plants while reducing carbon-dioxide emissions by half.

This, too, is a return wind generation can never match because it forces "backup" fossil-fuel plants to ramp up and down constantly as wind speeds rise and fall, causing inefficiencies, high fuel use and high carbon-dioxide emissions.

What of the president's pledge? While being committed to both "stopping the ocean's rise" by controlling carbon dioxide and asking the "biggest corporations to pay their fair share," he has let the PTC fail him on both counts.

Not only has the PTC helped a Fortune 200 company evade its "fair share" of corporate income tax, Mr. Obama has unwittingly let his beloved production tax credit fund the construction of the largest fossil-fuel gas-fired turbine plant in the United States a mere 1,000 feet from the Everglades' Arthur R. Marshall Loxahatchee Wildlife Refuge.

If Mr. Obama is serious about protecting the environment and making the "biggest corporations" pay their fair share, he should oppose any extension of the PTC.

Kevon Martis is the senior policy analyst for the Michigan-based Interstate Informed Citizens Coalition Inc. Tauna Christensen is a principal of the Idaho-based Energy Integrity Project.

From: Rob Pforzheimer
Sent: Friday, December 28, 2012 12:36 AM
Subject: Lyme has been "ignored," "marginalized" by state and BP Wind Energy

Lyme has been "ignored," "marginalized" by state and BP Wind Energy, officials say
By JAEGUN LEE
TIMES STAFF WRITER
THURSDAY, DECEMBER 27, 2012
ARTICLE OPTIONS

CHAUMONT — Lyme officials said the town has been "ignored" and "marginalized" by both BP Wind Energy, developer of the proposed Cape Vincent Wind Farm, and the state.
Although there will be no wind turbines in the town under the developer's latest proposal, BP still would need to run a transmission line connecting the wind farm to a substation in Lyme.
But instead of seeking local approval, the wind project manager in October said BP will ask a state siting board to consider the transmission line.

"Now BP and our own state are ignoring the town of Lyme, our comprehensive plan and our zoning law. This is not new, as Lyme has been marginalized in the entire process," Lyme officials said in a Dec. 14 letter to Public Service Commission Secretary Jaclyn A. Brilling. "Perhaps you don't care. Perhaps you and the other officials on the siting board are simply doing as BP is, the minimum that is required by law, checking off a box in the steps of a process that ignores the wishes of the residents of a small community."

The letter was signed by town Supervisor Scott G. Aubertine and council members Donald R. Bourquin, Ann "Boo" Harris, Daniel J. Villa and David A. Henderson.

Supervisor Aubertine had told Richard F. Chandler, director of business development for the Cape Vincent Wind Farm, that Lyme's zoning law allows for transmission lines, but Mr. Chandler said BP is treating the wind farm and transmission line as one project.

"Although the transmission line will divide our entire town, and Lyme will be surrounded by industrial turbines, there has been little attempt to engage with public officials or our residents," the officials said. "The town of Lyme will have industrial wind turbines located just off their boundaries which in turn will impact property values."

Officials also said they fear that BP will attempt to place turbines in Lyme as a possible second phase of the project.

BP's proposed $300 million wind farm would place 124 turbines in Cape Vincent and is projected to generate up to 285 megawatts of electricity.

The developer is seeking an Article X review for the wind project and transmission line, which would allow a state siting board to overrule what it deems to be unreasonable local laws.

"Please do not override our carefully researched and well-thought-out law that will protect the residents of our community," the Lyme officials said in their letter.

http://www.watertowndailytimes.com/article/20121227/NEWS03/712279922

From: Rob Pforzheimer
Sent: Friday, December 28, 2012 10:21 AM
Subject: Spanish wind farms kill 6 to 18 million birds & bats a year

ANR has given First Wind a "take" permit to allow them to kill endangered bats in Sheffield. Will GMP in Lowell, Blittersdorf in Georgia Mtn, and any future wind boondoggles also be granted take permits that will bring bats, already endangered by White Nose Syndrome, to extinction in VT?
Please consider the cumulative effect of industrial scale wind projects in New England on birds and bats.

Spanish wind farms kill 6 to 18 million birds & bats a year
On 12 January 2012, at the First Scientific Congress on Wind Energy and Wildlife Conservation in Jerez de la Frontera, Spain, **the Spanish Society of Ornithology (SEO/Birdlife)** made public its estimate that, yearly, Spain's 18,000 wind turbines may be killing 6 to 18 million birds and bats (1). The average per turbine comes down to 333 – 1,000 deaths annually, which is a far cry from the 2 – 4 birds claimed by the American wind industry, or the 400,000 birds a year estimated by the American Bird Conservancy for the whole United States, which has about twice as many turbines as Spain.

Bats are included in the Birdlife estimate, comments Mark Duchamp, president of Save the Eagles International (STEI). "Therefore, supposing for example that wind farms would kill twice as many bats as they do birds, the figures would be: 111 – 333 birds per turbine per year, and 222 – 666 bats per turbine/year. The mortality figures that were recorded in Germany and Sweden in the early nineties are not unusual after all", he notes. Quoting from a California Energy Commission study: **"In a summary of avian impacts at wind turbines by Benner et al. (1993) bird deaths per turbine per year were as high as 309 in Germany and 895 in Sweden."** (2)

Duchamp has always maintained that earlier studies, made when bird mortality at windfarms wasn't such a hot potatoe, were more credible than recent ones. "It is a curious business where those consultants who find or predict the lowest mortality land all the contracts. This is what is being asked of them, and this is what they do. **This unethical conduct has already condemned the Tasmanian Wedge-tailed eagle to extinction (3), and more recently the Golden Eagle in the United States (4).**Another factor is the occultation of carcasses by windfarm employees, as may be seen in the SEO/Birdlife report." (5)

The report also stresses that even a small incremental mortality for bird species whose populations are not abundant may drive them to extinction. "This is what I have been claiming for years", laments Mark, who has been banned from ornithology forums as an unwelcomed messenger of bad news. "I am now vindicated, but that won't save the birds", he says.

SEO/Birdlife puts the blame on poor-quality environmental studies. So did Duchamp, as early as 2004: " …(avian impact assessments)… are sometimes voluminous and obfuscating, sometimes short and to the point, **but mendacious always** , minimizing the avian impact. They serve the purpose that is assigned to them: permit the erection of windfarms where the promoters want them, regardless of bird activity in the area." (6)

Mark has long been claiming that it was foolish to allow environmental impact assessments to be directed and controlled by wind farm developers. It now appears he was right. The question is, he concludes: "will this aberration be allowed to continue?"

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Juan Avalos Schlegel +34 639 30 26 19
Vice President, Save the Eagles International – Spain
el_aguilero@hotmail.com

References:

(1) – On SEO/Birdlife webpage:
http://www.seo.org/2012/01/12/seobirdlife-presenta-una-nueva-guia-para-la-evaluacion-del-impacto-de-parques-eolicos-en-aves-y-murcielagos/
- In the media: http://www.abc.es/20120112/natural-biodiversidad/abci-parques-eolicos-aves-201201121310.html

(2) – PIER Study of the California Energy Commission (2002). See page 12, first paragraph – D. Sterner, for the California Energy Commision (Dec. 2002) A Roadmap for PIER Research on Avian Collisions with Wind Turbines in
California. http://www.iberica2000.org/documents/EOLICA/REPORTS/Dave_Sterner_2002.pdf

(3) – Suspicious error by consultant condemns Tasmanian eagle to
extinction http://www.iberica2000.org/Es/Articulo.asp?Id=4382

(4) – The Golden Eagle in peril in the US http://savetheeaglesinternational.org/?page_id=755

(5) – SEO/Birdlife report: http://www.seo.org/media/docs/Manual_molinos.pdf see page 11 – 2)

(6) – Chilling Statistics http://www.iberica2000.org/Es/Articulo.asp?Id=1875

14 Responses to "A bombshell from Spain – 14 Jan. 2012"

- *Windfarms: bird mortality cover-up in the UK. (MEDIA RELEASE) by Mark Duchamp « Raptor Politics*:

April 17, 2012 at 10:41 am

[...] (4) – SEO/Birdlife: 6 to 18 million dead birds and bats a
year: http://savetheeaglesinternational.org/?page_id=770 [...]

- *Thankfully, the word is continuing to spread regarding the destructive nature of wind turbines. | Quixotes Last Stand*:
-

July 2, 2012 at 1:14 am
[...] places its windfarms. – STEI http://savetheeaglesinternational.org/?page_id=947 (5) – 6-18 million birds and bats killed yearly by 18,000 wind turbines in Spain: [...]

- *Dispelling the cats, buildings vs. wind farm bird death myth : Solar Company USA*:

July 2, 2012 at 7:00 am
[...] – 6-18 million birds and bats killed yearly by 18,000 wind turbines in [...]

- *Lettre au Premier Ministre du Québec « Conseil Mondial pour la Nature*:

July 20, 2012 at 1:26 am

[...] (3) – Les éoliennes tuent des millions d'oiseaux et de chauve-souris:http://savetheeaglesinternational.org/?page_id=770 (4) – Un investissement superflu:http://www.iberica2000.org/Es/Articulo.asp?Id=4540 (5) – [...]

- *Letter to Quebec's Premier « World Council for Nature*:

July 20, 2012 at 2:59 am

[...] (3) – Wind farms kill millions of birds and bats a year: http://savetheeaglesinternational.org/?page_id=770(4) – Wind farms are redundant: http://www.iberica2000.org/Es/Articulo.asp?Id=4540 (5) – [...]

- *Carta abierta al Señor Fernando Pizarro, alcalde de Plasencia « PLASENCIA LIBRE*:

August 7, 2012 at 9:16 am

[...] – SEO/Birdlife: los molinos matan entre 6 y 18 millones de aves y murciélagos al año [...]

- *Obama's Wind Power a Lot of Hot Air at US Action News*:

August 15, 2012 at 2:35 pm

[...] values, and forever changing the character of the area – these giant "Cuisanarts of the air" slaughter countless eagles, bats (already under serious threat from disease) and other magnificent flying creatures worldwide. [...]

- *Local Wind Subsidies: New York State's Money-Road to Nowhere | WesternFront America*:

August 15, 2012 at 3:30 pm

[...] wind installations driving people from their homes — while further endangering the populations of eagles, hawks, herons, cranes, bats, and all magnificent flying creatures. Rural wind power, in short, is [...]

- *New York State's money-road to nowhere - Eco-Imperialism*:

August 16, 2012 at 3:51 am

[...] values, and forever changing the character of the area – these giant "Cuisanarts of the air" slaughter countless eagles, bats (already under serious threat from disease) and other magnificent flying creatures worldwide. [...]

- *New York state's money to nowhere bridge*:

August 16, 2012 at 5:38 pm

[...] values, and forever changing the character of the area – these giant "Cuisanarts of the air" slaughter countless eagles, bats (already under serious threat from disease) and other magnificent flying creatures worldwide. [...]

- *HACER Weekly News Report USA | US: New York State's money-road to nowhere – by Mary Kay Barton*:

August 17, 2012 at 10:20 am

[...] values, and forever changing the character of the area – these giant "Cuisanarts of the air" slaughter countless eagles, bats (already under serious threat from disease) and other magnificent flying creatures worldwide. [...]

- *El Consejo Mundial para la Naturaleza critica la Junta de Extremadura | SALVAREXT*:

September 12, 2012 at 9:56 pm

[...] gracias a la legislación que protege el derecho de los ciudadanos a la información ambiental. Dice STEI en su página web: “Bats are included in the Birdlife estimate… Therefore, supposing for example that [...]

- *L'éolien industriel n'est pas écologique - Contrepoints | Contrepoints*:

September 23, 2012 at 7:54 am
[...] WCFN insiste sur l’effet désastreux des éoliennes sur l’environnement. Une étude récente de la Société Espagnole d’Ornithologie (SEO/Birdlife), révèle que les éoliennes tuent en [...]

- *L’éolien industriel n’est pas écologique « Mirmande PatrimoineS Blogue*:

September 24, 2012 at 11:38 am
[...] WCFN insiste sur l’effet désastreux des éoliennes sur l’environnement. Une étude récente de la Société Espagnole d’Ornithologie (SEO/Birdlife), révèle que les éoliennes tuent en [...]

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From: Rob Pforzheimer
Sent: Friday, December 28, 2012 10:47 PM
Subject: Accusations fly as First Wind fights Clipper for refund

"the Liberty turbine (used by First Wind in Sheffield) has faced well-known problems such as faulty gearboxes and cracked blades."

http://www.windpowermonthly.com/northamerica/news/login/1164654/

Accusations fly as First Wind fights Clipper for refund
Ros Davidson, Windpower Monthly Magazine, 28 December 2012, 12:00am
UNITED STATES: Turbine manufacturer Clipper Windpower and Boston-based developer First Wind are engaged in a near-$60 million lawsuit in Iowa over a disputed wind turbine order.

Dispute: First Wind's claim involves Clipper's 2.5MW Liberty turbine
First Wind said it paid the money for a batch of Clipper's 2.5MW Liberty turbines, which were never delivered. It also said Clipper has effectively stopped manufacturing the turbines. As of mid-December 2012, the Iowa suit was still ongoing, while a similar action in California was withdrawn on 5 November by First Wind for reasons that are not clear.

First Wind, a former major customer of Clipper, has been trying to freeze $59.5 million of Clipper's assets in three different court jurisdictions. The aim is to ensure that the private equity-owned turbine manufacturer can pay an arbitration settlement under way with First Wind in Chicago currently being overseen by the American Arbitration Association.

The allegations contained in the three court cases are at times startling. According to a memorandum filed by First Wind in the New York case, Platinum Equity purchased Clipper in August 2012 for "nothing - in fact, United Technologies Corporation (UTC) had to inject money into Clipper in order to get Platinum to take the manufacturer and its liabilities off UTC's hands". First Wind has also said that Clipper is on the "verge of imploding".Both Clipper and Platinum declined to respond to a request for comment on the financial side of the deal.

Manufacture offer
In October, Judge Peter Sherwood of the Supreme Court of the State of New York declined to freeze the assets, noting that Clipper had said it was willing to manufacture the turbines if First Wind would only

make a firm order. In court documents, First Wind has cited uncertainty over the production tax credit and permitting delays as reasons for not proceeding with its order.

In the Iowa suit, First Wind said that earlier in 2011 Clipper turned down a proposed order for 20 turbines. However, in another court proceeding, Clipper said that First Wind's order was never firm and that Clipper could have assembled the turbines if this was the case. In the Iowa suit, First Wind is reported as claiming it had difficulty obtaining financing for wind projects specifying Clipper turbines because of the manufacturer's financial instability.

Waranty work
NextEra Energy Resources, the largest owner and operator of wind in the US, has become involved. It tried to intervene in the New York suit at the last minute, although the judge ruled before it could do so. In court documents, NextEra said that Clipper was in breach of its warranty obligations - but that the situation would be exacerbated if Clipper was forced into involuntary bankruptcy because First Wind succeeded in freezing its assets.

NextEra declined to comment on its role or whether it is in arbitration with Clipper over warranties. the company has not intervened in the Iowa suit, according to the court clerk's office.

Warranty claims have long been a problem for Clipper Windpower. Just a week before it sold Clipper, UTC said in its financial statements that Clipper had $91 million in reserves for potential warranty claims. Even before UTC bought Clipper in 2010 for $385 million, the Liberty turbine has faced well-known problems such as faulty gearboxes and cracked blades.

There have been reports that Clipper is planning to scale the company back to its servicing operation, which handles the Clipper-manufactured gearbox for the Liberty turbine.

Clipper manufactured the Liberty turbine in Cedar Rapids, Iowa from 2006 until earlier this year. It suspended turbine production and laid off 76 employees after the company was sold to leveraged buyout specialist Platinum Equity. Not long before the purchase, Clipper had warned that it might not be able to keep going without an injection of cash.

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From: Rob Pforzheimer
Sent: Saturday, December 29, 2012 10:24 PM
Subject: Check out Wind Energy Subsidies to Expire at End of the Year - YouTube

Robert Bryce on Fox News talking about industrial wind noise and the PTC

Click here: Wind Energy Subsidies to Expire at End of the Year - YouTube:

http://www.youtube.com/watch?feature=player_embedded&v=wstSa2mrqHk

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From: Rob Pforzheimer
Sent: Sunday, December 30, 2012 10:49 AM
Subject: Wind power a fiscal loser - Boston Herald

Wind power a fiscal loser
http://bostonherald.com/news_opinion/opinion/2012/12/wind_power_fiscal_loser
December 30, 2012

By
Herald Staff

Whatever Congress does about the “fiscal cliff,” it should let subsidies for electricity-generating wind turbines die as scheduled on Monday.

These subsidies, touted by their early sponsors 20 years ago as necessary to kick-start a green industry, do little to keep carbon dioxide, an earth-warming gas generated by combustion of fossil fuels, out of the atmosphere. And that little costs a lot — $12 billion if the subsidies are renewed for another year. Disappointing the hopes of those sponsors, costs have not declined. And since electricity cannot be stored except at great cost, every wind farm must have conventional generators as ready backups for when the wind dies down. Though wind fluctuation varies from site to site, on average current turbines produce electricity about 15 percent of the time.

The most important subsidy is a tax credit — the equivalent of cash — of 2.2 cents per kilowatt-hour produced. This costs $5.2 billion a year. This excludes construction grants, loan guarantees and other help that brings the total to 5.2 cents per kwh — 17 times the subsidy rate for nuclear power, according to figures from the Energy Information Administration quoted by former Sen. Phil Gramm (R-Texas). That’s still not the whole story: Nobody has counted all the state subsidies and purchase requirements, in effect in 30 states (including Massachusetts). Unwise as they are, they will keep many wind farms running.

Members of Congress are naturally under pressure from wind farm operators at home to keep the subsidies flowing. But it would amount to a political sin to do so for such an inefficient approach with the national debt ever rising and when abundant natural gas costs only one-quarter what it did four years ago

From: Rob Pforzheimer
Sent: Sunday, December 30, 2012 9:01 PM
Subject: Telegraph: "Europe, wind, warming... we're slowly waking up

Same story, different country....

http://www.telegraph.co.uk/comment/9770705/Europe-wind-warming...-were-slowly-waking-up-to-reality.html

Sunday Telegraph

Europe, wind, warming... we're slowly waking up to reality

It was the year when many long-dominant belief systems began to collapse

2012: the year of promised 'drought' that turned into England's wettest on record
Photo: ALEX TODD/STOCKPIX.EU

By Christopher Booker
29 Dec 2012 7:
41PM GMT

There could be few more apt epitaphs for the year now ending than a recollection of the headlines in April that greeted a stark warning from the Environment Agency. Fuelled by the predictions of the climate-change-obsessed Met Office (and the the official policy, since 2007, of the similarly fixated EU) that we will have “hotter, drier summers” for decades to come, the agency foretold that the drought conditions of the early spring were likely to last “until Christmas and perhaps beyond”. The prophecy was swiftly followed by the wettest late spring, the wettest summer, the wettest autumn and the wettest Christmas we have ever known – eight months of near-continuous rain and floods amounting to England’s wettest year since records began.

For many of the major stories which have long been followed by this column, 2012 has been the year when long-dominant belief systems and fondly held illusions have been conspicuously falling apart, portending a time of agonising reappraisal when familiar certainties give way to greater realism and painful rethinking.

On Tuesday, for instance, much coverage will be given to the 40th anniversary of the day in 1973 when Britain finally junked “1,000 years of history” – in the famous words of Labour leader Hugh Gaitskell – and threw in her lot with the attempt to create an all-powerful super-government over the nations of Europe. (Gaitskell had shrewdly predicted, in his speech back in 1962, what the Common Market, as it was then known, was intended eventually to become.)

It is 20 years since this column began regularly reporting on the damage that our membership of the European Union (as it was then about to become, under the Maastricht Treaty) was starting to inflict on our national life. In those days, to question our membership was to be dismissed by all right-thinking people as a crank, a nutter, a xenophobe who could not be taken seriously. When at the start of 1992, I first began reporting horror stories about the tidal wave of new regulations hitting so many British businesses with the approach of the Single Market, along with the destruction of our fishing industry and much of our agriculture, we were still locked into that forerunner of the single currency, the ERM (almost unanimously supported, it is salutary to recall, by every political party and right across the media).

When we were forced out of the ERM on Black Wednesday, September 16, 1992, it ushered in a period of dramatic economic growth which, six years later, would allow Gordon Brown to announce his hubristic decision to double public spending in 10 years. We are paying the price for that now: this year the Government has had to borrow up to £18 billion a month to cover its ever-widening deficit.

Forty years on from our entry into “Europe”, as we see “the project” plunge deeper into the misery and chaos it has brought on itself by its even more hubristic desire to give the EU its own currency, British attitudes to our membership have changed beyond recognition. In their desperate efforts to save the euro, we see the EU’s inner core driving on towards yet another treaty and “full political union”, in a way that will condemn the UK to remain helplessly on the margin, with less influence over Europe’s destiny than ever. On all sides we hear plaintive cries that we must negotiate a “looser relationship” with the form of government to which we subordinated ourselves 40 years ago, as if we could defy its most basic rule: that powers once handed over to the centre in Brussels can never be given back.

Poll after poll shows that the majority of the British people would now like to see us get out altogether. One way or another – although few seem yet to have any realistic idea of how this could be achieved – we seem to be approaching a turning point in our relations with “Europe”, one as fateful as that step Edward Heath led us into so blindly back in 1973.

Just as significant this year have been the signs of glimmerings of reality breaking in on the delusions that go with the long-dominant conviction that the world is in the grip of a changing climate that we somehow have the power to reverse, if only we are prepared to subordinate every aspect of national policy to doing so and to change almost every aspect of our lives. It is 10 years since I first began reporting here on just one of the countless threads in that story – the belief that we could somehow derive most of the electricity on which our computer-dependent economy now relies from “renewable” sources: for instance, by covering vast tracts of our countryside and sea with giant wind turbines.

Again, back in 2002, to point out that wind energy was an incredibly damaging illusion was to be dismissed as a crank, a Nimby, a Luddite. But 10 years later, the penny is finally dropping that, in practical terms, this is an incredibly foolish and costly mistake. Furthermore, it is only part of a disastrous skewing of our energy policy through an obsesssion, shared with the EU since 1990, that we must lead the world in fighting a threat which, in the past few years, has increasingly come to be seen as a colossal scare story.

Six years ago, with global-warming hysteria still at its height, I first began to suggest here that it might be based on scientific evidence that was distorted or fabricated – as in the “hockey stick” graph, or the bizarre adjustments being made to official temperature records. Again, to say this at the time was to be derided as a “climate-change denier”, “anti-science”, a “flat earther”.

It is three years since, growing out of my researches for this column, I published a book called The Real Global Warming Disaster. It ranks alongside books by Al Gore and James Lovelock as one of the three best-sellers on the subject in the past decade, because it was the first detailed attempt to reconstruct the scientific and political story of the global-warming scare – just before it became clear, at the mammoth Copenhagen conference, that efforts to get a new treaty to combat global warming (and present mankind with the biggest bill in history) had collapsed.

As the scientific case for man-made climate change fell apart, in a welter of scandals which showed how ruthlessly the evidence had been fudged and manipulated, the real global warming disaster, as I argued, was the political legacy it was leaving us with. No one had promoted this more zealously than the EU and the British government, whose Climate Change Act, approved almost unanimously by MPs, is by far the most costly law ever put through Parliament.

At last, in 2012, we have begun to see calls for the repeal of this utterly insane legislation, requiring us to cut “carbon emissions” by four fifths in less than 40 years, which could only be achieved by shutting down virtually the entire British economy. At the same time we have heard influential calls, going right up into the heart of Government, for an end to the insanity of covering Britain’s countryside with useless

and ludicrously expensive windmills. We have also heard calls, as in a recent report from the think tank Civitas, for the scrapping of the equally mad “carbon tax”. From April, the steadily increasing costs of this will gradually – as this column has long pointed out – make Britain’s economy the least competitive in Europe, destroying tens of thousands of jobs as energy-intensive industries are forced to relocate abroad or close altogether, and driving millions more households into “fuel poverty”.

At the same time, we have the promise of a national debate as to whether Britain should remain part of the maddest political experiment in history as it staggers deeper and deeper into a relentless crisis which threatens eventually to tear it apart, and our joining of which Margaret Thatcher described in her retirement as “a political error of the first magnitude”.

As 2013 dawns, with the US teetering on the edge of its own “fiscal cliff”, in many ways not dissimilar to that left to us by Gordon Brown, we are certainly in for “an interesting time”. But at least as the political skies grow darker and Britain gets wetter, there are real signs that we are beginning to wake up from a whole series of collective dreams which turned out to be nightmares. The breaking in of reality on such make-believe must inevitably be painful and bewildering. But if it is a prelude to our returning to our senses as a nation, then this could be an apt cue to wish you all a happy New Year.

May I again thank the many readers who have sent me letters and emails in 2012 - too many, alas, for all to be answered. But they are appreciated more than perhaps you know, not least those from scores of unhappy parents whose children have been snatched from them for no good reason. This is a national scandal I shall continue my efforts to expose in 2013.

From: Willem Post
Sent: Sunday, December 30, 2012 6:43 PM
Subject: Re: Bill seeks to ban wind projects

All,

A wind energy moratorium is about 3 years overdue. The damage on Sheffield Mountain and Lowell Mountain is done. Joe Benning, John Campbell, David Hallquist, etc., have declared in favor of a 3-year moratorium. It is time, others declare themselves.
http://www.timesargus.com/article/20121230/NEWS03/712309928

The PSB shamelessly rubber-stamping any wind energy project that comes along, after pro-forma/sham hearings, is a blot on Vermont's democracy and reputation. No federal and state subsidies, and out-of-state capital investments, that benefit Vermont’s wind energy oligarchy, areworth the debasement of so many. How much snake oil will Vermonters swallow before revolting?

A few, willful, multi-millionaires and international corporations, greedy for “free” subsidies, are exploiting the gullibility/ignorance of Vermonters with extravagant promises of "fighting global warming/climate change", as if mankind's puny efforts, compared to that of the sun, will ever be of any importance. In the meantime, developing nations, i.e., China, India, Brazil, etc., will be burning all of THEIR coal, thereby more than negating all that could be done by developed nations. GW is here to stay no matter what Vermont does, and despite 20 futile United Nations Climate Change meetings; COP-18 in 2012 was the latest in Dohu, Qatar.

http://theenergycollective.com/willem-post/83704/reduce-co2-and-slow-global-warming

http://theenergycollective.com/willem-post/107316/global-warming-coal-combustion-and-sea-level-rise
http://theenergycollective.com/willem-post/151031/global-warming-targets-and-capital-costs-germany-s-energiewende

They are using their very own Section 248 (just for wind projects) to destroy Vermont's beauty, that Act 250 has been trying to preserve, for their environmentally-damaging, health-damaging, property-value-lowering, visually-offensive, noise-making, bird-killing projects, that produce expensive, variable, intermittent, i.e., junk energy, that could not be used on the grid, unless it is balanced by quick-ramping gas turbine energy.

Multi-millionaire Blittersdorf's “plan” is to put 460-ft tall, IWTs on 200 miles of Vermont’s ridge lines, equivalent to 200/3.5 = 57 Lowell Mountains @ $160 million = $9.14 billion. The damage would be equivalent to at least 5 times that of Vermont's ski "industry", plus nighttime noise. The life of the IWTs is at most 20-years. The energy foisted onto Vermont households and businesses would be 10 c/kWh, heavily subsidized, per GMP; 15 c/kWh, unsubsidized, per US-DOE.
http://theenergycollective.com/willem-post/61309/lowell-mountain-wind-turbine-facility-vermont

Note: HydroQuebec, Vermont Yankee and grid energy is available at 5-6c/kWh.
Note: GMP is buying 60 MW of Seabrook nuclear energy for 23 years @ 4.66 c/kWh; VY was offering 4.9 c/kWh.

http://www.wptz.com/Vt-Utility-To-Buy-Power-From-NH-s-Seabrook-Nuclear-Plant/-/8870596/5731094/-/4nauia/-/index.html

According to Economics 101, rolling expensive wind energy into rate schedules:

- increases the prices of goods and services,
- reduces household living standards,
- reduces household incomes and business net incomes and tax payments,
- creates jobs only in RE sectors, but reduces them in many other sectors, for a net LOSS of jobs,
- reduces investments by out-of-state companies (because of high energy costs) and drives companies out of Vermont (because of high energy costs).

All this while Vermont’s economy is barely growing, spendable household incomes declining since 2007, business profits are minimal, and good-paying job creation is almost nonexistent, and Vermont having a budget deficit of about $75 million. The nth degree of mismanagement of Vermont’s economy.

Klein, Cheney, Recchia, etc., defend the flawed PSB process. They want to reduce Vermont's CO2 emissions by 90% by 2050. That means no wood, fuel oil, natural gas, propane for building heating. All buildings are to be electrically heated. They want to start off the process by adding a fee on the fuel oil consumption of households and businesses, which are already suffering due to the Great Recession, i.e., start at 5% and go from there, as happened with the Efficiency Vermont charge. All vehicles would be electric only, no hybrids. It would all be done by 2050. This kind of unrealistic dreaming masquerades as energy policy in Montpelier. Its "do-good" (or is it voodoo?) proponents imply Vermonters do not know how to prepare for the future, as they have done for about 250 years.

Gov. Peter Shumlin says "environmental and economic imperatives demand that the state adopt an aggressive posture on renewable energy development of all kinds." Oh, really! As a lawyer, he is not into numbers. Vermont's CO2 emissions are almost nothing from energy generation, but about 75% from buildings and transportation. A rational, less crony-capitalist person would start with a statewide, strictly-enforced, energy efficiency building code, and would provide an annual bonus for using the highest mileage vehicles, and an annual tax for using the lowest mileage vehicles. The last thing

Vermont (and New England) needs is more energy generation capacity. New England's grid already has the lowest CO2 emissions/kWh in the US. It would be soooo much more effective, and appropriate for Vermont, to shift subsidies away from renewables to increased energy efficiency, which would:

- decrease the prices of goods and services,
- increase household living standards,
- increase household incomes and business net incomes and tax payments,
- create greatly more jobs in EE sectors and other sectors, than any RE ever could, for a net GAIN of jobs.
- increase investments by out-of-state companies (because of lower energy costs) and attract companies to Vermont (because of lower energy costs).

How is it, that the blind pursuit of federal and state subsidies would cause some Vermont leaders, who unfortunately are in power, to stray that far off the mark? What were they thinking, or were they thinking at all, or just going with the flow?
http://theenergycollective.com/willem-post/46652/reducing-energy-use-houses
http://theenergycollective.com/willem-post/71771/energy-efficiency-first-renewables-later

Willem

The following articles describe how unsuitable expensive, variable, intermittent wind energy is regarding CO2 reduction.

http://theenergycollective.com/willem-post/61774/wind-energy-expensive
http://theenergycollective.com/willem-post/77343/vermont-leaders-back-away-renewable-energy-goals
http://theenergycollective.com/willem-post/84293/wind-turbine-noise-and-air-pressure-pulses
http://theenergycollective.com/willem-post/89476/wind-energy-co2-emissions-are-overstated
http://theenergycollective.com/willem-post/98061/irelands-wind-energy-export-plan

From: Kathleen Iselin
To:
Cc:

Subject: Fw: final report
Date: Tuesday, December 18, 2012 6:23:06 PM
Attachments: Final Report to VT DPS v3.pdf

December 19th, 2012

To the Governor's Siting Commission;

The attached 80-page report,

ELECTRIC ENERGY EFFICIENCY POTENTIAL FOR VERMONT
Final Draft Report
Prepared for:
VERMONT DEPARTMENT OF PUBLIC SERVICE
February 2011

states that VT doesn't need any new electricity generation sources until 2031, and that all VT needs to do, in that time period (19 years from now), is to implement energy conservation and efficiency measures. The report maintains that even if VT were to pay for all of these measures, and the new appliances that would be required, VT would still save money.

I submit this report, created by GDS Associates, of Marietta, GA, as evidence that there is no need for siting and/or granting CPG approval to any industrial-scale wind projects in VT, and in support of the Siting Commission recommending a 3-year moratorium on all industrial wind projects in VT (this to include the Commission's recommendation that all new big wind proposals be put on hold until a moratorium can begin.)

Sincerely,

Kathleen Iselin

East Haven, VT

GDS Associates, Inc.
Engineers and Consultants

THE CADMUS GROUP, INC.

ELECTRIC ENERGY EFFICIENCY POTENTIAL FOR VERMONT

Final Draft Report

Prepared for:
VERMONT DEPARTMENT OF PUBLIC SERVICE

February 2011

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1 EXECUTIVE SUMMARY

In October 2010, the Vermont Department of Public Service ("VDPS") commissioned GDS Associates, Inc. to conduct a study of the potential for electric energy efficiency to reduce electric consumption and peak demand throughout the State of Vermont. The most recent electric load forecast available from the Vermont Electric Company (VELCO) predicts total electricity sales and summer peak demand in the state to increase at average annual growth rates of 0.6% and 1.0% respectively for the period from 2010 through 2030.[1] Improving energy efficiency and lowering electric demand in homes, businesses, and industries can be a cost effective way to address the challenges of increasing energy costs and the increasing demand for energy in the state. Consequently, energy efficiency potential studies are important and helpful tools for identifying those energy efficiency measures that are the most cost effective and that have the most significant electricity savings potential.[2] This energy efficiency potential study provides reliable estimates of how much of Vermont's future electric service needs could be met through energy efficiency. The authors of this report emphasize that only energy efficiency measures that cost less than new power supply resources are considered to be cost effective.

This detailed report presents results from the evaluation of opportunities for energy efficiency programs in the service areas of Vermont's two energy efficiency utilities (EEU).[3] The Vermont Public Service Board (Board) has appointed the Burlington Electric Department (BED) as the EEU for the City of Burlington, and the Board has appointed the Vermont Energy Investment Corporation as the EEU for the remainder of the State, under the name "Efficiency Vermont" (EVT). For purposes of this report, "BED" will be used to refer to the area served by the Burlington Electric Department, and "EVT" will be used to refer to the area served by VEIC.

Estimates of technical potential, economic potential, and maximum achievable potential from 2012-2031 (a 20-year period) are provided for the residential and commercial/industrial (C&I) sectors. Results from three (3) resource portfolios scenarios are under development to estimate the portion of the achievable potential that might be achieved given a specific funding level and program design. The results for these three resource portfolios will be made available in a subsequent report prepared by the GDS Associates/Cadmus Group team.

All results were developed using customized residential and commercial/industrial (C&I) sector-level potential assessment computer models and Vermont-specific cost effectiveness criteria including the most recent Vermont avoided cost projections for electricity and other fuels. To help inform these models, up-to-date measure saturation data were primarily obtained from the following recent studies:

1. Vermont Department of Public Service, "Analysis of On-Site Audits of Existing Homes in Vermont", June 2009

[1] The most recent electric load forecast for the State of Vermont was prepared for the Vermont Electric Company (VELCO) by Itron, and provided to Efficiency Vermont and the VDPS through the auspices of the Vermont System Planning Committee (VSPC). GDS received this load forecast from Walter Poor of the VDPS via email on January 4, 2011. The growth rates presented here reflect a load forecast that does not include the impacts of energy efficiency efforts undertaken by Efficiency Vermont during the forecast period. More detailed information on the electric load forecast for Vermont and sub-regions are provided in Section 4 of this report.

[2] The avoided electric supply costs used in this study include avoided electric generation capacity and energy costs as well as avoided electric transmission and distribution costs.

[3] The December 20, 2010 Vermont Public Service Board Order of Appointment states on page 2 that "The Board shall appoint one or more EEUs to undertake demand-side efficiency resource acquisition initiatives in place of utility-specific programs developed pursuant to 30 V.S.A. § 218c." .

2. Vermont Department of Public Service "Overall Report, Vermont Residential New Construction Study, Final Report", July 2009
3. Vermont Department of Public Service, "Business Sector Market Assessment and Baseline Study – Existing Commercial Buildings", July 2009
4. Vermont Department of Public Service, "Business Sector Market Assessment and Baseline Study – Commercial New Construction", October 2009
5. Vermont Department of Public Service, "Business Sector Market Assessment and Baseline Study – Existing Industrial Facilities", September 2009
6. Burlington Electric Department, 2005 Residential Appliance Saturation Survey

These market assessment reports provided valuable insight regarding the current saturation of electrical equipment and baseline levels of energy efficiency throughout the state of Vermont.

The results of this study provide detailed information on energy efficiency measures that are most cost effective and have the greatest potential kWh and kW savings. The data used for this report were the best available at the time this analysis was developed. As building and appliance codes and energy efficiency standards change, and as energy prices fluctuate, additional opportunities for energy efficiency may occur while current practices may become out-dated.

1.1 Study Scope

The study examines the potential to reduce electric consumption and peak demand through the implementation of energy efficiency technologies and practices in residential, commercial, and industrial facilities. The study assessed energy efficiency potential throughout the EVT and BED service areas over twenty years, from 2012 through 2031.

The study had the following main objectives:

- Evaluate the electric energy efficiency technical potential savings in the overall State of Vermont, as well as in the EVT and BED service areas;
- Calculate the Vermont Societal Test ("VT SCT") benefit-cost ratio for the achievable potential for electric energy efficiency measures and programs and determine the electric energy efficiency economic potential savings for Vermont homes and businesses;
- Evaluate the potential for maximum achievable savings through electric efficiency programs over a twenty-year horizon (2012-2031);
- Estimate resource plan scenario savings over a twenty-year period from the delivery of a portfolio of example energy efficiency programs based on specific funding levels or savings targets.

The scope of this study distinguishes among four types of energy efficiency potential; (1) technical, (2) economic, (3) maximum achievable, and (4) resource plan scenarios. The definitions used in this study for energy efficiency potential estimates are as follows:

- **Technical Potential** is the theoretical maximum amount of energy use that could be displaced by efficiency, disregarding all non-engineering constraints such as cost-effectiveness and the willingness of end-users to adopt the efficiency measures. It is often estimated as a "snapshot" in time assuming immediate implementation of all technologically feasible energy saving measures,

with additional efficiency opportunities assumed as they arise from activities such as new construction.[4]

- **Economic potential** refers to the subset of the technical potential that is economically cost-effective as compared to conventional supply-side energy resources. Both technical and economic potential are theoretical numbers that assume immediate implementation of efficiency measures, with no regard for the gradual "ramping up" process of real-life programs. In addition, they ignore market barriers to ensuring actual implementation of efficiency. Finally, they only consider the costs of efficiency measures themselves, ignoring any programmatic costs (e.g., marketing, analysis, administration) that would be necessary to capture them.[5]

- **Achievable potential** is the amount of energy use that efficiency can realistically be expected to displace assuming the most aggressive program scenario possible (e.g., providing end-users with payments for the entire incremental cost of more efficiency equipment). This is often referred to as maximum achievable potential. Achievable potential takes into account real-world barriers to convincing end-users to adopt efficiency measures, the non-measure costs of delivering programs (for administration, marketing, tracking systems, monitoring and evaluation, etc.), and the capability of programs and administrators to ramp up program activity over time.[6]

- **Resource Plan Scenarios -** Results from three (3) resource portfolios scenarios are under development to estimate the portion of the achievable potential that might be achieved given specific funding levels and program designs. The results of these resource plan scenarios will be presented in a supplemental report.

Limitations to the scope of study: As with any assessment of energy efficiency potential, this study necessarily builds on a large number of assumptions, including the following:

- Energy efficiency measure lives, measure savings and measure costs
- The discount rate for determining the net present value of future savings
- Projected penetration rates for energy efficiency measures
- Projections of electric generation avoided costs for electric capacity and energy
- Projections of avoided costs for externalities (e.g. carbon)
- Projections of avoided costs for other fuels (heating oil, natural gas, propane)
- Electric transmission and distribution avoided costs

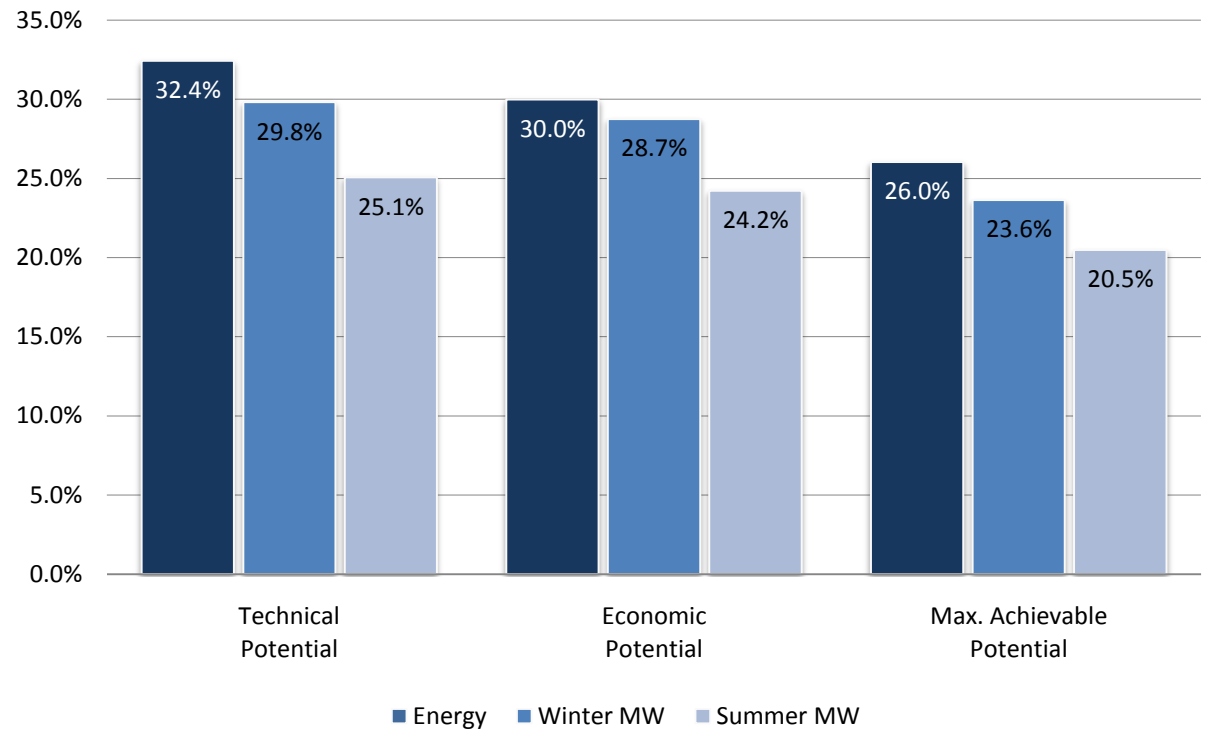
While the authors have sought to use the best available data, there are many assumptions where there may be reasonable alternative assumptions that would yield somewhat different results. Furthermore, while the lists of measures examined in this study represent most commercially available measures, these measure lists are not exhaustive. Finally there was no attempt to place a dollar value on some difficult to quantify benefits arising from installation of some measures, such as increased comfort or increased safety, which may in turn support some personal choices to implement particular measures that may otherwise not be cost-effective or only marginally so.

[4] National Action Plan for Energy Efficiency, "Guide for Conducting Energy Efficiency Potential Studies", page 2-4.
[5] Id.
[6] Id.

1.2 Results Overview

Figure 1-1, presented below, shows that cost effective electric energy efficiency resources can play a significantly expanded role in the Vermont energy resource mix over the next 20 years. For the total State of Vermont, the technical potential for energy efficiency is 32.4% of forecasted kWh sales in 2031, twenty years from now.[7] The energy efficiency economic and achievable potential in 2031 are 30.0% and 26.0% of forecasted kWh sales in 2031. The technical, economic and achievable electric demand savings for the state as a whole are 29.8%, 28.8% and 23.7% (respectively) of forecasted winter peak demand in 2031. The technical, economic and achievable electric demand savings for the state as a whole are 25.1%, 24.2% and 20.5% (respectively) of forecasted summer peak demand in 2031.

Figure 1-1: 2031 DSM Potential Savings Summary for State of Vermont (DSM Potential as a Percent of Forecasted Vermont kWh Sales in 2031)



This study examined over 400 energy efficiency measure permutations in the residential, commercial and industrial sectors combined.

Table 1-1 below presents detailed information on the technical, economic and achievable energy efficiency savings potential for all sectors combined for the BED service area, for the EVT service area, and for the BED and EVT service areas combined. Further information on the energy efficiency potential by sector is provided in Sections 6 and 7 of this report.

[7] All energy and demand savings presented in this report are at the end-consumer (meter) level unless specifically noted otherwise in this report. See Section 5.10 of this report for information on the assumptions used in this study for free-ridership and spillover.

Table 1-1: DSM Potential Savings Detail (by Region and Customer Class)

	Energy		Demand			
	Energy (MWh)	% of 2031 Sales	Winter MW	% of 2031 Winter Peak	Summer MW	% of 2031 Summer Peak
ALL SECTORS COMBINED						
State-wide						
Technical Potential	1,910,154	32.4%	302.1	29.8%	282.4	25.1%
Economic Potential	1,766,075	30.0%	291.8	28.8%	272.9	24.2%
Achievable Potential	1,533,411	26.0%	240.0	23.7%	230.7	20.5%
EVT Territory						
Technical Potential	1,784,580	32.6%	285.5	29.9%	264.2	25.3%
Economic Potential	1,650,955	30.2%	275.9	28.9%	255.8	24.5%
Achievable Potential	1,432,224	26.2%	226.6	23.7%	215.9	20.7%
BED Territory						
Technical Potential	125,574	30.1%	16.6	27.6%	18.2	22.8%
Economic Potential	115,120	27.6%	15.8	26.3%	17.0	21.4%
Achievable Potential	101,187	24.2%	13.4	22.3%	14.8	18.6%
RESIDENTIAL SECTOR						
State-wide						
Technical Potential	1,101,684	44.3%	236.5	48.1%	173.1	39.0%
Economic Potential	1,056,019	42.5%	232.7	47.4%	172.5	38.9%
Achievable Potential	894,360	36.0%	186.8	38.0%	140.4	31.7%
EVT Territory						
Technical Potential	1,052,787	44.1%	225.9	47.8%	165.1	38.7%
Economic Potential	1,007,939	42.3%	222.2	47.0%	164.8	38.7%
Achievable Potential	853,509	35.8%	178.2	37.7%	134.0	31.4%
BED Territory						
Technical Potential	48,897	49.1%	10.6	56.8%	8.0	45.8%
Economic Potential	48,080	48.3%	10.5	56.2%	7.7	44.4%
Achievable Potential	40,851	41.0%	8.6	46.1%	6.4	37.0%
COMMERCIAL/INDUSTRIAL SECTOR						
State-wide						
Technical Potential	808,470	23.7%	65.6	12.5%	109.3	16.0%
Economic Potential	710,057	20.8%	59.1	11.3%	100.3	14.7%
Achievable Potential	639,051	18.8%	53.2	10.2%	90.3	13.2%
EVT Territory						
Technical Potential	731,794	23.7%	59.6	12.4%	99.1	16.0%
Economic Potential	643,016	20.8%	53.8	11.2%	91.0	14.7%
Achievable Potential	578,715	18.7%	48.4	10.0%	81.9	13.2%
BED Territory						
Technical Potential	76,676	24.1%	6.0	14.4%	10.2	16.3%
Economic Potential	67,040	21.1%	5.3	12.9%	9.3	14.9%
Achievable Potential	60,336	19.0%	4.8	11.6%	8.4	13.4%

Table 1-2 below presents the results of the Vermont Societal Test calculations for the achievable potential for three areas: the BED service area, the EVT service area, and the combined service areas of EVT and BED. It is clear that the level of kWh and kW savings represented by the achievable potential is very cost effective, with a Societal Test ratio for the overall state of 2.2 to 1. This means that for every dollar spent by Vermont ratepayers on energy efficiency programs, $2.20 of benefits are returned to ratepayers.

Table 1-2: VT Societal Test Benefits & Costs (Achievable Potential - All Sectors Combined)

	Benefits				Costs			
	Electric	Non-Electric	Non-Energy	Total Benefits	Measure	Admin	Total Costs	B/C Ratio
	(in millions)				*in millions*			
State-wide								
NPV $2012	$1,937.3	$346.5	$36.0	$2,319.7	$702.3	$330.8	$1,033.2	2.2
EVT Territory								
NPV $2012	$1,814.0	$331.0	$33.7	$2,178.7	$664.6	$311.8	$976.4	2.2
BED Territory								
NPV $2012	$123.3	$15.4	$2.3	$141.0	$37.7	$19.1	$56.8	2.5

2 GLOSSARY OF TERMS[8]

The following list defines many of the key energy efficiency terms used throughout this study.

Achievable potential: the amount of energy use that efficiency can realistically be expected to displace assuming the most aggressive program scenario possible (*e.g.*, providing end-users with payments for the entire incremental cost of more efficient equipment). This is often referred to as maximum achievable potential. Achievable potential takes into account real-world barriers to convincing end-users to adopt efficiency measures, the non-measure costs of delivering programs (for administration, marketing, tracking systems, monitoring and evaluation, etc.), and the capability of programs and administrators to ramp up program activity over time.

Applicability factor: the fraction of the applicable dwelling units or businesses that is technically feasible for conversion to the efficient technology from an *engineering* perspective (e.g., it may not be possible to install CFLs in all light sockets in a home because the CFLs may not fit in every socket in a home).

Base Case Equipment End-Use Intensity: the electricity used per customer per year by each base-case technology in each market segment. This is the consumption of the electric energy using equipment that the efficient technology replaces or affects. For example, if the efficient measure is a high efficiency light bulb (CFL), the base end-use intensity would be the annual kWh use per bulb per household associated with an incandescent light bulb that provides equivalent lumens to the CFL.

Base Case Factor: the fraction of the market that is applicable for the efficient technology in a given market segment. For example, for residential lighting, this would be the fraction of all residential electric customers that have electric lighting in their household.

Coincidence factor: the fraction of connected load expected to be "on" and using electricity coincident with the system peak period.

Cost-effectiveness: a measure of the relevant economic effects resulting from the implementation of an energy efficiency measure. If the benefits are greater than the costs, the measure is said to be cost-effective.

Cumulative annual: refers to the overall annual savings occurring in a given year from both new participants and annual savings continuing to result from past participation with measures that are still in place. Cumulative annual does not always equal the sum of all prior year incremental values as some measures have relatively short lives and, as a result, their savings drop off over time.

Early replacement: refers to an efficiency measure or efficiency program that seeks to encourage the replacement of functional equipment before the end of its operating life with higher-efficiency units

Economic potential: refers to the subset of the technical potential that is economically cost-effective as compared to conventional supply-side energy resources. Both technical and economic potential are theoretical numbers that assume immediate implementation of efficiency measures, with no regard for the gradual "ramping up" process of real-life programs. In addition, they ignore market barriers to ensuring actual implementation of efficiency. Finally, they only consider the costs of efficiency measures

[8] Potential definitions taken from "National Action Plan for Energy Efficiency (2007). Guide for Conducting Energy Efficiency Potential Studies. Prepared by Philip Mosenthal and Jeffrey Loiter, Optimal Energy, Inc.

themselves, ignoring any programmatic costs (e.g., marketing, analysis, administration) that would be necessary to capture them.

End-use: a category of equipment or service that consumes energy (*e.g.*, lighting, refrigeration, heating, process heat, cooling).

Energy efficiency: using less energy to provide the same or an improved level of service to the energy consumer in an economically efficient way. Sometimes "conservation" is used as a synonym, but that term is usually taken to mean using less of a resource even if this results in a lower service level (*e.g.*, setting a thermostat lower or reducing lighting levels).

Free Driver: individuals or businesses that adopt an energy efficient product or service because of an energy efficiency program, but are difficult to identify either because they do not receive an incentive or are not aware of the program. Nonparticipant spillover is defined as savings from efficiency projects implemented by those who did not directly participate in a program, but which nonetheless occurred due to the influence of the program. Participant spillover is defined as additional energy efficiency actions taken by program participants as a result of program influence, but actions that go beyond those directly subsidized or required by the program.[9]

Free Rider: participants in an energy efficiency program who would have adopted an energy efficiency technology or improvement in the absence of a program or financial incentive.

Gross Savings: Gross energy (or demand) savings are the change in energy consumption or demand that results directly from program-promoted actions (e.g., installing energy-efficient lighting) taken by program participants regardless of the extent or nature of program influence on their actions.

Incremental: savings or costs in a given year associated only with new installations happening in that specific year.

Lost-opportunity: refers to an energy efficiency measure or energy efficiency program that seeks to encourage the selection of higher-efficiency equipment or building practices than would typically be chosen at the time of a purchase or design decision.[10]

Measure: any action taken to increase energy efficiency, whether through changes in equipment, changes to a building shell, implementation of control strategies, or changes in consumer behavior. Examples are higher-efficiency central air conditioners, occupancy sensor control of lighting, and retro-commissioning. In some cases, bundles of technologies or practices may be modeled as single measures. For example, an ENERGY STAR® ™ home package may be treated as a single measure.

MW: a unit of electrical output, equal to one million watts or one thousand kilowatts. It is typically used to refer to the output of a power plant.

MWh: one thousand kilowatt-hours, or one million watt-hours. One MWh is equal to the use of 1,000,000 watts of power in one hour.

[9] The definitions of participant and nonparticipant spillover were obtained from the National Action Plan for Energy Efficiency Report titled "Model Energy Efficiency Program Impact Evaluation Guide", November 2007, page ES-4.
[10] In Vermont, it is common practice to refer to this as "market opportunity".

Net-to-gross ratio: a factor representing net program savings divided by gross program savings that is applied to gross program impacts to convert them into net program load impacts

Net Savings: Net energy or demand savings refer to the portion of gross savings that is attributable to the program. This involves separating out the impacts that are a result of other influences, such as consumer self-motivation. Given the range of influences on consumers' energy consumption, attributing changes to one cause (i.e., a particular program) or another can be quite complex.

Portfolio: Either a collection of similar programs addressing the same market, technology, or mechanisms; or the set of all programs conducted by one energy efficiency organization or utility.

Program: a mechanism for encouraging energy efficiency that may be funded by a variety of sources and pursued by a wide range of approaches (typically includes multiple measures).

Remaining factor: the fraction of applicable units that have not yet been converted to the electric energy efficiency measure; that is, one minus the fraction of units that already have the energy efficiency measure installed.

Replace-on-burnout: a DSM measure is not implemented until the existing technology it is replacing fails. An example would be an energy efficient water heater being purchased after the failure of the existing water heater.

Retrofit: refers to an efficiency measure or efficiency program that seeks to encourage the replacement of functional equipment before the end of its operating life with higher-efficiency units (also called "early retirement") or the installation of additional controls, equipment, or materials in existing facilities for purposes of reducing energy consumption (e.g., increased insulation, low flow devices, lighting occupancy controls, economizer ventilation systems).

Savings factor: the percentage reduction in electricity consumption resulting from application of the efficient technology used in the formulas for technical potential screens.

Technical potential: the theoretical maximum amount of energy use that could be displaced by efficiency, disregarding all non-engineering constraints such as cost-effectiveness and the willingness of end-users to adopt the efficiency measures. It is often estimated as a "snapshot" in time assuming immediate implementation of all technologically feasible energy saving measures, with additional efficiency opportunities assumed as they arise from activities such as new construction.

Total Resource Cost Test: The TRC measures the net benefits of the energy efficiency program for a region or service area as a whole. Costs included in the TRC are costs to purchase and install the energy efficiency measure and overhead costs of running the energy efficiency program. The benefits included are the avoided costs of energy and capacity.

Vermont Societal Test ("VT SCT") Test: includes all of the costs and benefits of the TRC test, but it also includes environmental and other non-energy benefits that are not currently valued by the market. The SCT may also include non-energy costs, such as reduced customer comfort levels.[11] See Section 5.9 for a full discussion of the costs and benefits included in the calculation of the Vermont Societal Test.

[11] In this study, non-energy costs for reduced custom comfort levels have not been reflected in any of the calculations of the Vermont Societal Test.

Useful Life: The number of years (or hours) that the new energy efficient equipment is expected to function. Useful life is also commonly referred to as "measure life."

3 INTRODUCTION

This report assesses the potential for energy efficiency programs to assist Vermont in meeting future energy service needs. This section of the report provides the following information:

- defines the term "energy efficiency",
- describes the general benefits of energy efficiency programs
- provides results of similar energy efficiency potential studies conducted in other New England states
- presents the organization of this report

3.1 INTRODUCTION TO ENERGY EFFICIENCY

Efficient energy use, often referred to as energy efficiency, is using less energy to provide the same level of energy service. An example would be insulating a home or business to use less heating and cooling energy to achieve the same inside temperature. Another example would be installing fluorescent lighting in place of incandescent lights to attain the same level of illumination. Energy efficiency can be achieved through more efficient technologies and/or processes as well as through changes in individual behavior.

3.1.1 GENERAL BENEFITS OF ENERGY EFFICIENCY

There are a number of benefits that accrue to the State of Vermont due to energy efficiency programs. These benefits include avoided energy and capacity cost savings, non-electric benefits such as water and fossil fuel savings, environmental benefits, economic stimulus, job creation, risk reduction, and energy security.

Avoided electric energy and capacity costs are based upon the costs an electric utility would incur to construct and operate new electric power plants or to purchase power from another source. These avoided costs of electricity include both fixed and variable costs that can be directly avoided through a reduction in electricity usage. The energy component includes the costs associated with the production of electricity, while the capacity component includes costs associated with the capability to deliver electric energy during peak periods. Capacity costs consist primarily of the costs associated with building peaking generation facilities. The electric and other fuel avoided costs used in this study are ones developed for the region and adopted by the Vermont Public Service Board.[12]

At the consumer level, energy efficient products often cost more than their standard efficiency counterparts, but this additional cost is balanced by lower energy consumption and lower energy bills. Over time, the money saved from energy efficient products will pay consumers back for their initial investment as well as save them money. Although some energy efficient technologies are complex and expensive, such as installing new high efficiency windows or a high efficiency boiler, many are simple and inexpensive. Installing compact fluorescent lighting or low-flow water devices can be done by most individuals.

Although the reduction in energy and capacity costs is the primary benefit to be gained from investments in energy efficiency, the utility, its consumers, and society as a whole can also benefit in other ways. Many electric efficiency measures also deliver non-energy benefits. For example, low-flow water devices

[12] Avoided Energy Supply Component Study Group, report titled "Avoided Energy Supply Costs in New England: 2009 Report", dated October 23, 2009.

and efficient clothes washers also reduce water consumption.[13] Similarly, weatherization measures that improve the building shell not only save on air conditioning costs in the summer, but also can save the customer money on space heating fuels, such as natural gas or propane. Reducing electricity consumption also reduces harmful emissions, such as SO_X, NO_X, CO_2 and particulates into the environment.[14] The Burlington Electric Department's 2009 Annual Energy Efficiency Report states that the environmental impacts avoided by decreasing the need for electricity are of increasing importance to the ratepayers of Burlington. The energy savings (5,470 MWh) generated by BED's energy efficiency programs in 2009 alone will have avoided the release of about 45,872 tons of carbon dioxide (CO2); the equivalent of removing about 1,265 cars from U.S. highways each year for the next 12 years.[15]

Energy efficiency programs create both direct and indirect jobs. The manufacture and installation of energy efficiency products involves the manufacturing sector as well as research and development, service, and installation jobs. These are skilled positions that are not easily outsourced to other states and countries. The indirect jobs are more difficult to quantify, but result from households and businesses experiencing increased discretionary income from reduced energy bills. These savings produce multiplier effects, such as increased investment in other goods and services driving job creation in other markets.

Energy efficiency reduces risks associated with fuel price volatility, unanticipated capital cost increases, environmental regulations, supply shortages, and energy security. Aggressive energy efficiency programs can help eliminate or postpone the risk associated with committing to large investments for generation facilities a decade or more before they are needed.[16] Energy efficiency is also not subject to the same supply and transportation constraints that impact fossil fuels. Finally, energy efficiency reduces competition between states and utilities for fuels, and dependence on fuels imported from other states or countries to support electricity production. Energy efficiency can help meet future demand increases and reduce dependence on out-of-state or overseas resources. The Vermont Societal Test includes an environmental adder of $.0070 per kWh saved (in $2000) and a 10% reduction to costs to account for the risk diversification benefits of energy efficiency measures and programs

3.2 The Vermont Context

3.2.1 Continuing Customer Growth

The annual kWh sales and electric peak loads for the areas served by BED and EVT are growing. From 2000 to 2009, the number of Vermont electric utility customers grew at a rate of approximately 1% annually. The latest available Vermont Electric Company (VELCO) load forecast for the State of Vermont projects that the number of electric consumers in Vermont will continue to increase at an average annual growth rate of approximately 1% from 2012 through 2031 (the timeframe for this study)

[13] The ENERGY STAR web site (www.energystar.gov) states that "ENERGY STAR qualified clothes washers use about 37% less energy and use over 50% less water than regular washers".

[14] The 2009 ENERGY STAR Annual Report states that "2009 was another banner year for EPA's climate protection partnerships. More than 19,500 organizations across the country have partnered with EPA and achieved outstanding results: (1) Preventing 83 million metric tons (in MMTCE2) of GHGs—equivalent to the emissions from 56 million vehicles (see Figure 4, p. 6)—and net savings to consumers and businesses of about $18 billion in 2009 alone. (2) Preventing more than 1,200 MMTCE of GHGs cumulatively and providing net savings to consumers and businesses of more than $250 billion over the lifetime of their investments." See page 2 of this Annual Report.

[15] Burlington Electric Department, 2009 Annual Energy Efficiency Report, page 3.

[16] According to the Final Order in Vermont Public Service Board Docket No. 5270, the Societal Test calculation in Vermont includes a 10% reduction to costs to account for the risk diversification benefits of energy efficiency measures and programs.

creating further growth in system electricity sales and demand. This report assesses the potential for energy efficiency programs to assist Vermont in meeting future energy service needs.

3.2.2 Energy Efficiency Activity

Making homes and buildings more energy efficient is seen as a key strategy for addressing energy security, reducing reliance on fossil fuels from other countries, assisting consumers to lower energy bills, and addressing concerns about climate change. Faced with rapidly increasing energy prices, constraints in energy supply and demand, and energy reliability concerns, states are turning to energy efficiency as the most reliable, cost-effective, and quickest resource to deploy.[17] The State of Vermont has been a pioneer in developing and implementing effective energy efficiency programs. Vermont was the first state in the US to have an energy efficiency utility (EEU).

3.2.3 Recent Energy Efficiency Potential Studies

In January 2007, the Vermont Department of Public Service released a study on the achievable potential for electricity savings in Vermont.[18] Overall, the study found that substantial potential savings remain: the achievable energy efficiency savings potential was estimated at 19% of total Vermont electric consumption by 2015. Table 3-1, below, provides the results from a GDS review of recent energy efficiency potential studies conducted throughout New England.

Table 3-1: Results of Recent Energy Efficiency Potential Studies in New England

State	Study Year	Author	Study Period	# of Years	Achievable Potential
Connecticut	2009	KEMA	2009-2018	10	20.3%
New Hampshire	2009	GDS	2009-2018	10	20.5%
Rhode Island	2008	KEMA	2009-2018	10	9.0%
Vermont	2007	GDS	2006-2015	10	19.4%

A 2010 report by the American Council for an Energy Efficient Economy (ACEEE) offers information regarding the current savings and spending related to energy efficiency by state.[19] Based on self-reported data, the top states spend more than 2% of electric sales revenue on energy efficiency programs. Five of the six New England states (including Vermont) rank in the top ten states on the ACEEE scorecard. In addition, the top states are currently achieving annual energy efficiency savings of roughly 1% of total electric sales.

[17] The December 2008 National Action Plan for Energy Efficiency (NAPEE) "Vision for 2025: A Framework for Change" states that "the long-term aspirational goal for the Action Plan is to achieve all cost-effective energy efficiency by the year 2025. Based on studies, the efficiency resource available may be able to meet 50 percent or more of the expected load growth over this time frame, similar to meeting 20 percent of electricity consumption and 10 percent of natural gas consumption. The benefits from achieving this magnitude of energy efficiency nationally can be estimated to be more than $100 billion in lower energy bills in 2025 than would otherwise occur, over $500 billion in net savings, and substantial reductions in greenhouse gas emissions."

[18] Vermont Department of Public Service, "Vermont Electric Energy Efficiency Potential Study, Final Report", prepared for the Department by GDS Associates, Inc., January 2007.

[19] American Council for an Energy Efficient Economy, "The 2010 State Energy Efficiency Scorecard", Report #E107, October 2010.

Vermont ranks #1 of the 50 states in terms of annual kWh savings as a percent of total retail kWh sales in a state. In the ACEEE scorecard report, Vermont is reported as spending 4.4% of revenue in 2009 on energy efficiency programs, and saving 2.6% of kWh sales (in 2008) from energy efficiency programs. Vermont ranked #1 on spending on energy efficiency of the 50 states (annual energy efficiency spending as a percent of annual electric revenues).

3.3 Purpose of this Study

This study provides an analysis of the technical, economic and achievable potential for electric energy efficiency resources in Vermont. This study has examined a full array of energy efficiency technologies and building practices that may be deemed technically achievable, including measures that aren't available currently but are expected to be on the market within the study timeline, such as measures enabled by advanced metering infrastructure, that address both annual energy and peak demand.

3.4 Report Organization

The remainder of this report is organized in the following seven sections as follows:

Section 4: Characterization of EVT and BED Service Areas provides an overview of the EVT and BED service areas and a brief discussion of the historical and forecasted electric energy sales as well as peak demand.
Section 5: Overall Project Implementation Approach details the development of technical, economic, and achievable potential for energy efficiency savings
Section 6: Residential Energy Efficiency Potential Estimates (2012-2031) provides a breakdown of the technical, economic, and maximum achievable potential in the residential sector
Section 7: Commercial and Industrial Energy Efficiency Potential Estimates (2012-2031) provides a breakdown of the technical, economic, and achievable potential in the C&I sectors
Section 8: Conclusions presents the final discussion regarding potential for energy efficiency savings through 2031.

4 CHARACTERIZATION OF TOTAL STATE, EVT AND BED SERVICE AREAS

Energy efficiency potential studies and other market assessment studies are valuable sources of information for planning energy efficiency programs. In order to develop estimates of electricity savings potential, it is important to understand the extent to which electricity is used by households and businesses in Vermont, as well as in the EVT and BED service areas.[20] This section provides a brief overview of the economic/demographic characteristics of the State of Vermont and the EVT and BED service areas. Data are also presented for the historical and forecasted electric energy sales and system peak demand, and the on-going energy efficiency efforts of EVT and BED.

4.1 EVT AND BED MEMBER SERVICE TERRITORIES

This section provides information on economic, demographic, geographic and appliance saturation characteristics of the State of Vermont. In order to develop estimates of electricity savings potential, it is important to understand how electricity is used by households and businesses in Vermont. Vermont is a rural state with a population of approximately 625,741 persons in 2010, and 314,246 housing units.[21] The State's population only grew 2.8% between 2000 and 2010, whereas the population in the entire US grew 9.1%. That rate of growth was Vermont's slowest since the Great Depression era, when the state's population fell 0.1 percent. According to the U.S. Census Bureau, 14.5% of the population in Vermont was 65 or older in 2009.

4.1.1 VERMONT GEOGRAPHIC AND DEMOGRAPHIC CHARACTERISTICS

Vermont is the second largest state (in terms of surface area) in New England after Maine. Dominating the state's geography are the Green Mountains, one of the oldest mountain ranges in the world. The nation's sixth largest lake, Lake Champlain, runs along the state's western border.

In comparison with the other forty-nine states, Vermont is small in total area (9,609 square miles). Delivering energy efficiency services in a small state like Vermont presents different challenges than in larger states like Alaska, California and Texas. The State is bordered by Canada, New York, Massachusetts, and New Hampshire. It is 157.4 miles in length, 90.3 miles wide at the Canadian border, and 41.6 miles along the Massachusetts border. The Connecticut River forms the eastern boundary, while the western boundary runs down the middle of Lake Champlain for more than half of its length. Burlington is the largest of Vermont's 255 communities, and it had an estimated population of 38,647[22] in 2009 according to the US Census Bureau.

As of the census of 2000, the population density for Burlington was 3,682 people per square mile (1,421.9/km^2). There were 16,395 housing units in Burlington at an average density of 1,552.3 units per square mile (599.4/km^2). As of 2000, there were 15,885 households in Burlington out of which 21.3% had children under the age of 18 living with them, 31.4% were married couples living together, 10.0% had a female householder with no husband present, and 55.6% were non-families. 35.6% of all households were made up of individuals and 8.2% had someone living alone who was 65 years of age or older. The average household size was 2.19 and the average family size was 2.86.

[20] The Vermont Public Service Board has appointed the Burlington Electric Department (BED) as the EEU for the City of Burlington, and the Board has appointed the Vermont Energy Investment Corporation as the EEU for the remainder of the State, under the name "Efficiency Vermont" (EVT). For purposes of this report, "BED" will be used to refer to the area served by the Burlington Electric Department, and "EVT" will be used to refer to the area served by VEIC.
[21] The Vermont population data for 2010 was obtained from US Census Bureau.
[22] US Census Bureau, 2009 population estimate for Burlington, Vermont.

In Burlington the population was spread out with 16.3% under the age of 18, 25.4% from 18 to 24, 31.0% from 25 to 44, 16.8% from 45 to 64, and 10.5% who were 65 years of age or older. The median age was 29 years. For every 100 females there were 93.2 males. For every 100 females age 18 and over, there were 90.7 males.

The demographic data for the remainder of the state show the more rural nature of this area. There are 3,683 persons per square mile in the City of Burlington, whereas there are only 63 persons per square mile in the remainder of the state (the region outside of Burlington. Thus the region served by EVT has significantly fewer persons per square mile than the region served by BED. It is also interesting that Vermont has a greater percentage of the population age 65 and older (13.8%) than the US as a whole (12.6%).

The economic/demographic data for a state or service area are important to understand when developing estimates of energy efficiency potential. For example, one needs to know how many housing units there are in a service area in order to estimate the number of appliances that are plugged into the electric grid in an area. In addition, the composition (age breakdowns, etc.) of the population is important for the development of marketing strategies for different types of energy efficiency programs.

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Figure 4-1: Map of Vermont

4.1.2 Historical Electric Sales and Electric Customers in Vermont

Tables 4-1 and 4-2 show historical Vermont data for annual kWh sales and electric customers by class of service. From 2000 to 2009, MWh sales to ultimate electric customers in Vermont decreased at a rate of -0.19 percent per year. From 2000 to 2009, the number of ultimate electric customers increased at a rate of 1 percent per year.

According to 2009 historical sales data, the residential sector accounts for approximately 86% of total customers and nearly 38% of total energy sales while the commercial and industrial sectors account for 36% and 25%, respectively. Although the residential sector constitutes the greatest portion of total kWh sales, the industrial sector consumes the most energy on a per customer basis. The average industrial facility consumes roughly 5.9 million kWh annually. Comparatively, the average commercial consumer uses approximately 40,500 kWh per year, while the residential consumers use 6,905 kWh per year on average.

Table 4-1: Historical Vermont MWh Sales to Ultimate Customers by Customer Class (MWh) – 2001 to 2009

Year	Residential	Commercial	Industrial	Total
2001	2,009,279	1,920,847	1,611,750	5,541,876
2002	2,046,101	1,943,752	1,592,436	5,582,290
2003	2,128,702	1,911,512	1,561,371	5,601,585
2004	2,141,488	1,926,616	1,638,954	5,707,058
2005	2,190,529	2,037,152	1,619,651	5,847,333
2006	2,140,470	2,015,444	1,598,664	5,754,577
2007	2,168,978	2,080,318	1,567,484	5,816,780
2008	2,133,399	2,049,198	1,526,493	5,709,090
2009	2,120,949	1,969,121	1,368,903	5,458,973
Compound Annual Average Rate of Growth	*0.68%*	*0.31%*	*-2.02%*	*-0.19%*

Table 4-2: Historical Number of Customers by Customer Class - 2001 to 2009

Year	Residential	Commercial	Industrial	Total
2001	285,735	42,303	413	328,451
2002	288,966	43,066	455	332,487
2003	292,031	43,783	468	336,282
2004	295,505	44,743	554	340,802
2005	298,480	45,822	314	344,616
2006	302,809	46,733	324	349,866
2007	305,070	47,601	232	352,903
2008	306,494	48,051	326	354,871
2009	307,127	48,636	231	355,994
Compound Annual Average Rate of Growth	*0.91%*	*1.76%*	*-7.01%*	*1.01%*

4.2 Load Forecasts Excluding Sales and Peak Load of IBM

For purposes of this study, the future sales and peak load associated with IBM have been excluded from the sales and peak load forecasts. IBM, which represents approximately 7% of the state's annual kWh sales and 5% of system peak load, no longer pays the energy efficiency charge, nor participates in EVT programs. Thus, their sales and contribution to system peak load have been excluded from the sales forecast for the EVT service area and from the load forecast for the State as a whole.

4.3 Forecast of Energy Sales & Peak Demand (2012-2031)

The new VELCO load forecast for Vermont projects that total kWh sales in the State will grow slowly over the next two decades, at a compound average annual growth rate of 0.6% a year (sales at the customer meter level of the utility grid). The residential sector is projected to grow at 0.67% a year, the commercial sector at 0.71% per year, and the industrial sector at 0.27% per year. Summer peak load is expected to grow 1% per year, and winter peak load is expected to grown 0.54% per year. Table 4-3 presents the MWH sales forecast for the State of Vermont, and Table 4-4 presents the summer and winter peak load forecasts for the State of Vermont. The numbers shown in Tables 4-3 and 4-4 exclude the impacts of Efficiency Vermont programs. Tables 4-5 through 4-8 provide the energy and demand forecasts for the EVT and BED service territories.

Table 4-3: VELCO MWh Sales Forecast for the State of Vermont (Without Future DSM Impacts)

	MWh Sales					
Year	Residential	Commercial	Industrial	Other	Total	@ Generation
2012	2,188,275	2,045,481	977,561	37,753	5,249,070	5,773,977
2013	2,175,059	2,075,448	983,092	38,001	5,271,599	5,798,759
2014	2,181,269	2,097,410	986,614	38,125	5,303,418	5,833,760
2015	2,192,649	2,113,881	989,285	38,188	5,334,003	5,867,404
2016	2,211,926	2,127,124	991,623	38,220	5,368,892	5,905,781
2017	2,219,367	2,140,287	993,979	38,236	5,391,869	5,931,056
2018	2,234,108	2,153,730	996,295	38,244	5,422,377	5,964,614
2019	2,249,063	2,166,881	998,603	38,248	5,452,795	5,998,074
2020	2,271,217	2,179,853	1,000,975	38,250	5,490,294	6,039,324
2021	2,278,812	2,193,047	1,003,426	38,251	5,513,536	6,064,890
2026	2,375,816	2,267,512	1,015,900	38,252	5,697,480	6,267,228
2031	2,484,279	2,339,484	1,028,797	38,252	5,890,812	6,479,893
Compound Annual Average Rate of Growth	*0.67%*	*0.71%*	*0.27%*	*0.07%*	*0.61%*	*0.61%*

Table 4-4: VELCO Peak Load Forecast for State of Vermont (Without Future DSM Impacts)

	Summer Peak Load					Winter Peak Load				
Year	Residential	Comm.	Ind.	Other	Total	Residential	Comm.	Ind.	Other	Total
2012	340	427	164	0	931	451	304	153	8	916
2013	343	434	166	0	943	444	309	154	8	914
2014	349	439	167	0	955	444	312	155	8	918
2015	355	442	167	0	965	444	315	155	8	922
2016	361	446	167	0	975	447	318	155	8	928
2017	366	450	167	0	984	448	321	155	8	931
2018	372	454	168	0	994	451	324	154	8	936
2019	378	458	168	0	1,004	453	326	154	8	941
2020	384	462	167	0	1,014	455	330	154	7	947
2021	389	466	168	0	1,023	456	332	154	7	950
2026	419	489	167	0	1,076	474	349	152	7	981
2031	444	510	171	0	1,125	491	362	154	7	1,015
Compound Annual Average Rate of Growth	*1.41%*	*0.94%*	*0.23%*	*0.00%*	*1.00%*	*0.45%*	*0.93%*	*0.02%*	*0.00%*	*0.54%*

Table 4-5: 2012-2031 Forecast MWh Sales for the EVT Service Area (Without Future DSM Impacts)

	MWh Sales					
Year	Residential	Commercial	Industrial	Other	Total	@ Generation
2012	2,097,503	1,848,679	904,672	33,899	4,884,752	5,373,228
2013	2,083,615	1,877,246	909,684	34,147	4,904,692	5,395,161
2014	2,089,230	1,897,341	912,515	34,272	4,933,357	5,426,693
2015	2,100,062	1,912,138	914,566	34,334	4,961,101	5,457,211
2016	2,118,354	1,923,339	916,147	34,366	4,992,206	5,491,426
2017	2,125,562	1,935,081	917,977	34,382	5,013,001	5,514,301
2018	2,139,860	1,946,807	919,657	34,390	5,040,713	5,544,784
2019	2,154,183	1,958,301	921,351	34,394	5,068,228	5,575,051
2020	2,175,257	1,968,850	922,825	34,396	5,101,327	5,611,460
2021	2,182,952	1,980,709	924,783	34,397	5,122,840	5,635,124
2026	2,277,927	2,046,361	933,992	34,398	5,292,677	5,821,945
2031	2,384,637	2,110,417	943,958	34,398	5,473,410	6,020,751
Compound Annual Average Rate of Growth	*0.68%*	*0.70%*	*0.22%*	*0.08%*	*0.60%*	*0.60%*

Table 4-6: 2012-2031 Forecast Peak Load (MW) for the EVT Service Area (Without Future DSM Impacts)

	Summer Peak Load					Winter Peak Load				
Year	Residential	Comm.	Ind.	Other	Total	Residential	Comm.	Ind.	Other	Total
2012	325	386	151	0	862	435	276	145	7	863
2013	328	392	153	0	873	427	281	146	7	861
2014	334	396	154	0	884	427	284	147	7	865
2015	340	400	154	0	893	428	287	147	7	868
2016	346	403	154	0	903	431	290	147	7	874
2017	351	406	154	0	911	431	292	146	7	876
2018	357	410	154	0	921	434	295	146	7	881
2019	362	414	154	0	930	436	297	146	7	885
2020	368	418	154	0	940	438	301	146	7	891
2021	372	422	154	0	948	439	303	145	6	893
2026	403	443	153	0	998	456	318	143	6	923
2031	426	463	156	0	1,046	473	331	145	6	955
Compound Annual Average Rate of Growth	*1.43%*	*0.97%*	*0.19%*	*0.00%*	*1.02%*	*0.43%*	*0.95%*	*-0.02%*	*0.00%*	*0.53%*

Table 4-7: 2012-2031 Forecast MWh Sales for the BED Service Territory (Without Future DSM Impacts)

	MWh Sales					
Year	Residential	Commercial	Industrial	Other	Total	@ Generation
2012	90,773	196,801	72,889	3,854	364,317	377,068
2013	91,444	198,202	73,408	3,854	366,908	379,749
2014	92,039	200,068	74,099	3,854	370,061	383,013
2015	92,587	201,743	74,720	3,854	372,903	385,954
2016	93,571	203,785	75,476	3,854	376,686	389,870
2017	93,805	205,206	76,002	3,854	378,868	392,128
2018	94,248	206,923	76,638	3,854	381,664	395,022
2019	94,880	208,581	77,252	3,854	384,566	398,026
2020	95,961	211,003	78,149	3,854	388,967	402,581
2021	95,861	212,338	78,644	3,854	390,696	404,370
2026	97,889	221,151	81,908	3,854	404,802	418,970
2031	99,642	229,067	84,839	3,854	417,402	432,011
Compound Annual Average Rate of Growth	*0.49%*	*0.80%*	*0.80%*	*0.00%*	*0.72%*	*0.72%*

Table 4-8: 2012-2031 Forecast Peak Load (MW) for the BED Service Area (Without Future DSM Impacts)

	Summer Peak Load					Winter Peak Load				
Year	Residential	Comm.	Ind.	Other	Total	Residential	Comm.	Ind.	Other	Total
2012	15	42	13	0	69	16	27	8	1	52
2013	15	42	13	0	70	16	27	8	1	53
2014	15	42	13	0	71	17	28	8	1	53
2015	15	43	13	0	71	17	28	8	1	54
2016	15	43	13	0	72	17	28	8	1	54
2017	16	44	14	0	73	17	29	8	1	55
2018	15	44	14	0	73	17	29	8	1	55
2019	16	44	14	0	74	17	29	8	1	55
2020	16	44	14	0	74	17	29	8	1	56
2021	16	45	14	0	75	17	29	9	1	56
2026	17	46	14	0	77	18	30	9	1	58
2031	17	47	15	0	80	19	31	9	1	60
Compound Annual Average Rate of Growth	*0.84%*	*0.67%*	*0.67%*	*0.00%*	*0.71%*	*0.73%*	*0.73%*	*0.73%*	*0.00%*	*0.72%*

4.4 CURRENT EEU DSM OFFERINGS

The two Vermont Energy Efficiency Utilities (EEU) offer several energy efficiency programs for homes and businesses in the State. For the City of Burlington, these programs are delivered by the Burlington Electric Department (BED). For the remainder of the state, these programs are delivered by Efficiency Vermont (EVT).

4.4.1 CURRENT EFFICIENCY VERMONT PROGRAMS

Efficiency Vermont offers several energy efficiency programs for homes and businesses.

Residential Programs

Efficiency Vermont offers programs to help residential consumers save energy in their homes. These programs cover efficiency improvements for space heating, space cooling, water heating, lighting and other uses of energy.

Energy Efficient Lighting

EVT offers programs to provide information to consumers about the benefits of energy efficient CFL and LED light bulbs. CFLs are now available in many different shapes and styles for every socket, indoors and outdoors. CFLs use up to 75% less energy than incandescent bulbs and can last 6 to 10 times longer. The types and sizes of LED bulbs have expanded dramatically over the past three years. EVT uses several marketing and delivery strategies to make these bulbs available in Vermont at discounted prices.

Energy Audits and Home Improvements

EVT supports a network of Home Performance with ENERGY STAR® contractors certified to perform energy audits; diagnose building problems such as moisture, mold, and ice dams; and install recommended energy efficiency improvements that can reduce household energy consumption by up to 30%. Using a certified contractor provides assurance that the project will lead to real energy savings and be done safely. EVT also provides web-based information to help consumers find a certified contractor as well as information on financial incentives to help pay for qualified energy efficiency improvements.

Energy Efficient Appliances

ENERGY STAR appliances use 10% to 50% less energy and water than standard efficiency models or older appliances. Older appliances can consume so much energy that in some circumstances it may make sense to retire them early, even if they still work. EVT offers rebates on select ENERGY STAR appliances (clothes washers, refrigerators, freezers) and seasonal rebates on room A/Cs and dehumidifiers. Efficiency Vermont also offers incentives for early retirement of older refrigerators.

Home Electronics

Home electronics, like TVs, DVD players, computer monitors, and laptops, can account for more than 15% of household electricity use. Some electronics use energy even when they're turned off, to power features like clock displays and remote controls. When buying home electronics, EVT recommends that consumers look for ENERGY STAR® labeled products, which use much less energy than standard

electronics. Using the EVT web site, EVT provides information to consumers on the energy savings of ENERGY STAR® labeled home electronics, and information on the energy savings that can be achieved using advanced power strips. An Advanced Power Strip uses smart technology to cut the power to certain electronics when they're not in use, saving you energy and money automatically. This study does examine the energy efficiency potential from such advanced power strips and ENERGY STAR® labeled home electronics.

DIY - Do It Yourself

EVT recommends using a certified Home Performance with ENERGY STAR® contractor to make major energy efficiency improvements. If a consumer wishes to make some improvements on his/her own, Efficiency Vermont has created a Home Heating Help section on the EVT website. This resource provides information on home energy topics including; sealing air leaks, attic insulation, heating equipment and energy-efficient appliances.

Meter Loan Program

A good way to understand the connection between a home's energy use and energy costs is to know how much electricity home electronics and appliances are using. A consumer can measure electricity usage of an appliance with a "Watts Up" Electric Meter. Efficiency Vermont offers this meter to electric customers in Vermont free of charge for a period of three weeks. Once the consumer identifies where electricity is used the most, a consumer can make changes to energy usage that will have the greatest impact on the electric bill.

Education on the ENERGY STAR® Logo

EVT provides information to consumers about the ENERGY STAR® Logo**.** ENERGY STAR is a national program that helps consumers save money and protect the environment through energy efficient products and practices. There are national ENERGY STAR programs for residential construction on new and existing homes. The ENERGY STAR label can be found on more than 60 types of products including lighting, appliances, home electronics and heating and cooling equipment. Consumers will also see a yellow EnergyGuide label on most new appliances. This label estimates how much energy the appliance uses compared to similar products, and shows the consumer approximately how much it will cost to use each year to help the consumer compare different models when shopping for a new appliance.

EVT Programs for the Commercial and Industrial Sectors

Listed below are short descriptions of the energy efficiency programs that are currently offered by EVT for commercial and industrial facilities.

Energy Efficient Lighting

newLIGHT is a program promoting the replacement of T12 and HID High-Bay lighting in commercial and industrial facilities with more efficient technology. EVT is offering businesses significantly enhanced rebates for upgrading their old T12 fluorescent and HID high-bay lighting systems to more efficient equipment - from 50 to 90% of the equipment cost. To qualify for enhanced rebates offered through the newLIGHT program, commercial and industrial organizations must work with a contractor, distributor, or other lighting professional who will evaluate their facilities and submit a "Project Pre-Approval Form"

to Efficiency Vermont on their behalf. Projects eligible for the newLIGHTEnhanced Rebate Program include:

- T12 Upgrades and Controls
- HID High-Bay Upgrades and Controls
- Exit Sign Upgrades

High Efficiency HVAC Equipment

EVT provides rebates for the purchase of high efficiency HVAC equipment. Energy-efficient HVAC equipment lowers a business' overhead costs by decreasing energy costs while increasing reliability of the equipment. EVT also provides information about HVAC systems typically found in Vermont, about actions one can take to lower energy costs, and about available financial incentives for energy-efficient equipment that will improve the bottom line.

In order to be eligible for a financial incentive, efficient HVAC equipment must be new and meet certain minimum efficiencies as well as other requirements. Pre-approval is required from Burlington Electric Department for all new construction projects in their territory, regardless of size. Split AC systems (including evaporator and condensing coils) must be AHRI tested and rated matched or paired systems. Ductless mini-split AC systems do not qualify for rebates. Dual enthalpy economizer controls are eligible for rebates only when installed with new, qualifying equipment. Rebates exceeding $2,500 require pre-approval by Efficiency Vermont prior to purchase.

Building Performance Program

Building Performance incentives are available from EVT to assist small business and rental property owners in improving the insulation and comfort of their buildings, and boosting bottom lines. The available incentives can reduce the cost of audits and insulation upgrades. Building Performance incentives are available to help Vermont's small business and rental property owners improve the energy efficiency of their buildings. EVT offers up to $7,500 in incentives per building to help pay for energy efficiency improvements completed by a participating BPI certified contractor. These independent contractors are certified by the Building Performance Institute to perform energy audits, diagnose building problems such as moisture, mold, and ice dams, and install the recommended energy efficiency improvements. Efficiency Vermont provides contractor training, quality assurance, and customer incentives.

EVT also provides for energy audits. An energy audit typically includes the following:

- A comprehensive evaluation of your building's air tightness and insulation effectiveness and windows;
- Identification of energy efficiency opportunities with mechanical systems, lighting, and appliances;
- Installation of energy-saving products such as efficient light bulbs and water conservation products;
- An audit report and scope of work for recommended energy efficiency improvements.

There is a fee for this service.

Other Rebates

EVT also offers a wide range of other rebates for high efficiency equipment, such as the following:

- commercial lighting equipment
- motors
- refrigeration equipment
- compressed air equipment
- vending machines
- agricultural equipment

4.4.2 CURRENT PROGRAMS OFFERED BY THE BURLINGTON ELECTRIC DEPARTMENT

Listed below are descriptions of the energy efficiency programs offered by the Burlington Electric Department.

Residential New Construction

This BED program aims to improve the efficiency of all new homes, and buildings undergoing substantial renovation. This includes single-family homes, multi-family homes and low income multi-family projects. This program addresses all major end uses: space heating, water heating, central cooling (if applicable), ventilation, major appliances and lighting for high use areas. Residential New Construction (RNC) encourages builders and consumers to build to the Vermont Energy Star Home standard. This standard specifies that homes meet the Energy Star performance standard (representing nearly 20% savings in heating, cooling and hot water consumption relative to the Vermont Residential Building Energy Standard (RBES). The standard also requires that at least four lighting fixtures in high use areas be energy efficient, three major appliances and efficient automatically controlled mechanical ventilation be installed. The Vermont Energy Star Homes (VESH) standard is promoted to developers, architects, builders, building supply centers, equipment suppliers and consumers through a combination of marketing, technical assistance to builders, provision of energy ratings, and a package of incentives for efficient lighting fixtures, major appliances and ventilation equipment.

Residential Existing Homes

This BED program aims to improve the efficiency of all existing residential buildings including low-income single family, market-rate single-family and all multi-family projects (market-rate and low-income). BED offers the same existing homes service as Efficiency Vermont (EVT) and also works closely with Vermont Gas Systems (VGS) and the Champlain Valley Weatherization Service (CVWS) on many of its projects. Low-income buildings are addressed by a partnership with the state's Low-income Weatherization Assistance Program (WAP). This partnership provides electric efficiency measures (including fuel switching of electric hot water and electric space heating) to Burlington's low-income electricity consumers. Electrical efficiency measures are delivered to income-eligible electric customers at the time they receive thermal shell, space heating and water heating improvements from CVWS. This service also works closely with high usage households for energy efficiency improvements that can significantly reduce their energy bills. On-site energy audits, customer education, appliance meter loans, technical assistance, project management and cash incentives are all part of this service. In some cases, the high usage is driven by electric domestic hot water and\or electric resistance space heating. The opportunity to convert to natural gas is available to the owners of some of these housing units, providing significant energy and cost savings.

Over the past few years, BED and EVT have been trying to work more successfully in the private (market-rate) rental housing market (customers not eligible for low-income energy services) to increase both participation and the depth of savings per participant. Traditionally, renters have not been strong participants and the same holds true for property-owners where the tenants pay the energy bills directly. The "Rental Properties Owners" service offers free tank wraps (electric tanks only), pipe insulation, water saving devices, enhanced rebates for the early retirement of eligible refrigerators, incentives for improving mechanical ventilation along with up to fifteen free screw-in CFL's per apartment. This service provides savings directly to the tenant but also water savings, and potentially maintenance savings to the property owner. This service allows us the opportunity to develop long-lasting relationships with property-owners to help identify further savings from refrigeration replacements, common area lighting and laundry equipment improvements, weatherization and ventilation. BED has also been working successfully with JUMP (Joint Urban Ministry Program) over the past few years by providing free CFL's and efficiency education and program information to families and individuals in need. The idea is for JUMP staff to inform participants (mostly all renters) about energy usage and bills and encourage them to participate in energy efficiency programs. JUMP staff makes direct referrals to CVWS for low-income weatherization services or to BED for assistance. JUMP also provides language translators to help with the African community within Burlington. This is particularly helpful when there are billing issues that can present a barrier to participation. The translators can also help with communications with rental property owners.

BED continues to offer a robust energy education service for customers that includes onsite energy audits, lending of appliance meters and custom billing history analysis. BED also continues to provide energy efficiency information in a variety of forums. BED staff has also visited several classrooms in the Burlington School District to discuss energy efficiency with faculty and schoolchildren. Also, starting in 2009, BED contracted with VGS to install CFL's and collect potential electrical energy efficiency savings information while performing normal VGS energy audits.

Retail Products

BED's Efficient Products Program (EP) aims to increase sales of DOE\EPA ENERGY STAR® qualified lighting products, Compact Fluorescent (CFL) screw-in bulbs, CFL hardwired fixtures, and ENERGY STAR® appliances such as clothes washers, refrigerators, freezers, and ceiling fans with lights, room air conditioners and dehumidifiers. This is accomplished primarily through retail stores with on-site and mail-in consumer rebates, but also by arranging retailer buy-downs and manufacturer mark-downs for CFL products. The program pursues this objective with extensive outreach to retailers, such as efforts to encourage Vermont lighting showrooms to increase the number and variety of energy efficient fixtures stocked and displayed. Field representatives personally visit every participating retail store at least three times per year; larger stores are visited more frequently. The program provides consumer rebates for ENERGY STAR® -qualified bulbs, fixtures, refrigerators, ceiling fans with lights, window AC units, clothes washers, dehumidifiers and freezers. These incentives are intended to entice consumers by lowering the cost of efficient products. The program uses a variety of marketing and promotion efforts in addition to its prominently displayed in-store rebate coupons including a catalog, and an on-line purchase web site in order to build consumer awareness and participation in the program.

Business New Construction

This program helps commercial and industrial builders and developers incorporate the most energy efficient products and systems possible when building or renovating. It is designed to help customers exceed the City of Burlington's required Guidelines for Energy Efficient Construction (which adopted the statewide CBES energy code as of January 1, 2007). By working directly and early in the process with

designers and owners, BED assists in the choice of energy efficient systems and construction techniques that meet business and energy needs. The program offers prescriptive and custom tracks for Act 250 and non-Act 250 projects, providing financial incentives for the installation of cost effective efficiency measures. This includes a minimum package of efficiency criteria including lighting, motors and HVAC systems that all customers must include to be eligible to participate. Eligible participants gain technical assistance, verification services and financial incentives to help with efficient equipment costs. BED's Business New Construction service addresses all energy (especially electricity) consuming equipment, components or practices, including motors, lighting, heating, ventilation and air-conditioning (HVAC).

Business Existing Facilities

This program targets naturally occurring equipment changeovers in the business sector to secure energy savings in the equipment replacement market. Targeted equipment includes lighting, heating, ventilation, cooling, water heating, refrigeration, motors and drives, controls and industrial process applications. This program offers prescriptive and custom tracks, with technical assistance and financial incentives that encourage the adoption of cost effective, high efficiency alternatives to standard efficiency equipment. BED offers prescriptive incentives (fixed incentives for specific eligible measures) for building lighting, refrigeration economizers and controls, motors, unitary HVAC equipment and dual enthalpy economizers for unitary HVAC units. BED also participates in the Northeast Energy Efficiency Partnership to further the market transformation of motors, lighting and HVAC equipment. Incentives for above average energy efficient equipment are supplied to wholesalers, contractors, and customers at the time of equipment replacement. Non-prescriptive cost-effective measures or combinations of measures are eligible for custom incentives. Custom incentives are designed to capture as many potential lost opportunity resources as possible, while maximizing program delivery resources. BED staff and trade allies serving Burlington (including equipment vendors, manufacturers, suppliers, contractors, architects and engineers) market the program to potential participants.

5 Overall Project Implementation Approach

This section describes the overall methodology used to conduct this study and explains the general steps and methods used at each stage of the analytical process necessary to produce the various estimates of energy efficiency potential. Specific changes in methodology from one sector to another have been noted throughout the report. Information has been provided to EVT and BED throughout the development of this report for feedback and comment.

Energy efficiency potential studies involve carrying out a number of analytical steps to produce estimates of each type of energy efficiency potential. This study utilizes the GDS Benefit/Cost Screening Tool, an Excel-based model that integrates technology-specific impacts and costs, customer characteristics, utility load forecasts, utility avoided cost forecasts and more. Excel was used as the modeling platform to provide transparency to the estimation process and allow for simple customization based on Vermont's unique characteristics and the availability of specific model input data.

5.1 Measure List Development

Energy efficiency measure lists were based on the Vermont Technical Reference Manual[23] savings as well as the analysis team's existing knowledge and current databases of electric end-use technologies and energy efficiency measures, and were supplemented as necessary to include other technology areas of interest to the VDPS staff, VEIC and BED. The study scope included measures and practices that are currently commercially available as well as emerging technologies. The commercially available measures should be of most immediate interest to energy efficiency program planners.

In addition, this study includes measures that could be relatively easily substituted for or applied to existing technologies on a retrofit or replace-on-burnout basis. Replace-on-burnout applies to equipment replacements that are made normally in the market when a piece of equipment is at the end of its useful life. A retrofit measure is eligible to be replaced at any time in the life of the equipment or building. Replace-on-burnout measures are generally characterized by incremental measure costs and savings (*e.g.* the costs and savings of a high-efficiency versus standard efficiency air conditioner); whereas retrofit measures are generally characterized by full costs and savings (e.g. the full costs and savings associated with retrofitting ceiling insulation into an existing attic) until that point when the equipment would have failed anyway.

5.2 Measure Characterization

A significant amount of data is needed to estimate the savings potential for individual energy efficiency measures or programs across the entire existing residential, commercial and industrial sectors. To this extent, considerable effort was expended to identify, review, and document all available data sources.[24] This review allowed development of reasonable assumptions regarding measure lives; installed incremental and full costs (where appropriate); and electric energy and demand savings for each measure included in the final lists of measures in this study.

[23] Vermont Technical Reference User Manual (TRM) Measure Savings Algorithms and Cost Assumptions, June 14, 2010.

[24] The appendices to this report provide the data sources used by the GDS Team to obtain up-to-date data on measure costs, savings and useful lives.

Savings: Estimates of annual measure savings as a percentage of base equipment usage was taken foremost from the Vermont TRM and, when not available there, were developed from a variety of sources, including:[25]

- Building energy modeling software and engineering analyses
- Secondary sources such as the American Council for an Energy-Efficient Economy ("ACEEE"), Department of Energy ("DOE"), Energy Information Administration ("EIA"), Energy Star® and other technical potential studies
- Program evaluations conducted by other utilities and program administrators
- Customer meter data

Measure Costs: Measure costs represent either incremental or full cost, and typically include the cost of installation. For purposes of this study, nominal measures costs were held constant over time. This general assumption was made due to the fact that historically many measure costs (for example, CFL bulbs) have declined over time, while some measure costs have increased over time (fiberglass insulation). Cost estimates were taken foremost from the Vermont TRM and when not available derived from the following sources:

- Secondary sources such as ACEEE, Energy Star®, and other technical potential studies
- Retail store pricing and industry experts
- Evaluation reports

Measure Life: Represents the number of years (or hours) that energy-using equipment is expected to operate. Useful life estimates were taken foremost from the Vermont TRM and when not available derived from:

- Manufacturer data
- Savings calculators and Life-cycle cost analyses
- Secondary sources such as ACEEE, Energy Star®, and other technical potential studies
- The California Database for Energy Efficient Resources ("DEER") database
- Evaluation reports

Baseline and Efficient Technology Saturations: In order to assess the amount of energy efficiency savings still available, estimates of the current saturation of baseline equipment and energy efficiency measures are necessary. Up-to-date measure saturation data were primarily obtained from the following recent studies:

- Vermont Department of Public Service, "Analysis of On-Site Audits of Existing Homes in Vermont", June 2009
- Vermont Department of Public Service "Overall Report, Vermont Residential New Construction Study, Final Report", July 2009
- Vermont Department of Public Service, "Business Sector Market Assessment and Baseline Study – Existing Commercial Buildings", July 2009
- Vermont Department of Public Service, "Business Sector Market Assessment and Baseline Study – Commercial New Construction", October 2009

[25] On a going forward basis, the energy and demand savings over baseline are assumed to remain consistent – as the baselines increase due to code and appliance standards, so does the high efficiency version.

- Vermont Department of Public Service, "Business Sector Market Assessment and Baseline Study – Existing Industrial Facilities", September 2009
- Burlington Electric Department, 2005 Residential Appliance Saturation Survey

Emerging technologies were selected based on existing research and discussions with DPS staff. Existing research sources included ACEEE, Bonneville Power Administration, and general knowledge of emerging technology trends. Technologies not applicable to Vermont's climate were rejected, while those included had savings estimates calculated for Vermont's climate and/or specific markets. For solar water heating, RETScreen was used to model the performance of a typical single family residential system in Vermont, with a performance and sizing extrapolated made to address multi-family systems. Energy conservation programs that produce energy savings through behavioral based changed in consumption habits were also included in this analysis and defined as emerging technologies due to their relatively unknown period of savings persistence.

The overall cost to purchase and install certain emerging technologies was reduced annually to reflect the likelihood of various factors (i.e. increased market competition, reduced production costs, or technology maturation) leading to a decrease in market prices over the period of study. For example, the install cost of residential solar water heating was reduced by 2% annually to account for any future reduction in purchase or installation costs and to gauge the impact of these reduced costs on the overall cost effectiveness of the measure.

Further detail regarding the development of measure assumptions for energy efficiency in the residential and commercial/industrial sectors can be found later in this report. Additionally, refer to the individual sector appendices for a comprehensive listing of all energy efficiency measure assumptions and sources assessed in this report.

5.3 Impacts of Early Replacement Programmatic Approach

This section explains the impacts of the early replacement programmatic approach. The GDS Team utilized the early replacement approach for fifty percent of the eligible measures during the twenty-year time period of this analysis (2012 to 2031). Energy efficiency potential in the existing stock of buildings can be captured over time through two principal processes:

1. as equipment replacements are made normally in the market when a piece of equipment is at the end of its useful life (we refer to this as the "market-driven" or "replace-on-burnout" case); and,
2. at any time in the life of the equipment or building (which we refer to as the "retrofit" case).

Market-driven measures are generally characterized by *incremental* measure costs and savings (e.g., the incremental costs and savings of a high-efficiency versus a standard efficiency air conditioner); whereas retrofit measures are generally characterized by full costs and savings (e.g., the full costs and savings associated with retrofitting ceiling insulation into an existing attic). For the market driven measures, the study team assumed that existing equipment will be replaced with high efficiency equipment at the time a consumer is shopping for a new appliance or other energy using equipment, or if the consumer is in the process of building or remodeling. Using this assumption, equipment that needs to be replaced (replaced on burnout) in a given year is eligible to be upgraded to high efficiency equipment. A specialized retrofit case is often referred to as "early replacement" or "early retirement". This refers to a piece of equipment whose replacement is accelerated by several years, as compared to the market-driven assumption, for the purpose of capturing energy savings earlier than they would otherwise occur.

For this study, GDS utilized the "replace on burnout" programmatic approach for 50% of eligible measures, and utilized the "early replacement" approach for the remaining 50% of eligible measures. Thus these two approaches were utilized equally in this study. For replace-on-burnout and early replacement measures in the maximum achievable potential analysis, GDS assumed that the Program Administrator would pay an incentive equivalent to 100% of the incremental cost or full cost of energy efficiency measures.[26] In general, GDS finds that the early replacement approach can accelerate kWh and kW savings to earlier time periods, and can provide greater net present value savings. In the long run (more than 10 years), however, the early retirement and replace-on-burnout approaches often provide identical cumulative annual kWh and kW savings. The early replacement approach causes program budgets to be substantially higher than would occur with a replace-on-burnout approach, because costs are based on the full cost of purchasing a new appliance or piece of energy efficient equipment, not the incremental cost. However, these higher program costs can be mitigated by the net present value of the benefits achieved by the savings occurring sooner in time. These benefits can be significant in avoiding other, more costly, utility system expenditures such as transmission and distribution upgrades. Based on an a special analysis conducted for this study, GDS finds that both programmatic approaches pass the Vermont Societal test and are cost effective. GDS found that while the replace on burnout approach has a greater Vermont Societal Test benefit/cost ratio, the net present value savings for the early replacement approach are higher than with the replace on burnout approach.

For early retirement energy efficiency measures, the study team assumed that the measure would be replaced early, at most five years prior to reaching the end of its expected lifetime.[27] Therefore, for the first five years of the newly installed measure, the energy savings associated with the efficiency measure reflect the large savings that result from replacing an old, relatively inefficient measure with a new energy-efficient model (the energy savings are calculated as the difference between the old unit that is replaced and the new high efficiency unit that is installed). For the remaining life of the measure beyond year five, the energy savings associated with the measure reflects the incremental savings associated with installing an energy-efficient model rather than a new standard-efficiency model. While there are more substantial energy savings available in the first five years, continued savings at a lower level are captured for the remainder of the measure lifetime.

There is one more cost that needs to be considered in the Vermont Societal Cost Test for the early replacement programmatic approach. It is necessary to capture the additional costs to program participants of roughly five years of additional capital costs of equipment due to advancing the refrigerator replacement cycle by five years. Because the early replacement programmatic approach permanently advances the cycle of when the refrigerator will be replaced in the future, it is necessary to add this cost impact to the economic analysis.[28] The point is that by advancing a capital expense five years, you advance an entire stream of capital expenses over many years, and this has to be accounted for in the cost effectiveness screening analysis. It is also necessary to reflect reduced energy savings, beginning at the same time that the deferred cost credit is recognized. GDS has included this additional cost when considering the cost effectiveness of the early retirement programmatic approach.

[26] Even with payment of an incentive equal to 100% of the measure incremental or full cost, GDS has assumed that only 90 percent of the available market will participate in programs. This is to acknowledge that some households and businesses will not participate in programs even when the EEU pays 100% of the incremental or full cost of measures.

[27] For purposes of this study, the study team used 5 years as the maximum remaining life at time of early replacement, with half the measure life as the remaining life for measures with EULs under 10 years.

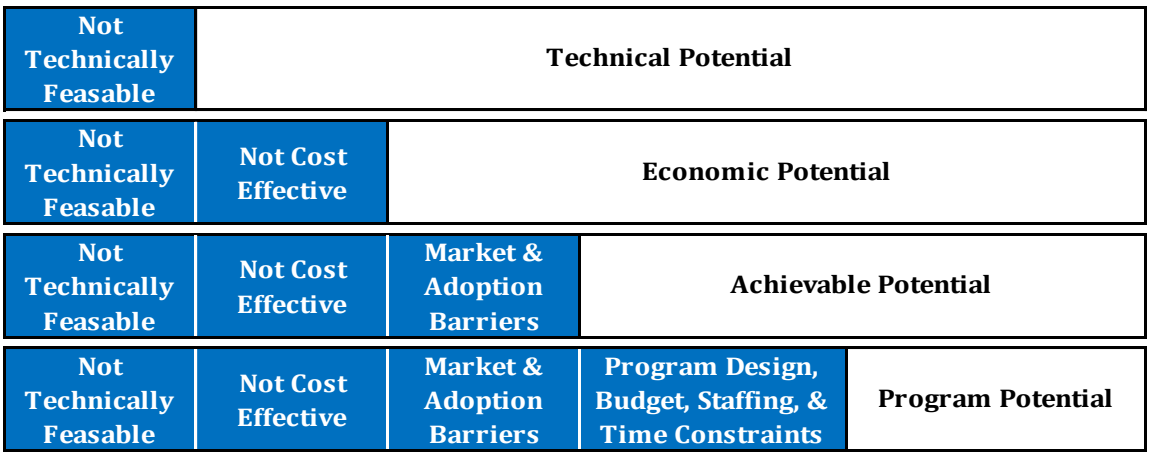
[28] This cost is discussed on page 2 of a paper titled "Retrofit Economics 201: Correcting Common Errors in Demand-Side Management Cost-Benefit Analysis", by Rachel Brailove, John Plunkett, and Jonathan Wallach, Resource Insight, Inc. William Steinhurst of the Vermont Department of Public Service assisted in the derivation of this deferred replacement concept.

The authors of this report acknowledge that the early replacement programmatic approach also has other benefits that should be considered. There is a societal value due to the five years advancement in CO2 (and other emissions) reductions. There is a value to the five year advancement in employment effects, as energy efficiency programs create new jobs in Vermont. Furthermore, if accelerating energy efficiency measure installation delays or avoids utility system costs (particularly in capital costs that may represent a 20, 30 or even 50 year commitment), the 'societal' benefits will be strongly positive.

5.4 Potential Savings Overview

Potential studies often distinguish between three to four different types of efficiency potential: technical, economic, achievable, and program. However, because there are often important definitional issues between studies, it is important to understand the definition and scope of each potential estimate as it applies to this analysis.

Figure 5-1: Types of DSM Potential[29]



The first two types of potential, technical and economic, provide a theoretical upper bound for energy savings. Still, even the best designed portfolio of programs is unlikely to capture 100 percent of the technical or economic potential. Therefore, achievable potential and program potential attempt to estimate what may realistically be achieved, when it can be captured, and how much it would cost to do so. Figure 5.1 illustrates the four most common types of efficiency potential. In this report, achievable potential is referred to as maximum achievable potential as it assumes aggressive savings targets over the 20-year study time-frame. Estimates of program potential are not included as part of the current report. Rather, three resource plan scenarios will be examined as a supplement to this study that will analyze the potential for energy and demand savings given specific budget and other program parameters.

[29] Reproduced from "Guide to Resource Planning with Energy Efficiency" November 2007. ES EPA. Figure 2-1.

5.5 TECHNICAL POTENTIAL

Technical potential is the theoretical maximum amount of energy use that could be displaced by efficiency, disregarding all non-engineering constraints such as cost-effectiveness and the willingness of end-users to adopt the efficiency measures. It is often estimated as a "snapshot" in time assuming immediate implementation of all technologically feasible energy saving measures, with additional efficiency opportunities assumed as they arise from activities such as new construction.[30]

In general, this study used a "bottom-up" approach in the residential sector to calculate the potential of an energy efficiency measure or set of measures. A bottom-up approach first starts with the savings and costs associated with replacing one piece of equipment with its efficient counterpart, and then multiplies these values by the number of measures available to be installed throughout the life of the program. The bottom-up approach is often preferred in the residential sector because of better data availability and greater homogeneity of the building and equipment stock to which measures are applied. However, this methodology was not able to be used in the C&I sector. The savings estimates per base unit were determined by comparing the high efficiency equipment to current installed equipment for existing construction retrofits or to current equipment code standards for replace-on-burnout and new construction scenarios.

5.5.1 CORE EQUATION FOR THE RESIDENTIAL SECTOR

The core equation used in the residential sector technical potential analysis for each individual efficiency measure is shown below in Figure 5-2.

Figure 5-2: Core Equation for the Residential Sector Technical Potential

Technical Potential of Efficient Measure = Total Number of Households or Buildings X Base Case Equipment End Use Intensity [kWh/unit] X Base Case Factor X Remaining Factor X Applicability Factor X Savings Factor

Where:

- Base Case Equipment End Use Intensity = the electricity used per customer per year by each base-case technology in each market segment. This is the consumption of the electric energy using equipment that the efficient technology replaces or affects.

- Base Case Factor = the fraction of the end use electric energy that is applicable for the efficient technology in a given market segment. For example, for residential lighting, this would be the fraction of all residential electric customers that have electric lighting in their household,

- Remaining Factor = the fraction of applicable dwelling units that have not yet been converted to the electric energy efficiency measure; that is, one minus the fraction of households that already have the energy-efficiency measure installed.

- Applicability Factor = the fraction of the applicable units that is technically feasible for conversion to the efficient technology from an engineering perspective (e.g., it may not be possible to install CFLs in all light sockets in a home because the CFLs may not fit in every socket.)

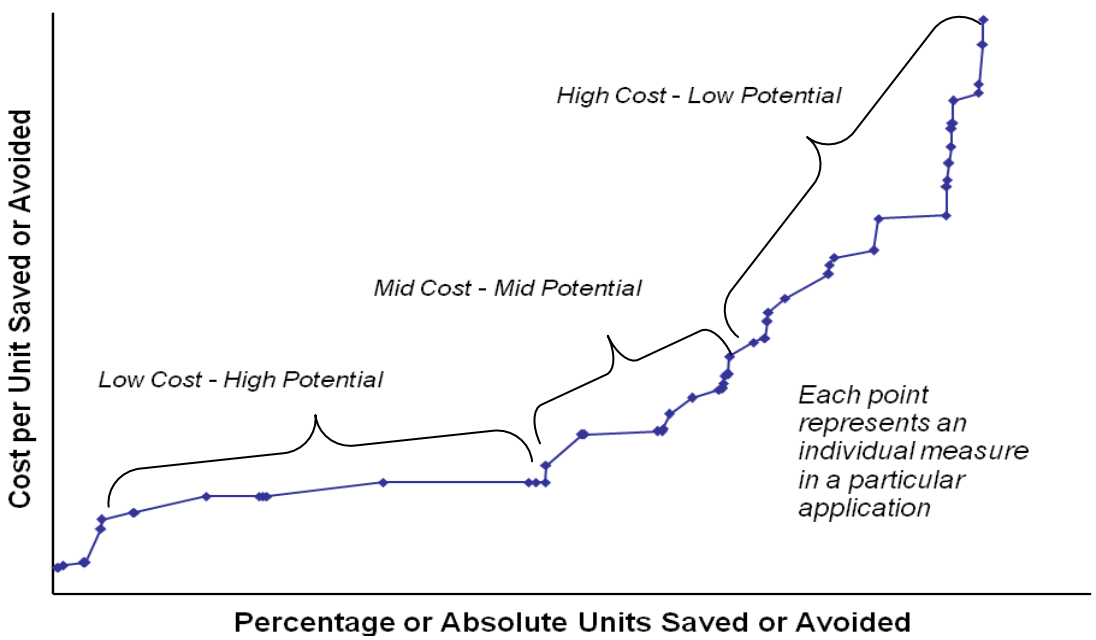
[30] National Action Plan for Energy Efficiency, "Guide for Conducting Energy Efficiency Potential Studies", page 2-4

- Savings Factor = the percentage reduction in electricity consumption resulting from application of the efficient technology.

Technical energy efficiency potential in the residential sector was calculated in two steps. In the first step, all measures were treated *independently*; that is, the savings of each measure were not reduced or otherwise adjusted for overlap between competing or interacting measures. By analyzing measures independently, no assumptions were made about the combinations or order in which they might be installed in customer buildings. However, the cumulative technical potential cannot be estimated by adding the savings from the individual savings estimates because some savings would be double-counted. For example, the savings from a measure that reduces heat loss from a building, such as insulation, are partially dependent on other measures that affect the efficiency of the system being used to heat the building, such as a high-efficiency furnace; the more efficient the furnace, the less energy saved from the installation of the insulation.

In the second step, cumulative technical potential was estimated using an energy efficiency supply curve approach. This method eliminates the double-counting problem mentioned above. A generic example of a supply curve is shown in Figure 5-3. As shown in the figure, a supply curve typically consists of two axes; one that captures the cost per unit of saving a resource (e.g., dollars per kWh saved) and another that shows the amount of savings that could be achieved at each level of cost. The curve is typically built up across individual measures that are applied to specific base-case practices or technologies by market segment. Savings measures were sorted on a least-cost basis and total savings are calculated incrementally with respect to measures that precede them. Supply curves typically, but not always, end up reflecting diminishing returns, i.e., costs increase rapidly and savings decrease significantly at the end of the curve.

Figure 5-3: Generic Example of a Supply Curve



As noted above, the cost portion of this energy-efficiency supply curve is represented in dollars per unit of energy savings. Cost are annualized (often referred to as levelized) in supply curves. For example,

energy-efficiency supply curves usually present levelized costs per kWh saved by multiplying the initial investment in an efficient technology or program by the capital recovery rate (CRR):

Therefore,

Levelized Cost per kWh Saved = Initial Cost x CRR/Annual kWh Savings

5.5.2 Core Equation for the Commercial and Industrial Sector

The core equation used in the commercial sector technical potential analysis for each individual efficiency measure is shown below in Figure 5-4.

Figure 5-4: Core Equation for Commercial Sector Technical Potential

Technical Potential of Efficient Measure = Total End Use kWh Sales by Industry Type X Base Case Factor X Remaining Factor X Convertible Factor X Savings Factor

Where:

- Total end use kWh sales (by segment) = the forecasted level of electric sales for a given end-use (e.g., space heating) in a commercial or industrial market segment (e.g., office buildings).
- Base Case factor = the fraction of the end use electric energy that is applicable for the efficient technology in a given market segment. For example, for fluorescent lighting, this would be the fraction of all lighting kWh in a given market segment that is associated with fluorescent fixtures.
- Remaining factor = the fraction of applicable kWh sales that are associated with equipment that has not yet been converted to the electric energy efficiency measure; that is, one minus the fraction of the market segment that already have the energy-efficiency measure installed.
- Convertible factor = the fraction of the equipment or practice that is technically feasible for conversion to the efficient technology from an *engineering* perspective (e.g., it may not be possible to install VFDs on all motors in a given market segment).
- Savings factor = the percentage reduction in electricity consumption resulting from application of the efficient technology.

Similar to the residential sector, technical electric energy efficiency savings potential in the C&I sector was calculated in two steps. In the first step, all measures are treated *independently*; that is, the savings of each measure are not reduced or otherwise adjusted for overlap between competing or synergistic measures. By treating measures independently, their relative economics were analyzed without making assumptions about the order or combinations in which they might be implemented in customer buildings. However, the total technical potential across measures cannot be estimated by summing the individual measure potentials directly because some savings would be double-counted. For example, the savings from a weatherization measure, such as low-e ENERGY STAR® windows, are partially dependent on other measures that affect the efficiency of the system being used to cool or heat the

building, such as high-efficiency space heating equipment or high efficiency air conditioning systems; the more efficient the space heating equipment or electric air conditioner, the less energy saved from the installation of low-e ENERGY STAR windows.

For the residential and commercial sectors, the GDS Team addressed the new construction market as a separate market segment, with a program targeted specifically at the new construction market. In the residential new construction market segment, for example, detailed energy savings estimates for the ENERGY STAR Homes program were used as a basis for determining electricity savings for this market segment in Vermont.

5.6 Economic Potential

Economic potential refers to the subset of the technical potential that is economically cost-effective as compared to conventional supply-side energy resources. Both technical and economic potential are theoretical numbers that assume immediate implementation of efficiency measures, with no regard for the gradual "ramping up" process of real-life programs. In addition, they ignore market barriers to ensuring actual implementation of efficiency. Finally, they only consider the costs of efficiency measures themselves, ignoring any programmatic costs (e.g., marketing, analysis, administration) that would be necessary to capture them. The study team used the Vermont Societal test to determine whether measures were cost effective.

In practice, most technical and economic potential estimates produce similar results. The study team calculated the Vermont Societal test for each measure over a ten-year implementation period (2012 to 2021) to determine if each measure was cost effective. The cost effectiveness testing was done in this manner to ensure that all measures that were cost effective on average over the ten-year period were included in the estimates of economic and achievable potential. This procedure ensured that measures that were not cost effective in early years but became cost effective in later years were included in the estimates of economic and achievable potential. All measures that were not found to be cost-effective were excluded from future analysis.

5.7 Maximum Achievable Potential

Maximum Achievable Potential describes the economic potential that could be achieved over a given time period under the most aggressive program scenario.

Achievable potential is the amount of energy use that can realistically be expected to save assuming the most aggressive market penetration and funding scenarios. Achievable potential takes into account barriers that hinder consumer adoption of energy efficiency measures such as financial, political and regulatory barriers, the administrative and marketing costs associated with efficiency programs, and the capability of programs and administrators to ramp up activity over time. For purposes on this study, the GDS team assumed that the EEU would pay incentives equal to 100 percent of measure costs. It was assumed that the combination of this level of incentives along with well-designed programs with effective education and outreach would generally result in an overall measure penetration rate of 90 percent.

5.8 Resource Plan Scenarios

The next phase of this study will also examine projected budgets and kWh and kW savings for three resource plan scenarios:

1. Acquiring all reasonably available cost effective efficiency potential over 20 years, through a reasonably flat budget
2. Acquiring 2% savings relative to annual energy consumption, ramping up to 3% in five years, then holding constant
3. The current budget adjusted for inflation

The results of these resource plan scenarios will be presented in a supplement of this study.

5.9 Determining Cost-Effectiveness

A standard methodology for energy efficiency program cost effectiveness analysis was published in California in 1983 by the California Public Utilities Commission and updated in December 1987, 2001 and 2002.[31] It was based on experience with evaluating conservation and load management programs in the late 1970's and early 1980's. This methodology examines five perspectives:

- the Total Resource Cost Test
- the Participant Test
- the Utility Cost Test (or Program Administrator Test)
- the Rate Impact Measure (RIM) Test
- the Societal Cost Test

Figure 5-5 below summarizes the major components of these five benefit/cost tests. Vermont uses the Societal Cost Test as described below.

Figure 5-5: Components of Energy Efficiency Benefit/Cost Tests

	Participant Test	Rate Impact Test	Total Resource Cost Test	Utility Cost Test	Societal Test
Benefits					
Reduction in Customer's Utility Bill	X				
Incentive Paid by Utility	X				
Any Tax Credit Received	X		X		
Avoided Supply Costs		X	X	X	X
Avoided Participant Costs	X		X		X
Participant Payment to Utility (if any)		X		X	
External Benefits					X
Costs					
Utility Costs		X	X	X	X
Participant Costs	X		X		X
External Costs					X
Lost Revenues		X			

[31]California Public Utilities Commission and California Energy Commission, Standard Practice Manual, Economic Analysis of Demand-Side Programs and Projects, 2002.

5.9.1 THE TOTAL RESOURCE COST TEST

The Total Resource Cost (TRC) test measures the net costs of a demand-side management or energy efficiency program as a resource option based on the total costs of the program, including both the participants' and the utility's costs.[32]

Benefits and Costs: The TRC test represents the combination of the effects of a program on both the customers participating and those not participating in a program. In a sense, it is the summation of the benefit and cost terms in the Participant and the Ratepayer Impact Measure tests, where the revenue (bill) change and the incentive terms intuitively cancel (except for the differences in net and gross savings).

The benefits calculated in the Total Resource Cost Test include the avoided electric supply costs for the periods when there is an electric load reduction, as well as savings of other resources such as fossil fuels and water. The avoided supply costs are calculated using net program savings, which are the savings net of changes in energy use that would have happened in the absence of the program.

The costs in this test are the program costs paid by the utility and the participants plus any increase in supply costs for periods in which load is increased. Thus all equipment costs, installation, operation and maintenance, cost of removal (less salvage value), and administration costs, no matter who pays for them, are included in this test. Any tax credits are considered a reduction to costs in this test.

5.9.2 THE PARTICIPANT TEST

The Participant Test is the measure of the quantifiable benefits and costs to program participants due to participation in a program. Since many customers do not base their decision to participate in a program entirely on quantifiable variables, this test cannot be a complete measure of the benefits and costs of a program to a customer.[33] This test is designed to give an indication as to whether the program or measure is economically attractive to the customer. Benefits include the participant's retail bill savings over time, and costs include only the participant's costs.

5.9.3 THE RATE IMPACT MEASURE TEST

The Ratepayer Impact Measure (RIM) Test measures what happens to customer bills or rates due to changes in utility revenues and operating costs caused by a program. Rates will go down if the change in revenues from the program is greater than the change in utility costs. Conversely, rates or bills will go up if revenues collected after the program is implemented are less than the total costs incurred by the utility in implementing the program. This test indicates the direction and magnitude of the expected change in customer rate levels.[34] Thus, this test evaluates an energy efficiency program from the point of view of rate levels. The RIM test is a test of fairness or equity; it is not a measure of economic efficiency.

[32]California Public Utilities Commission, California Standard Practice Manual, Economic Analysis of Demand-Side Management Programs and Projects, October 2001, page 18.
[33]Ibid., page 9.
[34]Ibid., page 17.

5.9.4 THE UTILITY COST TEST

The Utility Cost Test measures the net costs of a demand-side management program as a resource option based on the costs incurred by the utility (including incentive costs) and excluding any net costs incurred by the participant. The benefits are similar to the Total Resource Cost Test benefits. Costs are defined more narrowly, and only include the utility's costs.[35] This test compares the utility's costs for an energy efficiency program to the utility's avoided costs for electricity and/or gas. This means that a measure could pass the Utility Cost Test but not be cost effective from a more comprehensive perspective that included participant costs.

5.9.5 THE VERMONT SOCIETAL TEST

The December 20, 2010 Vermont Public Service Board Order of Appointment states that "When assessing the cost-effectiveness of efficiency measures, an EEU shall utilize the Societal Test as described by the Board in its April 16, 1990 Order in Docket No. 5270, or other tests as may be approved by the Board".[36] All of the cost effectiveness screening and results for this study were determined using the Vermont Societal Test.

The Societal Cost Test is structurally similar to the Total Resource Cost Test.[37] It goes beyond the TRC test in that it attempts to quantify the change in total resource costs to society as a whole rather than to only the service territory (the energy efficiency utility service area). In taking society's perspective, the Societal Cost Test utilizes essentially the same input variables as the TRC test, but they are defined with a broader societal point of view.[38] An example of societal benefits is reduced emissions of carbon, nitrous and sulfur dioxide and particulates from electric utility power plants.[39] When calculating the Societal Cost Test benefit/cost ratio, future streams of benefits and costs are discounted to the present using a discount rate. The avoided costs of electricity, natural gas, propane, #2 fuel oil, kerosene and water used in this study are provided in Appendix 1 of this report.

According to the Final Order in Vermont Public Service Board Docket No. 5270, the Societal Test calculation in Vermont includes a 10% reduction to costs to account for the risk diversification benefits of energy efficiency measures and programs. The Board subsequently adopted an environmental adder of $.0070 per kWh saved (in $2000). This adder replaces the original 5% adder for environmental externalities. In this report, GDS has used the definition of the Societal Test calculation as specified by the Vermont Public Service Board in its final order in Docket No. 5270, and has used the $.0070 adder for environmental benefits, adjusted to current year dollars. GDS has also applied the 10% reduction to energy efficiency measure costs for all calculations of the Vermont Societal Test.

[35] Ibid., page 33.
[36] Vermont Public Service Board Order of Appointment dated December 20, 2010, page 28.
[37] According to the November 2008 National Action Plan for Energy Efficiency Guide titled "Understanding Cost Effectiveness of Energy Efficiency Programs", the Societal Cost Test (SCT) includes all of the costs and benefits of the TRC test, but it also includes environmental and other non-energy benefits that are not currently valued by the market. The SCT may also include non-energy costs, such as reduced customer comfort levels. See page 6-7.
[38] California Public Utilities Commission, California Standard Practice Manual, Economic Analysis of Demand-Side Management Programs and Projects, October 2001, page 27.
[39] The Vermont Public Service Board Order in Docket No. 5270 cites the following as such societal benefits: reductions in acidic precipitation, carbon dioxide and other greenhouse gases, reduction in habitat destruction, and reduction in nuclear waste disposal risks.

5.10 AVOIDED COSTS

The avoided electric supply costs for this Vermont energy efficiency potential study consist of the electric supply costs avoided due to the implementation of electric energy efficiency programs. The costs that are avoided depend on the amount electricity that is saved, and when it is saved (in peak heating season periods, seasonal or annual, etc.). The avoided costs used in this study were adopted by the Vermont Public Service Board and provided to the GDS/Cadmus study team by staff of the Vermont Department of Public Service.[40]

Second, it is very important to note that the electricity avoided costs used in the Vermont Societal (VT SCT) Test do not represent the retail rate for each customer class. While the actual retail rate is used in the calculation of the benefits for the Participant Test, the actual retail rate is not the avoided electric cost used in the calculation of the benefits for the Societal Test or the Total Resource Cost Test.

5.11 FREE-RIDERSHIP VERSUS FREE-DRIVERS

Free-riders are defined as participants in an energy efficiency program who would have undertaken the energy-efficiency measure or improvement in the absence of a program or in the absence of a monetary incentive. Free-drivers are those who adopt an energy efficient product or service because of the intervention, but are difficult to identify either because they do not collect an incentive or they do not remember or are not aware of exposure to the intervention.[41]

The issue of free-riders and free-drivers is important. For the commercial and industrial sectors, where a top-down approach is used to estimate electric savings potential, free-riders are accounted for through the electric energy and peak demand forecast provided to the study team by staff of the Vermont Department of Public Service. This electric kWh sales forecast already includes the impacts of naturally occurring energy efficiency (including impacts from vintaging of electric appliances, electric price impacts, and electric appliance efficiency standards). Because naturally occurring energy savings are already reflected in the electricity sales forecast used in this study, these electric savings will not be available to be saved again through the study team's energy efficiency supply curve analysis. The study team used this process to ensure that there is no "double-counting" of energy efficiency savings. This technical methodology for accounting for free-riders for the commercial and industrial sectors is consistent with the standard practice used in other recent technical potential studies, such as those conducted in California, Connecticut, Florida, Georgia, Idaho, Kentucky, New Mexico and Utah.

Adjustments to Savings for the Residential Sector

As noted above, the study team used a "bottom-up" approach to estimate potential kWh savings remaining in the residential sector in Vermont. The study team examined whether it would be necessary to adjust projected electricity savings for free-ridership, spillover and other market effects. The study team collected data on energy efficiency program realization rates from programs at NYSERDA, National Grid and Wisconsin Focus on Energy. As a result of this review, and using NYSERDA's most recent data, GDS has used an adjustment factor of 1.0 at this time to capture the impacts reflected in realization rates and net to gross ratios for this sector. The definitions of these terms are provided below.

[40] Avoided Energy Supply Component Study Group, report titled "Avoided Energy Supply Costs in New England: 2009 Report", dated October 23, 2009.

[41] Pacific Gas and Electric Company, "A Framework for Planning and Assessing Publicly Funded Energy Efficiency Programs", Study ID PG&E-SW040, March 1, 2001.

net to gross ratio: this is an adjustment factor that accounts for the amount of energy savings, determined after adjusting for free ridership and spillover (market effects), attributable to the program.

realization rate: this factor is calculated as the energy or demand savings measured and verified divided by the energy or demand savings originally forecasted to occur by the EEU. A rate of 1.0 means that the savings measured and verified aligned exactly with the savings claimed. A rate greater than 1.0 means that the savings were under-reported, while a rate less than 1.0 means the savings were over-estimated.

6 RESIDENTIAL ENERGY EFFICIENCY POTENTIAL ESTIMATES (2012 TO 2031)

This section of the report presents the estimates of electric technical, economic, and maximum achievable potential for the state of Vermont as well as the EVT and BED territories separately.

Figure 6-1 and Table 6-1 presented below, summarize the technical, economic, and achievable savings potential (as a % of forecast sales) for the Vermont service area by 2031. The maximum achievable potential estimates are based primarily on a market penetration scenario that targets the installation of energy efficient equipment in 80-90% of the remaining eligible market by 2031. If the targeted market penetration for all remaining eligible cost-effective measures can be reached over the next two decades, the maximum achievable potential for electric energy efficiency savings in this sector is approximately 36% of projected residential sales (853,509 MWh). Energy efficiency measures and programs can also serve to lessen peak demand, creating a reduction of roughly 38% of the 2031 residential winter peak (32% of the summer peak) in the maximum achievable potential scenario.

Figure 6-1: Summary of Residential Energy Efficiency Potential as a % of 2031 Forecast – VT Statewide

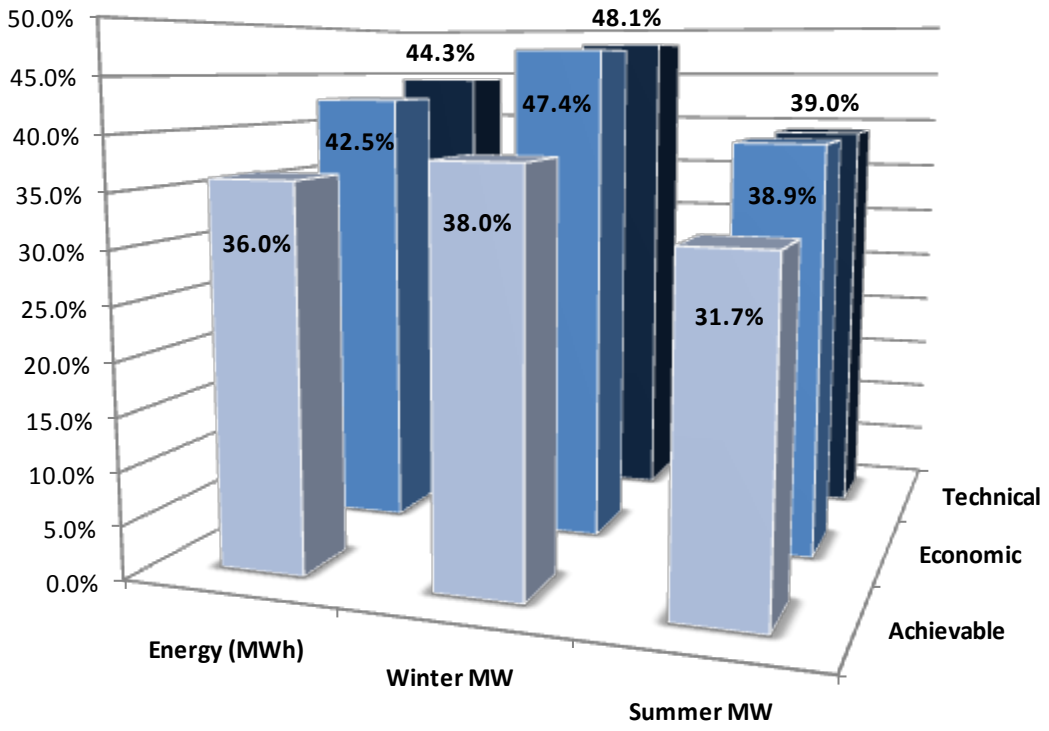


Table 6.1 also presents the separate technical, economic, and maximum achievable estimates for the EVT and BED service territories. In general the BED territory had slightly higher estimates of technical, economic, and achievable potential.[42] Of the combined 894,360 MWh of achievable potential energy

[42] Higher estimates of achievable potential are likely a result of several contributing factors. The BED saturation study was completed in 2005 and may not capture the most recent market changes in energy efficiency measure saturation compared to the 2009 NMR saturation data used in the EVT Territory. In addition, the BED residential load forecast has a lower annual growth rate than the growth rate found in the EVT residential forecast. As a result, the BED energy and demand savings potential appear larger relative to the 2031 BED forecast sales.

savings, the BED territory achievable electric energy savings was 40,851 MWh (41% of 2031 BED sales). The EVT territory was estimated to have a maximum achievable potential of 853,509 MWh (36% of 2031 EVT territory sales).

Table 6-1: 2031 Summary of Residential Energy and Demand Savings Potential

	Energy		Demand			
	Energy (MWh)	% of 2031 Sales	Winter MW	% of 2031 Winter Peak	Summer MW	% of 2031 Summer Peak
State-wide						
Technical Potential	1,101,684	44.3%	236.5	48.1%	173.1	39.0%
Economic Potential	1,056,019	42.5%	232.7	47.4%	172.5	38.9%
Achievable Potential	894,360	36.0%	186.8	38.0%	140.4	31.7%
EVT Territory						
Technical Potential	1,052,787	44.1%	225.9	47.8%	165.1	38.7%
Economic Potential	1,007,939	42.3%	222.2	47.0%	164.8	38.7%
Achievable Potential	853,509	35.8%	178.2	37.7%	134.0	31.4%
BED Territory						
Technical Potential	48,897	49.1%	10.6	56.8%	8.0	45.8%
Economic Potential	48,080	48.3%	10.5	56.2%	7.7	44.4%
Achievable Potential	40,851	41.0%	8.6	46.1%	6.4	37.0%

6.1 Energy Efficiency Measures Examined

67 residential electric energy efficiency programs or measures were included in the energy savings analysis for the residential sector.[43] Below, Table 6-2 provides a brief listing of the various residential energy efficiency programs or measures considered in this analysis. The list of energy efficiency measures examined was developed based on a review of the measures and programs included by other technical potential studies and measures included in the Vermont TRM.

Appendix 2 provides a brief discussion of each measure or program as well as the savings, useful life, cost assumptions, and VT SCT benefit-cost ratios at the "measure" level.

Table 6-2: Measures and Programs Included in the Residential Sector Analysis

End Use Type	End-Use Description	Measures/Programs Includes
Appliances	General Home Appliances	* Dehumidifiers * Refrigerators * Freezers * Refrigerator/Freezer Turn-In
Appliances/WH	Kitchen/Laundry	* Clothes Washers * Heat Pump Dryers * Clothes Dryer - Fuel Switch * Dishwashers
Electronics	Home Electronics	* Controlled Power Strips * Internal Power Supplies * Laptops * Computer Monitors * Televisions (LED, LCD, Plasma)

[43] After accounting for adjustments to different building types, replacement approaches, and housing characteristics, particularly for measures targets the space heating and cooling end use, the number grew to approximately 379 measure permutations.

		* Set Top Boxes * Misc. Consumer Electronics
HVAC (Envelope)	Building Envelope Upgrades	* Weatherization * Weatherization & Insulation Package * Energy Star Windows
HVAC (Equipment)	Heating/Cooling /Ventilation Equipment	* Efficient Central AC * Efficient Room AC * Efficient Furnace Fan Motors * Exhaust Fans * Primary Space Heat - Fuel Switch (MF Only) * Reverse Cycle Chillers – Emerging Tech. (MF Only)
Lighting	Indoor/Outdoor Lighting	* Incandescent to CFL * Incandescent to LED * CFL to LED * Specialty CFL bulbs (<=15W) * Specialty CFL bulbs (>15W) * Indoor Lighting Controls * Outdoor Lighting Controls
Other	Miscellaneous Efficiency Measures	* Pool Pump Timer * 2-speed Pool Pump Motor * Direct Feedback Devices (In Home Display Units) – Emerging Tech. * Indirect Energy Consumption Feedback – Emerging Tech.
Water Heating	Domestic Hot Water	* Efficient Storage Tank WH * Heat Pump WH * Solar WH (w/ Electric Back Up) – Emerging Tech. * Electric Water Heater - Fuel Switch * Tank Wrap * Pipe Wrap * Low Flow Showerheads * Faucet Aerators

6.2 Residential Sector Savings Methodology Overview

The portfolio of measures includes retrofit, early retirement, and replace-on-burnout programmatic approaches to achieve energy efficiency savings. In the residential sector, a retrofit measure refers to the application of supplemental measures (such as the addition of a low-flow device to a showerhead); early retirement includes the replacement of operational equipment before the end of its remaining useful life.

Existing homes were divided into single family and multi-family home markets in order to account for differing equipment saturations and heating/cooling consumption. New homes were also included in the analysis based on a forecast of the number of new customers each year from VELCO. The analysis of the potential for energy efficiency savings is based on the most recent residential electric sales forecasts for the EVT and BED service territories for the years 2012 through 2031.

The residential sector analysis was modeled using what is considered a "bottom-up approach." The methodology is illustrated in Figure 6-2 below:

Figure 6-2: Residential Sector Savings Methodology - Bottom Up Approach

As shown in this figure, the methodology started at the bottom based on the number of residential customers (splitting them into single-family and multi-family customers as well as existing vs. new construction). From that point, estimates of the size of the eligible market were developed for each efficiency measure. For example, energy efficiency measures that affect electric water heating are only applicable to those homes in the EVT and BED territories that have electric water heating.

To obtain up-to-date appliance and end-use saturation data, the study made extensive use of the data collected during the residential on-site surveys conducted for the 2009 Existing Homes Report and 2009 Vermont Residential New Construction Study, both completed by Nexus Market Research, Inc. (NMR). For the BED territory, data collected during 2005 by KEMA was utilized to define baseline saturation characteristics. When available, estimates of energy efficient equipment saturations were also based on the on-site survey data. Additional estimates of energy efficient saturation were generated from regional or national data when needed.

The full formula to determine savings at the measure level is shown below.

Technical Potential of Efficient Measure	=	Total Number of Households or Buildings	X	Base Case Equipment End Use Intensity [kWh/unit]	X	Base Case Factor	X	Remaining Factor	X	Applicability Factor	X	Savings Factor

The goal of the formula is to determine how many households this measure applies to (base case factor), then of that group, the fraction of households which do not have the efficient version of the measure being installed (remaining factor). In instances where technical reasons did not permit the installation of the efficient equipment in all eligible households or competing technologies were eligible for a household, an applicability factor was used that limits the potential. The last factor to be applied was the savings factor, which is the percentage savings achieved from installing the efficient measure over a standard measure.

In developing the overall potential electricity savings, the analysis also took steps to account for the interactive effects of measures designed to impact the same end-use. For instance, if a home were to improve their air leakage rate, the overall space heating and cooling consumption in that home would decrease. As a result, the remaining potential for energy savings derived from additional thermal envelope efficiency measures and efficient heating/cooling equipment would be reduced.

In this analysis, it was assumed that for those measures designed to impact the same end-use, the measure or program with the highest current market penetration would typically be installed first, followed by the measure(s) with the next highest market penetration. Presumably, the measures with the highest market penetrations are perceived as the most attractive based on costs, savings, or ease of implementation. Ranking the installation order in this manner also mimics the pattern of installation that is already occurring in the current market.

In instances where there were two (or more) competing technologies for the same electric end use, such as heat pump water heaters and high efficiency electric storage water heaters, a percent of the available population was assigned to each measure using the applicability factor. In the event that one of the competing measures was not found to be cost-effective, the homes assigned to that measure were transitioned over to the cost effective alternative (if any).

Fuel-switching was analyzed in this analysis for electric water heating and primary space heating.[44] These measures consist of replacement electric water and/or space heating equipment in favor of natural gas, oil, or propane units. Fuel switching was treated as a competing measure to other electric efficiency options. As a result, only a fraction of the total eligible homes were included in the fuel switch options.

The majority of measures were analyzed under both the replace-on-burnout and early retirement option. In the technical potential, 50% of the eligible remaining market was reserved for early retirement and the remaining 50% of the eligible market was analyzed through the replace-on-burnout approach. If both measures proved to be cost effective, the 50/50 split remained through the economic and achievable potential scenarios. The assumption of a 50/50 split remained through the achievable potential to allow for overall linear participation, budgets, and savings in lieu of alternate periods of program growth and contraction. However, in the event that one replacement approach was not cost-effective, the remaining replacement approach received 100% of the eligible market.

Finally, the residential savings potential also takes into account scheduled federal upgrades to incandescent lighting. Recently enacted federal standards (*Energy Independence and Security Act of 2007*) require incandescent bulbs to be approximately 30% more efficient beginning in 2012.[45] These improvements to incandescent equipment performance result in decreased savings potential for CFL and LED technologies. While these new standards may shift the market even further towards wide-spread acceptance of CFL technologies, they do not necessary signal the end of incandescent bulbs. As a result, this analysis continues to include the potential savings from screw-in CFL bulbs from 2012-2019.

[44] Primary space heat fuel switching was reserved for the multi-family sector only. The baseline saturation of primary electric space heat in the single family sector was deemed insignificant based on the results of the most recent end-use saturation studies.

[45] The mandated increase in the efficiency of incandescent bulbs is phased in over a 3-year period: 100-watt bulbs must be 30% more efficient beginning in 2012, 75-watt bulbs in 2013, and 60-watt and 40-watt bulbs in 2014. To facilitate this analysis, GDS took the increased standards for incandescent lighting into account throughout the entire period of study (2012-2031).

In 2020, a second tier of lighting standards is expected to take effect and require bulbs to be 45% more efficient than today's incandescent bulbs. Although these standards to not ban the incandescent bulb, this study assume the 2020 lighting standards will shift the market accordingly so that the standard new bulb has similar efficacy to a CFL bulb. As a result, all lighting savings from 2020-2031 are modeled as CFL to LED technology.

6.3 Technical and Economic Potential Savings

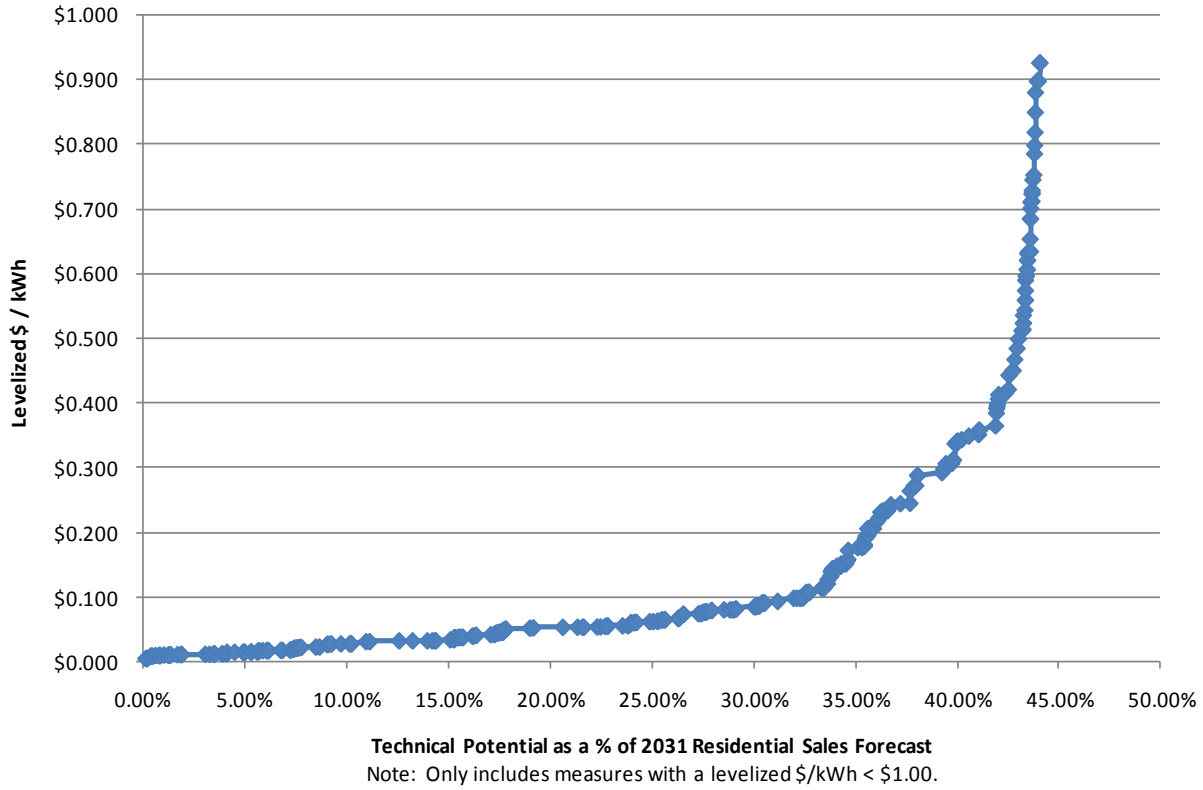
The technical potential represents the savings that could be captured if 100 percent of inefficient electric appliances and equipment were replaced instantaneously (where they are deemed to be technically feasible). As shown below in Table 6-3, total technical potential savings for the Vermont residential sector are 1,101,684 MWh, or 44.3% of forecast residential MWh sales in 2031. The technical potential for winter peak demand savings is 236 MW, or 48% of 2031 forecast winter peak demand. The potential for summer peak savings is approximately 173 MW (39% of the 2031 summer peak demand forecast).

Table 6-3: Technical Energy and Demand Potential and % Share of Residential Energy Forecast Sales and Summer/Winter Peak Demand in 2031

	Technical Potential		
End Use	**Energy (MWh)**	**Winter (MW)**	**Summer (MW)**
Water Heating	249,237	46	28
Lighting	194,547	77	18
Appliances/WH	184,557	37	28
HVAC (Equipment)	127,306	26	17
Consumer Electronics	108,524	12	11
Other	107,221	16	34
HVAC (Envelope)	79,947	8	22
Appliances	50,346	14	15
Total	**1,101,684**	**236**	**173**
% of 2031 Forecast	*44.3%*	*48.1%*	*39.0%*

Below, in Figure 6-3 presents the electric energy efficiency technical potential results for the residential sector in the form of a supply curve. The supply curve demonstrates the technical potential savings (as a % of 2031 forecast kWh sales) at varied levelized costs per lifetime kWh saved amounts. For example, roughly 32.5% savings can be achieved at a cost per lifetime kWh saved of $0.10 or less. To obtain increased electric energy from efficiency resources, it is necessary to move to the right on the curve and choose progressively more costly resources. It should be noted that the levelized costs are based on electric savings and do not factor in associated non-electric benefits, nor do they include program administrative costs.

Figure 6-3: Residential Electric Efficiency Supply Curve for Vermont



The economic potential calculations were made by incorporating the various measure assumptions (savings, cost, and useful life, etc) into the cost-effectiveness screening tool.[46] Any programmatic costs (e.g., marketing, analysis, and administration) were ignored in the economic potential analysis in order to screen whether energy efficient technologies were cost-effective on their own merit prior to any assistance or marketing endeavors from utilities or other organizations.

For the economic potential scenario, the study assumed 100% of all remaining cost-effective measures eligible for installation were installed. This produces an economic potential of 42.5% of forecast residential MWh sales in 2031. Economic winter peak demand savings are 233 MW, or 47.4% of forecast residential winter peak demand. Summer peak demand savings are approximately 173 MW, or 38.9% of the forecast residential summer peak.

Table 6.4: Economic Energy Potential and Percentage Share of Residential Forecast Energy Sales and Summer/Winter Peak Demand in 2030

[46] The cost-effectiveness of a measure is based on each measure's full savings potential, before any adjustments for interactive impacts. After identifying which measures passed screening, we made an additional adjustment for interactive effects in order to finalize estimates of overall economic potential.

	Economic Potential		
End Use	**Energy (MWh)**	**Winter (MW)**	**Summer (MW)**
Water Heating	205,432	42	29
Lighting	194,547	77	18
Appliances/WH	184,557	37	28
HVAC (Equipment)	126,756	26	16
Consumer Electronics	108,183	12	11
Other	107,221	16	34
HVAC (Envelope)	78,977	8	22
Appliances	50,346	14	15
Total	**1,056,019**	**233**	**173**
% of 2031 Forecast	*42.5%*	*47.4%*	*38.9%*

6.4 Maximum Achievable Potential Savings

The maximum achievable potential is a subset of the economic potential and is limited by various market and adoption barriers, including the assumed 50/50 split of replace-on-burnout and early retirement measures.

6.4.1 Estimating Maximum Achievable Savings in the Residential Sector

In the residential base maximum achievable scenario, achievable potential represents the attainable savings if the market penetration of high efficiency electric appliances and equipment reaches 80%-90% of the eligible market from 2012-2031. The 90% target achievable penetration was assumed for the appliances, appliances/WH, consumer electronics, HVAC (equipment) and water heating end-uses. 80% target market penetration was assumed for fuel-switching, emerging technologies, lighting, HVAC (envelope), and other end-uses[47].

The variation in target market penetration was utilized to account for increased barriers to measure adoption in certain end-uses. For example, homeowners may consider job length and personal inconvenience a greater barrier to implementation over the economics of the measure. Similarly, not all homes may have the appropriate building characteristics (orientation, shading, neighborhood codes) to be retrofitted with a solar hot water heating system (or other emerging technologies). For these reasons, this study assumed it was appropriate to assign a variable target market penetration across end-uses.

Once the total number of measures eligible to be installed over the 20-year analysis time frame was determined, one of four annual penetration curves (upward trending, bell curve, downward trending and flat) was assigned to each measure. In general, these curves were assigned based on measure cost and current market acceptance. For example, a measure with low cost or high market acceptance was assigned the downward trending curve, resulting in higher levels of penetration in early years, followed by a slow decline in incremental annual penetration during latter years. A measure with a high install cost or low market acceptance was assigned the upward trending penetration curve. Early retirement

[47] Although lighting has historically been an end-use that is able to achieve high levels of market penetration relative to other end-uses, this analysis limited the remaining potential to 80% of the remaining market. In the short term, the remaining potential is limited by the success of current lighting efforts and reduced remaining potential. In the long term, the market penetration was set at 80% to account for unknown LED bulb costs and the uncertainty of the LED lighting to be appropriate in all residential applications.

measures and new construction measures were assigned a flat penetration curve. All four curves were tailored to ensure that the full desired market penetration was reached by the end of the analysis time frame. Although this method simplifies what an adoption curve would look like in practice, it succeeds in providing a concise method for estimating achievable savings potential over a specific period of time.

Finally, the majority of savings measures possess a useful life less than the analysis time frame. For example, a clothes washer installed in 2012, with a measure life of ~12 years, might expire in 2024. In this analysis, expiring measures were reintroduced the following year. This allows the savings (and costs) to persist throughout the entire 20-year study. As noted earlier, this analysis acknowledges that measures reintroduced in later years may be impacted by future improvements to building or appliance codes and standards yet assumes that future energy and demand savings remain consistent through similar improvements to high efficiency measure standards over time.

6.4.2 Residential Maximum Achievable Savings Potential

By 2031 the total residential energy efficiency maximum achievable potential is 894,360 MWh, or 36% of forecast residential sales in 2031. The maximum achievable potential scenario also achieves 187 MW of residential winter peak savings, or 38% of the 2031 residential winter peak forecast. Summer peak savings are estimated at 140 MW, or 32% of the residential summer peak

Table 6-4: Maximum Achievable Energy and Demand Potential and % Share of Residential Forecast Energy Sales and Summer/Winter Peak Demand in 2031

	Achievable Potential		
End Use	**Energy (MWh)**	**Winter (MW)**	**Summer (MW)**
Water Heating	171,726	34	23
Appliances/WH	153,891	31	23
Lighting	125,522	59	14
HVAC (Equipment)	111,111	22	15
Consumer Electronics	96,807	11	10
Other	85,773	12	27
Appliances	85,727	10	11
HVAC (Envelope)	63,802	7	18
Total	**894,360**	**187**	**140**
% of 2031 Forecast	*36.0%*	*38.0%*	*31.7%*

Figures 6-4 and 6-5 are pie charts that show the maximum achievable potential by end-use and show the shifting flow of measure group share over time. In 2019, lighting is the dominant share (44%) of the total 2019 maximum potential. As noted earlier the section, in 2020 new federal lighting standards go into effect that are expected to effectively lead to CFL bulbs as the standard efficiency lighting technology in the U.S. The result is a significant drop-off in the potential for lighting savings in the residential. By 2031, lighting has decreased from 44% (258,360 MWh) to 14% of the total maximum achievable potential (125,522 MWH). During this time, nearly all other end-uses have increased their share of the total maximum achievable potential.

Table 6-5 through Table 6-7 depict the cumulative annual energy and demand savings, by end-use, for the residential sector. In addition to the statewide maximum achievable potential, the maximum achievable potential for the EVT and BED service territories are also included.

Figure 6-4: Residential Sector End-Use Savings as a % of 2019 Maximum Achievable Potential

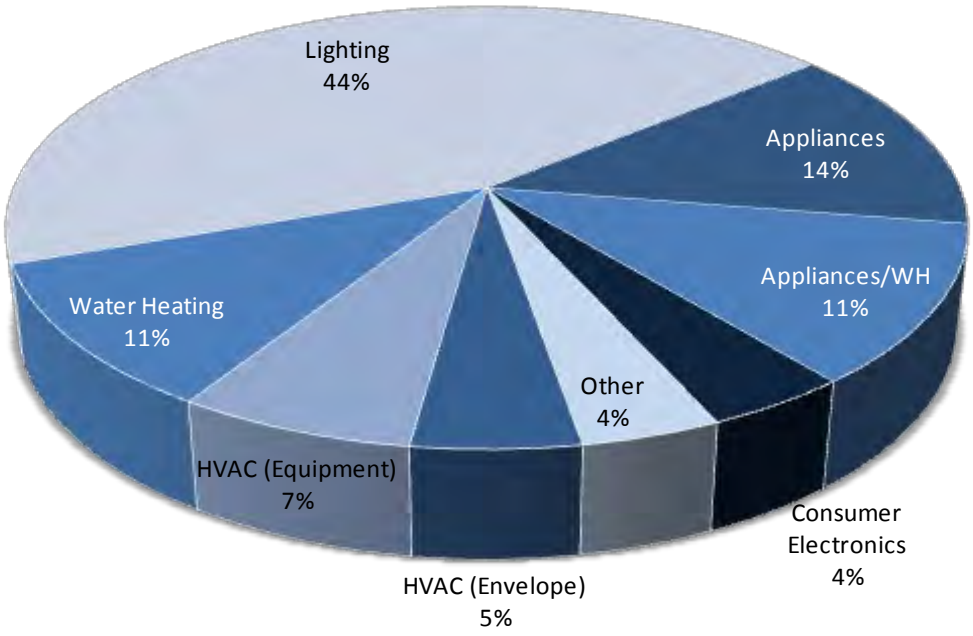


Figure 6-5: Residential Sector End-Use Savings as a % of 2031 Maximum Achievable Potential

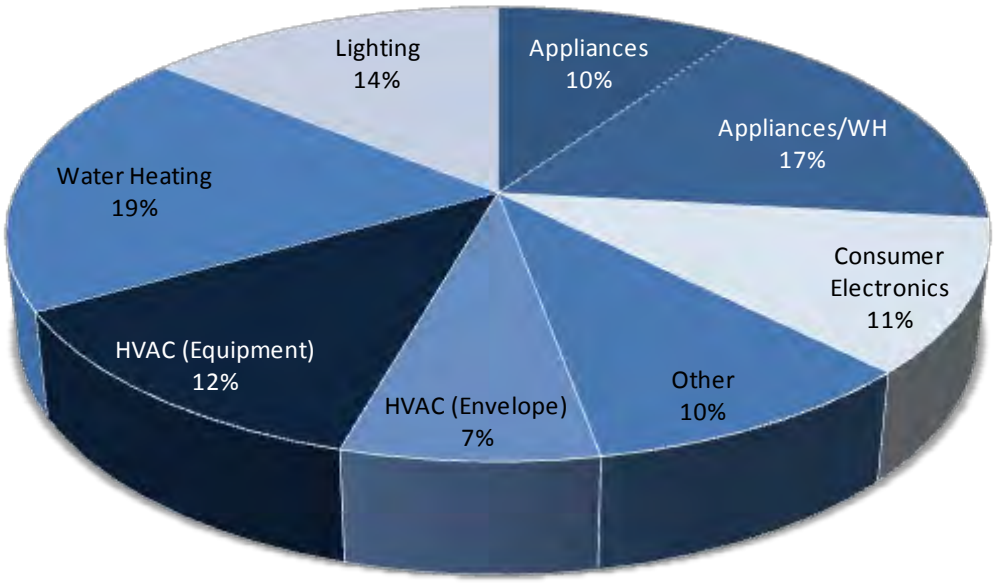


Table 6-5: Cumulative Annual Residential Energy (MWh) Savings Potential by End Use for VT (Statewide), EVT Territory, and BED Territory

Energy Savings (MWh) - Vermont (Statewide)																				
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Appliances	11,660	23,564	35,575	47,644	59,709	66,646	73,430	79,978	82,196	83,804	84,792	85,307	85,411	85,304	85,066	84,811	84,645	84,678	85,008	85,727
Appliances/WH	8,013	16,321	24,757	33,353	42,112	50,535	59,039	67,553	76,007	84,277	92,301	100,093	107,610	114,914	121,948	128,730	135,267	141,590	147,696	153,891
Consumer Electronics	2,531	5,110	7,782	10,596	13,598	16,836	20,357	24,207	28,529	33,323	38,681	44,512	50,719	57,209	63,887	70,659	77,431	84,110	90,600	96,807
HVAC (Envelope)	2,986	6,181	9,536	13,035	16,672	20,401	24,194	28,011	31,805	35,508	39,073	42,503	45,759	48,849	51,763	54,501	57,055	59,440	61,658	63,802
HVAC (Equipment)	4,538	9,252	14,009	18,868	23,903	29,007	34,252	39,669	45,274	51,023	56,939	62,988	69,126	75,312	81,505	87,661	93,698	99,627	105,409	111,111
Lighting	45,722	90,935	126,963	157,543	184,759	208,743	234,904	258,360	18,431	27,984	37,590	47,256	56,949	66,702	76,445	86,182	95,984	105,776	115,515	125,522
Other	2,557	5,165	7,802	10,533	13,409	16,457	19,734	23,275	27,190	31,449	36,131	41,175	46,498	52,045	57,727	63,471	69,203	74,864	80,370	85,773
Water Heating	6,813	13,883	21,229	28,852	36,760	44,864	53,238	61,874	70,804	79,962	89,348	98,882	108,474	118,059	127,571	136,926	146,071	154,952	163,496	171,726
Total	***84,821***	***170,409***	***247,653***	***320,424***	***390,923***	***453,490***	***519,148***	***582,926***	***380,236***	***427,329***	***474,855***	***522,715***	***570,547***	***618,394***	***665,912***	***712,941***	***759,354***	***805,036***	***849,752***	***894,360***
% of 2031 VT Sales	*3.9%*	*7.8%*	*11.4%*	*14.6%*	*17.7%*	*20.4%*	*23.2%*	*25.9%*	*16.7%*	*18.8%*	*20.7%*	*22.6%*	*24.4%*	*26.3%*	*28.0%*	*29.7%*	*31.3%*	*33.0%*	*34.5%*	*36.0%*

Energy Savings (MWh) - EVT Territory																				
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Appliances	11,133	22,500	33,970	45,496	57,020	63,678	70,189	76,473	78,592	80,126	81,064	81,546	81,635	81,520	81,281	81,025	80,842	80,853	81,148	81,823
Appliances/WH	7,648	15,578	23,628	31,829	40,189	48,226	56,341	64,466	72,534	80,423	88,076	95,508	102,677	109,641	116,349	122,816	129,026	135,033	140,835	146,736
Consumer Electronics	2,412	4,869	7,417	10,099	12,960	16,047	19,402	23,072	27,192	31,762	36,870	42,428	48,345	54,531	60,897	67,353	73,809	80,176	86,362	92,279
HVAC (Envelope)	2,845	5,887	9,080	12,410	15,868	19,413	23,020	26,645	30,249	33,766	37,149	40,403	43,491	46,425	49,193	51,792	54,218	56,480	58,584	60,623
HVAC (Equipment)	4,310	8,778	13,285	17,889	22,667	27,511	32,488	37,628	42,942	48,390	53,993	59,716	65,520	71,366	77,217	83,028	88,705	94,279	99,713	105,093
Lighting	43,546	86,614	120,953	150,116	176,097	199,008	223,991	246,405	17,640	26,761	35,932	45,156	54,403	63,707	73,001	82,287	91,608	100,918	110,179	119,711
Other	2,469	4,987	7,530	10,161	12,936	15,871	19,028	22,438	26,204	30,300	34,802	39,649	44,763	50,089	55,543	61,058	66,556	71,985	77,266	82,455
Water Heating	6,529	13,307	20,346	27,655	35,239	43,002	51,030	59,309	67,873	76,656	85,664	94,816	104,024	113,233	122,366	131,354	140,136	148,663	156,879	164,788
Total	***80,892***	***162,519***	***236,208***	***305,655***	***372,975***	***432,756***	***495,489***	***556,436***	***363,227***	***408,185***	***453,550***	***499,222***	***544,858***	***590,513***	***635,846***	***680,714***	***724,901***	***768,387***	***810,966***	***853,509***
% of 2031 EVT Sales	*3.9%*	*7.8%*	*11.3%*	*14.6%*	*17.6%*	*20.4%*	*23.2%*	*25.8%*	*16.7%*	*18.7%*	*20.6%*	*22.5%*	*24.3%*	*26.2%*	*27.9%*	*29.6%*	*31.1%*	*32.8%*	*34.3%*	*35.8%*

Energy Savings (MWh) - BED Territory																				
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Appliances	527	1,064	1,605	2,148	2,689	2,968	3,242	3,504	3,604	3,678	3,728	3,761	3,776	3,784	3,785	3,787	3,802	3,825	3,860	3,904
Appliances/WH	365	743	1,129	1,524	1,923	2,309	2,698	3,087	3,473	3,854	4,225	4,585	4,933	5,273	5,600	5,914	6,241	6,557	6,861	7,155
Consumer Electronics	119	240	365	497	638	790	954	1,134	1,337	1,561	1,811	2,084	2,374	2,678	2,990	3,306	3,622	3,934	4,238	4,528
HVAC (Envelope)	141	293	456	625	804	988	1,174	1,366	1,556	1,742	1,923	2,099	2,268	2,424	2,570	2,708	2,837	2,960	3,074	3,179
HVAC (Equipment)	228	474	724	979	1,236	1,496	1,764	2,041	2,332	2,633	2,946	3,272	3,605	3,945	4,288	4,632	4,993	5,348	5,696	6,018
Lighting	2,176	4,321	6,010	7,427	8,662	9,735	10,912	11,954	791	1,222	1,658	2,100	2,546	2,995	3,444	3,894	4,376	4,857	5,336	5,811
Other	88	178	272	372	473	586	706	837	986	1,149	1,329	1,526	1,735	1,956	2,184	2,413	2,647	2,879	3,104	3,318
Water Heating	283	576	883	1,197	1,521	1,862	2,208	2,565	2,932	3,306	3,684	4,066	4,450	4,826	5,205	5,573	5,935	6,288	6,617	6,938
Total	***3,928***	***7,890***	***11,444***	***14,769***	***17,947***	***20,733***	***23,659***	***26,490***	***17,009***	***19,144***	***21,305***	***23,493***	***25,689***	***27,881***	***30,066***	***32,227***	***34,453***	***36,649***	***38,786***	***40,851***
% of 2031 BED Sales	*4.3%*	*8.6%*	*12.4%*	*16.0%*	*19.2%*	*22.1%*	*25.1%*	*27.9%*	*17.7%*	*20.0%*	*22.1%*	*24.3%*	*26.3%*	*28.6%*	*30.7%*	*32.8%*	*34.9%*	*37.0%*	*39.1%*	*41.0%*

Table 6-6: Cumulative Annual Residential Winter Peak Demand (MW) Savings by End Use for VT (Statewide), EVT Territory, and BED Territory

Winter Peak Demand Savings (MW) - Vermont (Statewide)																				
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Appliances	1.4	2.8	4.2	5.7	7.1	7.9	8.7	9.5	9.8	10.0	10.1	10.2	10.2	10.2	10.1	10.1	10.1	10.1	10.1	10.2
Appliances/WH	1.6	3.2	4.8	6.5	8.2	9.9	11.6	13.3	14.9	16.6	18.2	19.8	21.3	22.8	24.2	25.6	27.0	28.3	29.5	30.8
Consumer Electronics	0.3	0.6	0.9	1.2	1.5	1.9	2.3	2.7	3.2	3.8	4.4	5.1	5.8	6.5	7.3	8.1	8.9	9.6	10.4	11.1
HVAC (Envelope)	0.4	0.7	1.1	1.5	1.9	2.3	2.8	3.2	3.6	4.0	4.3	4.7	5.0	5.3	5.6	5.8	6.1	6.3	6.5	6.7
HVAC (Equipment)	0.8	1.7	2.6	3.5	4.5	5.5	6.5	7.6	8.7	9.8	11.1	12.3	13.6	14.9	16.2	17.5	18.8	20.0	21.3	22.5
Lighting	15.7	31.2	43.7	54.5	64.3	73.1	82.7	91.6	9.5	13.9	18.3	22.7	27.1	31.6	36.1	40.6	45.1	49.6	54.1	58.7
Other	0.3	0.6	1.0	1.3	1.7	2.1	2.6	3.1	3.6	4.2	4.9	5.7	6.5	7.3	8.2	9.0	9.9	10.8	11.6	12.4
Water Heating	1.2	2.5	3.9	5.2	6.7	8.2	9.8	11.4	13.1	14.9	16.8	18.8	20.8	22.8	24.8	26.9	28.8	30.8	32.7	34.5
Total	***21.6***	***43.4***	***62.2***	***79.5***	***95.9***	***110.9***	***126.9***	***142.3***	***66.5***	***77.2***	***88.1***	***99.1***	***110.2***	***121.4***	***132.5***	***143.6***	***154.6***	***165.5***	***176.1***	***186.8***
% of 2031 VT Wtr Peak	*4.8%*	*9.8%*	*14.0%*	*17.9%*	*21.4%*	*24.7%*	*28.1%*	*31.4%*	*14.6%*	*16.9%*	*19.2%*	*21.4%*	*23.6%*	*25.8%*	*28.0%*	*30.1%*	*32.0%*	*34.1%*	*36.1%*	*38.0%*

Winter Peak Demand Savings (MW) - EVT Territory																				
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Appliances	1.3	2.7	4.0	5.4	6.8	7.6	8.4	9.1	9.4	9.5	9.7	9.7	9.7	9.7	9.7	9.6	9.6	9.6	9.7	9.7
Appliances/WH	1.5	3.0	4.6	6.2	7.8	9.4	11.0	12.6	14.3	15.8	17.4	18.9	20.3	21.8	23.1	24.4	25.7	26.9	28.1	29.3
Consumer Electronics	0.3	0.5	0.8	1.1	1.5	1.8	2.2	2.6	3.1	3.6	4.2	4.8	5.5	6.2	7.0	7.7	8.4	9.2	9.9	10.6
HVAC (Envelope)	0.3	0.7	1.1	1.4	1.8	2.2	2.6	3.0	3.4	3.8	4.1	4.5	4.8	5.0	5.3	5.6	5.8	6.0	6.2	6.4
HVAC (Equipment)	0.8	1.6	2.5	3.3	4.2	5.2	6.2	7.2	8.2	9.3	10.5	11.7	12.9	14.1	15.3	16.6	17.8	18.9	20.1	21.2
Lighting	14.9	29.7	41.6	51.9	61.3	69.7	78.9	87.4	9.1	13.3	17.5	21.7	25.9	30.2	34.5	38.8	43.1	47.3	51.6	56.0
Other	0.3	0.6	0.9	1.3	1.6	2.0	2.4	2.9	3.4	4.0	4.7	5.4	6.1	6.9	7.7	8.6	9.4	10.2	11.0	11.8
Water Heating	1.2	2.4	3.7	5.0	6.4	7.9	9.4	11.0	12.6	14.3	16.2	18.1	20.0	21.9	23.9	25.8	27.7	29.6	31.4	33.2
Total	***20.6***	***41.3***	***59.3***	***75.8***	***91.5***	***105.8***	***121.1***	***135.8***	***63.5***	***73.7***	***84.1***	***94.6***	***105.2***	***115.9***	***126.5***	***137.1***	***147.5***	***157.9***	***168.0***	***178.2***
% of 2031 EVT Wtr Peak	*4.7%*	*9.7%*	*13.9%*	*17.7%*	*21.2%*	*24.5%*	*27.9%*	*31.2%*	*14.5%*	*16.8%*	*19.1%*	*21.3%*	*23.4%*	*25.7%*	*27.8%*	*29.8%*	*31.8%*	*33.9%*	*35.8%*	*37.7%*

Winter Peak Demand Savings (MW) - BED Territory																				
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Appliances	0.1	0.1	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Appliances/WH	0.1	0.1	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.8	0.8	0.9	1.0	1.1	1.1	1.2	1.3	1.3	1.4	1.4
Consumer Electronics	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5
HVAC (Envelope)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
HVAC (Equipment)	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.6	0.7	0.7	0.8	0.9	0.9	1.0	1.1	1.2	1.2
Lighting	0.7	1.5	2.1	2.5	3.0	3.4	3.8	4.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.3	2.5	2.7
Other	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.6
Water Heating	0.0	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.7	0.7	0.8	0.9	1.0	1.0	1.1	1.2	1.2	1.3
Total	***1.0***	***2.0***	***2.9***	***3.7***	***4.4***	***5.1***	***5.8***	***6.5***	***3.0***	***3.5***	***4.0***	***4.5***	***5.0***	***5.5***	***6.0***	***6.5***	***7.1***	***7.6***	***8.1***	***8.6***
% of 2031 BED Wtr Peak	*6.2%*	*12.3%*	*17.5%*	*22.1%*	*26.5%*	*30.0%*	*34.2%*	*37.9%*	*17.3%*	*19.9%*	*22.5%*	*25.1%*	*28.1%*	*30.6%*	*33.3%*	*35.8%*	*38.6%*	*41.2%*	*43.7%*	*46.1%*

Table 6-7: Cumulative Annual Residential Summer Peak Demand (MW) Savings by End Use for VT (Statewide), EVT Territory, and BED Territory

Summer Peak Demand Savings (MW) - Vermont (Statewide)																				
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Appliances	1.4	2.9	4.4	5.9	7.4	8.3	9.1	9.9	10.2	10.4	10.5	10.6	10.6	10.6	10.6	10.5	10.5	10.5	10.6	10.6
Appliances/WH	1.2	2.4	3.6	4.8	6.1	7.3	8.6	9.9	11.1	12.4	13.6	14.7	15.9	17.0	18.1	19.1	20.1	21.1	22.0	22.9
Consumer Electronics	0.3	0.5	0.8	1.1	1.4	1.7	2.1	2.5	2.9	3.4	4.0	4.6	5.2	5.9	6.6	7.3	8.0	8.7	9.4	10.0
HVAC (Envelope)	0.8	1.6	2.4	3.3	4.2	5.2	6.2	7.2	8.3	9.3	10.3	11.3	12.3	13.3	14.1	15.0	15.8	16.5	17.2	17.9
HVAC (Equipment)	0.6	1.2	1.8	2.4	3.0	3.7	4.3	5.0	5.7	6.5	7.3	8.0	8.9	9.7	10.5	11.4	12.2	13.0	13.8	14.6
Lighting	4.2	8.4	11.8	14.7	17.2	19.6	22.1	24.5	1.8	2.8	3.9	5.0	6.1	7.1	8.2	9.3	10.4	11.4	12.5	13.6
Other	0.8	1.7	2.5	3.4	4.3	5.3	6.4	7.5	8.8	10.1	11.6	13.2	14.9	16.6	18.4	20.2	22.0	23.8	25.6	27.3
Water Heating	0.8	1.6	2.5	3.4	4.3	5.3	6.3	7.4	8.5	9.7	11.0	12.3	13.7	15.1	16.6	18.0	19.4	20.7	22.1	23.4
Total	***10.1***	***20.3***	***29.8***	***39.0***	***48.1***	***56.4***	***65.1***	***73.9***	***57.3***	***64.7***	***72.2***	***79.8***	***87.6***	***95.3***	***103.1***	***110.8***	***118.4***	***125.9***	***133.1***	***140.4***
% of 2031 VT Sum. Peak	*3.0%*	*5.9%*	*8.5%*	*11.0%*	*13.3%*	*15.4%*	*17.5%*	*19.5%*	*14.9%*	*16.6%*	*18.3%*	*19.9%*	*21.5%*	*23.1%*	*24.6%*	*26.1%*	*27.4%*	*28.9%*	*30.3%*	*31.7%*

Summer Peak Demand Savings (MW) - EVT Territory																				
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Appliances	1.4	2.8	4.2	5.6	7.1	7.9	8.7	9.5	9.8	9.9	10.1	10.1	10.1	10.1	10.1	10.1	10.0	10.0	10.1	10.2
Appliances/WH	1.1	2.3	3.4	4.6	5.8	7.0	8.2	9.4	10.6	11.8	12.9	14.1	15.1	16.2	17.2	18.2	19.2	20.1	21.0	21.9
Consumer Electronics	0.2	0.5	0.8	1.0	1.3	1.6	2.0	2.4	2.8	3.3	3.8	4.4	5.0	5.6	6.3	7.0	7.6	8.3	9.0	9.6
HVAC (Envelope)	0.7	1.5	2.3	3.2	4.0	5.0	5.9	6.9	7.9	8.9	9.8	10.8	11.7	12.6	13.4	14.2	15.0	15.7	16.3	17.0
HVAC (Equipment)	0.6	1.1	1.7	2.3	2.8	3.4	4.1	4.7	5.4	6.1	6.8	7.5	8.3	9.0	9.8	10.6	11.3	12.1	12.8	13.6
Lighting	4.0	8.0	11.2	14.0	16.4	18.7	21.1	23.3	1.7	2.7	3.7	4.8	5.8	6.8	7.8	8.9	9.9	10.9	11.9	13.0
Other	0.8	1.6	2.5	3.3	4.2	5.2	6.2	7.3	8.5	9.8	11.2	12.7	14.4	16.0	17.8	19.5	21.2	23.0	24.6	26.3
Water Heating	0.8	1.6	2.4	3.2	4.1	5.1	6.1	7.1	8.2	9.4	10.6	11.9	13.2	14.6	16.0	17.3	18.7	20.0	21.3	22.5
Total	***9.6***	***19.4***	***28.4***	***37.2***	***45.9***	***53.8***	***62.2***	***70.5***	***54.8***	***61.8***	***68.9***	***76.3***	***83.6***	***91.0***	***98.4***	***105.8***	***113.0***	***120.1***	***127.0***	***134.0***
% of 2031 EVT Sum. Peak	*3.0%*	*5.9%*	*8.5%*	*11.0%*	*13.3%*	*15.4%*	*17.4%*	*19.5%*	*14.9%*	*16.6%*	*18.2%*	*19.9%*	*21.4%*	*23.0%*	*24.5%*	*25.9%*	*27.2%*	*28.7%*	*30.1%*	*31.4%*

Summer Peak Demand Savings (MW) - BED Territory																				
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Appliances	0.1	0.1	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Appliances/WH	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.0	1.1
Consumer Electronics	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.5
HVAC (Envelope)	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	0.9
HVAC (Equipment)	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.8	0.9	0.9	1.0	1.1
Lighting	0.2	0.4	0.6	0.7	0.8	0.9	1.0	1.1	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6
Other	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.4	0.5	0.5	0.6	0.7	0.7	0.8	0.9	0.9	1.0
Water Heating	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.8	0.8
Total	***0.5***	***0.9***	***1.4***	***1.8***	***2.2***	***2.5***	***2.9***	***3.3***	***2.5***	***2.9***	***3.2***	***3.6***	***3.9***	***4.3***	***4.7***	***5.0***	***5.4***	***5.8***	***6.1***	***6.4***
% of 2031 BED Sum. Peak	*3.1%*	*6.2%*	*8.9%*	*11.5%*	*14.1%*	*16.3%*	*19.0%*	*21.2%*	*15.9%*	*17.8%*	*20.0%*	*22.1%*	*24.4%*	*26.2%*	*28.0%*	*29.9%*	*31.8%*	*33.6%*	*35.3%*	*37.0%*

6.4.3 Impacts of Fuel Switching in the Maximum Achievable Potential Scenario

A significant portion of the maximum achievable potential in the residential sector over the next 20 years is for conversion of residential electric water heating and/or space heating systems and electric dryers to alternative fuels. In total, approximately 21% of the residential maximum achievable potential (189, 041 MWH) is a result of fuel conversion programs, where electric end-uses are converted to fossil fuels. The largest fraction of the fuel switching savings was a result of converting electric clothes dryers to fossil fuel alternatives (114,010 MWh). An additional 52,404 MWh and 22,627 MWh were estimated from water heating and space heating system fuel switching, respectively.

In the absence of fuel conversion programs, it would be possible to shift a significant portion of the savings currently attributed to fuel-switching into currently available competing technologies. For instance solar water heating or heat pump water heaters, which save 50%-60% compared to standard efficiency electric storage tank water heater, would be eligible to receive increased participation in lieu of fuel conversion. Similarly, heat pump dryers could increasingly contribute to the total maximum achievable potential in lieu of converting electric dryers to fossil fuel.

6.4.4 Maximum Achievable Potential Benefits & Costs

For the maximum achievable potential, the 80%-90% target market penetration assumes that consumers would receive a financial incentive equal to 100% of the measure cost. For the replace on burnout approach, the incentive was 100% of the incremental cost to bridge the gap between the cost of standard efficiency equipment and high efficiency equipment. For retrofit and early retirement measures, the incentive was equal to 100% of the full measure cost.

In addition, an overall non-incentive or administrative cost per first year kWh saved was assigned to each measure in order to calculate the achievable cost-effectiveness tests. Administrative costs in 2012 were determined based on the 2007-2009 average of non-incentive costs reported by EVT in their annual report filings.[48] In all subsequent years, the administrative cost per kWh was escalated by the annual rate of inflation (2.6%).

In 2012, a cost of ~ $0.81 per kWh was used for all new construction measures based on the three-year average non-incentive costs calculated for EVT's current Residential New Construction Program. Appliances, lighting, consumer electronics, and select easy-to-install retrofit measures were assigned an administrative cost of ~ $0.04 per kWh based on the three-year average non-incentive costs calculated for the current Residential Efficient Products Program. All other measures were assigned an administrative cost per kWh of ~$0.48 based on the Residential Existing Buildings Program.

The overall benefit/cost screening results for the residential sector maximum achievable potential are shown below in Table 6-8. The net present value costs to Vermont of roughly $810.8 million dollars represent both total measure costs as well as the associated costs (i.e. marketing, labor, monitoring, etc.) of administering energy efficiency programs between 2012 and 2031. The net present value benefits of $1.58 billion represent the lifetime benefits of all measures installed during the same time period. In addition to the electric benefits received, the net present value benefit dollars include the impacts of reduced fuel consumption (or increased fuel consumption through fuel-switching efforts), water savings,

[48] Non-incentive costs refer to the Total Efficiency Vermont Costs reported by EVT net of all incentives to participants and/or trade allies. It does not include participant or other third party costs. Performance incentives and operations fees, along with evaluation budgets are additional costs to deliver programs that are not included in this calculation.

other O&M benefits, and the VT Societal Test externality benefits[49]. Although the maximum achievable potential estimates would require a substantial investment in energy efficiency over the long term, the resulting energy and demand savings would result in a net benefit of over $765 million dollars (present worth 2012).

Table 6-6: NPV ($2012) Benefits and Costs Associated with the Maximum Achievable Potential Electric Savings in the Residential Sector

	Benefits				Costs			
	Electric	Non-Electric	Non-Energy	Total Benefits	Measure	Admin	Total Costs	B/C Ratio
	(in millions)				in millions			
State-wide								
NPV $2012	$1,206.9	$343.6	$25.4	$1,575.8	$587.2	$223.5	$810.8	1.9
EVT Territory								
NPV $2012	$1,152.1	$328.4	$24.1	$1,504.6	$560.7	$214.7	$775.4	1.9
BED Territory								
NPV $2012	$54.8	$15.1	$1.3	$71.2	$26.5	$8.9	$35.4	2.0

The annual incentive and administrative cost associated with the maximum achievable potential savings are presented in greater detail in Tables 6.7 – 6.9. In total, the $2012 NPV of incentives is $707.4 million from 2012-2031. Total incentive costs are greater than the NPV measure cost recorded in the VT societal test ($587.2 million) because incentives were calculated as 100% of the measure cost whereas the VT societal test has applied a 10% reduction to energy efficiency measure costs for all calculations.

Administrative costs are $223.6 million and range annually from 20% - 31% of the total estimated annual dollars necessary to achieve the targeted maximum achievable potential. Because administrative costs are tied directly to first year kWh savings, administrative costs are sensitive to the number of measures being installed each year and are not a predetermined fraction of the total budget. Additionally, administrative budgets are expected to increase at a more rapid pace in the 2nd decade as programs are expected to see new measures being installed on an annual basis as well as the reintroduction of measures installed during the 1st decade reach the end of their original useful life.

[49] See Section 5.9.5 for a discussion of the VT Societal Test externality benefits adder.

Table 6-7: Incentive and Administrative Costs Associated with the Residential Maximum Achievable Potential (VT Statewide)

Incentive Costs - VT Statewide																					
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**NPV**
Appliances	$8,301,844	$8,380,671	$8,376,219	$8,376,891	$8,372,041	$8,324,769	$8,280,006	$8,208,074	$8,108,276	$7,958,530	$7,789,753	$7,655,432	$7,516,754	$7,433,342	$7,343,301	$7,276,145	$7,356,916	$9,825,514	$9,856,500	$9,949,430	$85,117,517
Appliances/WH	$12,367,403	$12,629,603	$12,656,719	$12,700,743	$12,733,215	$12,647,667	$12,564,035	$12,398,655	$12,149,111	$11,753,839	$11,410,727	$11,037,043	$12,803,839	$12,641,619	$19,197,699	$19,151,751	$18,959,675	$18,817,211	$18,679,035	$18,830,563	$139,055,741
Consumer Electronics	$430,250	$437,847	$453,075	$475,963	$774,333	$885,785	$1,001,151	$1,073,812	$1,444,946	$1,561,033	$1,773,218	$1,916,175	$2,394,086	$2,548,877	$2,714,973	$2,939,127	$3,361,313	$3,499,352	$3,691,842	$3,799,517	$14,193,742
HVAC (Envelope)	$17,815,806	$18,783,281	$19,253,020	$19,699,792	$20,125,046	$20,230,364	$20,284,482	$20,101,822	$19,651,479	$18,783,622	$17,679,182	$16,728,720	$15,632,191	$14,795,162	$13,866,776	$15,047,776	$14,336,668	$13,738,493	$13,151,569	$13,459,013	$187,260,591
HVAC (Equipment)	$2,901,173	$2,994,480	$3,020,529	$3,076,015	$3,159,627	$3,216,974	$3,297,104	$3,379,247	$3,490,527	$3,557,282	$4,934,785	$5,055,720	$5,102,807	$5,368,125	$5,683,691	$5,680,893	$5,638,194	$5,592,636	$6,033,423	$6,041,993	$40,071,321
Lighting	$8,932,177	$9,037,863	$7,563,962	$7,113,222	$7,085,357	$6,988,418	$7,693,758	$10,177,447	$15,368,360	$15,134,898	$16,213,669	$16,071,819	$15,874,653	$15,759,348	$15,583,123	$15,422,641	$15,397,979	$15,276,469	$15,153,174	$15,395,962	$115,487,738
Other	$1,034,617	$1,103,516	$1,176,991	$1,721,561	$1,851,533	$2,010,129	$2,649,545	$2,882,081	$3,191,476	$3,965,471	$4,831,901	$5,265,502	$6,126,798	$6,576,376	$7,029,645	$7,902,207	$8,333,129	$8,748,402	$9,570,758	$9,940,476	$36,625,778
Water Heating	$6,386,310	$6,441,559	$6,560,283	$6,745,098	$7,000,983	$7,314,033	$7,784,477	$8,209,100	$8,798,743	$9,373,780	$10,837,361	$11,325,116	$11,775,801	$12,006,202	$12,513,168	$12,440,217	$12,248,401	$11,940,807	$11,662,084	$11,191,965	$89,607,933
Total	***$58,169,580***	***$59,808,820***	***$59,060,799***	***$59,909,285***	***$61,102,136***	***$61,618,139***	***$63,554,558***	***$66,430,238***	***$72,202,918***	***$72,088,455***	***$75,470,597***	***$75,055,526***	***$77,226,928***	***$77,129,052***	***$83,932,375***	***$85,860,757***	***$85,632,274***	***$87,438,884***	***$87,798,385***	***$88,608,919***	***$707,420,361***
Administrative Costs - VT Statewide																					
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**NPV**
Appliances	$911,307	$953,440	$945,273	$954,536	$975,212	$976,145	$994,036	$1,004,736	$1,006,215	$977,497	$945,225	$920,262	$896,152	$899,130	$885,259	$884,632	$907,682	$1,757,737	$1,813,521	$1,954,948	$10,473,489
Appliances/WH	$1,393,619	$1,462,899	$1,414,437	$1,415,409	$1,450,479	$1,444,117	$1,485,755	$1,516,141	$1,528,974	$1,479,102	$1,442,142	$1,404,301	$1,785,450	$1,818,481	$3,270,506	$3,335,731	$3,293,028	$3,322,363	$3,388,802	$3,788,020	$18,392,656
Consumer Electronics	$101,868	$106,459	$113,219	$122,320	$204,692	$227,309	$288,292	$316,812	$434,437	$481,325	$545,035	$601,399	$797,528	$868,559	$947,833	$1,033,130	$1,211,828	$1,294,076	$1,429,391	$1,506,697	$4,570,485
HVAC (Envelope)	$1,544,720	$1,688,282	$1,803,195	$1,919,025	$2,041,321	$2,137,803	$2,230,328	$2,299,391	$2,344,706	$2,341,632	$2,308,578	$2,264,336	$2,204,829	$2,149,407	$2,079,324	$2,157,212	$2,086,355	$2,021,723	$1,951,717	$1,988,737	$21,008,971
HVAC (Equipment)	$2,439,923	$2,594,407	$2,659,657	$2,769,864	$2,932,324	$3,060,140	$3,218,175	$3,396,943	$3,589,716	$3,748,233	$5,607,156	$5,844,299	$6,026,731	$6,268,789	$6,503,503	$6,637,371	$6,736,247	$6,840,932	$7,857,006	$8,075,169	$41,878,685
Lighting	$5,102,627	$5,277,082	$4,746,023	$4,503,682	$4,998,106	$4,838,149	$4,983,507	$8,482,877	$5,554,430	$5,605,013	$6,109,220	$6,179,816	$6,234,686	$6,371,516	$6,471,106	$6,590,743	$6,803,905	$6,997,937	$7,172,513	$7,779,313	$59,063,850
Other	$1,149,418	$1,209,278	$1,234,497	$1,317,177	$1,411,064	$1,511,752	$1,673,926	$1,835,593	$2,047,735	$2,265,635	$3,963,547	$4,246,486	$4,505,168	$4,785,552	$5,062,491	$5,351,299	$5,629,304	$5,917,815	$6,247,357	$6,646,249	$26,843,903
Water Heating	$2,289,441	$2,445,350	$2,602,066	$2,766,547	$2,933,249	$3,099,990	$3,284,720	$3,441,458	$3,587,031	$3,730,515	$5,028,882	$5,151,864	$5,302,963	$5,535,621	$7,151,697	$7,331,017	$7,515,269	$7,679,964	$7,873,485	$8,052,503	$41,390,671
Total	***$14,932,923***	***$15,737,197***	***$15,518,367***	***$15,768,560***	***$16,946,447***	***$17,295,406***	***$18,158,739***	***$22,293,950***	***$20,093,245***	***$20,628,952***	***$25,949,786***	***$26,612,764***	***$27,753,506***	***$28,697,054***	***$32,371,720***	***$33,321,135***	***$34,183,618***	***$35,832,545***	***$37,733,792***	***$39,791,635***	***$223,622,710***

Table 6-8: Incentive and Administrative Costs Associated with the Residential Maximum Achievable Potential (EVT Territory)

Incentive Costs - EVT Territory																					
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**NPV**
Appliances	$7,901,609	$7,977,497	$7,972,906	$7,973,684	$7,971,259	$7,927,419	$7,885,220	$7,816,693	$7,721,071	$7,577,665	$7,416,580	$7,287,607	$7,155,234	$7,075,297	$6,989,498	$6,925,141	$6,990,343	$9,345,076	$9,375,149	$9,468,690	$81,024,258
Appliances/WH	$11,797,006	$12,048,778	$12,071,858	$12,113,258	$12,148,982	$12,068,130	$11,990,078	$11,832,906	$11,595,078	$11,216,078	$10,887,950	$10,530,698	$12,221,894	$12,067,714	$18,328,042	$18,284,890	$18,071,250	$17,936,038	$17,808,962	$17,971,026	$132,670,517
Consumer Electronics	$409,036	$416,287	$430,817	$452,579	$736,243	$842,089	$951,982	$1,021,110	$1,373,995	$1,484,403	$1,685,970	$1,821,929	$2,276,547	$2,423,768	$2,581,722	$2,794,682	$3,196,115	$3,327,425	$3,510,647	$3,613,004	$13,496,288
HVAC (Envelope)	$16,983,388	$17,905,535	$18,332,313	$18,757,896	$19,163,632	$19,268,612	$19,324,003	$19,136,225	$18,717,983	$17,883,640	$16,844,618	$15,930,534	$14,886,049	$14,102,531	$13,225,720	$14,334,213	$13,619,862	$13,049,543	$12,488,020	$12,827,748	$178,352,695
HVAC (Equipment)	$2,738,838	$2,827,668	$2,850,321	$2,901,606	$2,982,323	$3,034,684	$3,108,405	$3,182,846	$3,282,905	$3,340,601	$4,646,128	$4,755,011	$4,794,902	$5,041,272	$5,323,396	$5,320,220	$5,264,524	$5,221,096	$5,637,304	$5,653,048	$37,689,779
Lighting	$8,520,435	$8,621,335	$7,218,165	$6,788,780	$6,764,985	$6,671,819	$7,341,949	$9,706,082	$14,671,678	$14,444,762	$15,474,584	$15,335,786	$15,144,253	$15,033,207	$14,864,520	$14,709,615	$14,650,198	$14,534,943	$14,416,949	$14,666,919	$110,160,408
Other	$992,551	$1,058,508	$1,127,148	$1,642,909	$1,768,213	$1,917,718	$2,524,790	$2,746,800	$3,040,010	$3,775,041	$4,608,961	$5,020,307	$5,837,216	$6,262,835	$6,694,259	$7,521,240	$7,929,401	$8,323,371	$9,102,512	$9,456,139	$34,906,139
Water Heating	$6,186,286	$6,235,257	$6,358,117	$6,537,731	$6,787,374	$7,079,637	$7,542,275	$7,955,544	$8,523,251	$9,082,537	$10,514,618	$10,983,199	$11,423,366	$11,653,699	$12,116,649	$12,045,275	$11,853,395	$11,556,318	$11,295,471	$10,834,147	$86,824,308
Total	***$55,529,148***	***$57,090,865***	***$56,361,644***	***$57,168,443***	***$58,323,011***	***$58,810,108***	***$60,668,702***	***$63,398,206***	***$68,925,971***	***$68,804,728***	***$72,079,410***	***$71,665,072***	***$73,739,461***	***$73,660,322***	***$80,123,805***	***$81,935,276***	***$81,575,088***	***$83,293,810***	***$83,635,014***	***$84,490,721***	***$675,124,393***
Administrative Costs - EVT Territory																					
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**NPV**
Appliances	$877,785	$918,938	$910,860	$920,375	$942,221	$944,064	$962,160	$972,517	$973,832	$945,963	$915,123	$890,906	$867,735	$870,640	$857,458	$856,706	$863,998	$1,686,855	$1,741,363	$1,882,373	$10,109,014
Appliances/WH	$1,352,845	$1,421,544	$1,374,605	$1,376,151	$1,414,066	$1,409,774	$1,451,258	$1,480,795	$1,494,996	$1,445,797	$1,410,190	$1,373,261	$1,745,272	$1,777,958	$3,185,556	$3,250,143	$3,179,690	$3,209,643	$3,278,747	$3,679,396	$17,903,896
Consumer Electronics	$97,078	$101,454	$107,907	$116,571	$195,013	$216,555	$274,703	$301,879	$413,898	$458,558	$519,203	$572,896	$759,725	$827,368	$902,856	$984,040	$1,154,140	$1,232,432	$1,361,313	$1,434,867	$4,353,813
HVAC (Envelope)	$1,476,668	$1,613,118	$1,720,890	$1,830,866	$1,945,821	$2,037,651	$2,125,876	$2,188,661	$2,232,748	$2,228,452	$2,195,648	$2,152,488	$2,094,392	$2,045,044	$1,978,779	$2,053,095	$1,984,984	$1,922,277	$1,855,624	$1,897,986	$20,018,223
HVAC (Equipment)	$2,322,991	$2,465,532	$2,526,624	$2,631,602	$2,790,157	$2,912,038	$3,062,211	$3,231,762	$3,412,335	$3,560,485	$5,331,719	$5,553,856	$5,723,672	$5,950,449	$6,171,562	$6,296,892	$6,365,499	$6,463,340	$7,423,041	$7,648,774	$39,766,539
Lighting	$4,942,223	$5,115,753	$4,608,471	$4,380,516	$4,873,357	$4,725,289	$4,870,750	$8,258,998	$5,325,446	$5,371,902	$5,860,483	$5,926,590	$5,977,274	$6,108,113	$6,204,292	$6,317,870	$6,486,819	$6,671,840	$6,837,401	$7,435,465	$57,041,596
Other	$1,119,022	$1,177,201	$1,199,881	$1,277,803	$1,371,585	$1,466,198	$1,622,750	$1,778,980	$1,981,091	$2,191,575	$3,841,726	$4,112,463	$4,358,495	$4,624,503	$4,894,475	$5,168,792	$5,430,746	$5,708,246	$6,021,531	$6,414,426	$25,984,460
Water Heating	$2,183,023	$2,333,085	$2,480,765	$2,640,374	$2,799,111	$2,955,230	$3,133,222	$3,280,793	$3,421,482	$3,557,081	$4,823,767	$4,943,406	$5,087,060	$5,316,301	$6,816,578	$6,991,545	$7,157,682	$7,313,407	$7,502,563	$7,668,207	$39,513,919
Total	***$14,371,637***	***$15,146,626***	***$14,930,003***	***$15,174,258***	***$16,331,330***	***$16,666,800***	***$17,502,929***	***$21,494,386***	***$19,255,828***	***$19,759,813***	***$24,897,859***	***$25,525,866***	***$26,613,626***	***$27,520,375***	***$31,011,555***	***$31,919,083***	***$32,623,558***	***$34,208,040***	***$36,021,582***	***$38,061,494***	***$214,691,460***

Table 6-9: Incentive and Administrative Costs Associated with the Residential Maximum Achievable Potential (BED Territory)

Incentive Costs - BED Territory																					
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**NPV**
Appliances	$400,235	$403,174	$403,313	$403,207	$400,782	$397,350	$394,786	$391,381	$387,205	$380,865	$373,173	$367,825	$361,520	$358,045	$353,803	$351,004	$366,573	$480,438	$481,351	$480,740	$4,093,258
Appliances/WH	$570,397	$580,825	$584,861	$587,485	$584,233	$579,537	$573,957	$565,749	$554,033	$537,761	$522,777	$506,345	$581,945	$573,905	$869,657	$866,861	$888,425	$881,173	$870,073	$859,537	$6,385,224
Consumer Electronics	$21,214	$21,560	$22,258	$23,384	$38,090	$43,696	$49,169	$52,702	$70,951	$76,630	$87,248	$94,246	$117,539	$125,109	$133,251	$144,445	$165,198	$171,927	$181,195	$186,513	$697,454
HVAC (Envelope)	$832,419	$877,746	$920,708	$941,896	$961,414	$961,752	$960,479	$965,596	$933,496	$899,982	$834,564	$798,185	$746,142	$692,631	$641,056	$713,563	$716,806	$688,950	$663,549	$631,265	$8,907,896
HVAC (Equipment)	$162,335	$166,813	$170,208	$174,409	$177,305	$182,290	$188,699	$196,402	$207,623	$216,681	$288,658	$300,709	$307,905	$326,854	$360,295	$360,674	$373,670	$371,540	$396,119	$388,945	$2,381,542
Lighting	$411,742	$416,528	$345,797	$324,441	$320,372	$316,599	$351,809	$471,366	$696,682	$690,135	$739,085	$736,033	$730,400	$726,142	$718,602	$713,025	$747,781	$741,526	$736,226	$729,043	$5,327,329
Other	$42,066	$45,008	$49,843	$78,652	$83,320	$92,411	$124,755	$135,281	$151,466	$190,430	$222,940	$245,195	$289,582	$313,541	$335,386	$380,967	$403,728	$425,031	$468,246	$484,337	$1,719,639
Water Heating	$200,024	$206,302	$202,167	$207,367	$213,609	$234,397	$242,202	$253,556	$275,491	$291,243	$322,743	$341,917	$352,435	$352,503	$396,519	$394,942	$395,006	$384,489	$366,612	$357,818	$2,783,625
Total	***$2,640,432***	***$2,717,955***	***$2,699,155***	***$2,740,841***	***$2,779,125***	***$2,808,031***	***$2,885,855***	***$3,032,032***	***$3,276,947***	***$3,283,727***	***$3,391,188***	***$3,390,455***	***$3,487,467***	***$3,468,730***	***$3,808,570***	***$3,925,481***	***$4,057,187***	***$4,145,075***	***$4,163,371***	***$4,118,198***	***$32,295,968***
Administrative Costs - BED Territory																					
End-Use	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**NPV**
Appliances	$33,522	$34,502	$34,413	$34,161	$32,991	$32,081	$31,876	$32,218	$32,383	$31,534	$30,102	$29,356	$28,417	$28,490	$27,801	$27,927	$43,683	$70,882	$72,158	$72,575	$364,475
Appliances/WH	$40,774	$41,355	$39,832	$39,258	$36,412	$34,342	$34,497	$35,347	$33,978	$33,305	$31,952	$31,040	$40,177	$40,523	$84,951	$85,588	$113,338	$112,719	$110,055	$108,624	$488,760
Consumer Electronics	$4,789	$5,004	$5,312	$5,749	$9,679	$10,754	$13,590	$14,933	$20,539	$22,766	$25,832	$28,504	$37,803	$41,191	$44,977	$49,091	$57,688	$61,644	$68,078	$71,830	$216,672
HVAC (Envelope)	$68,052	$75,164	$82,305	$88,159	$95,500	$100,152	$104,451	$110,729	$111,958	$113,179	$112,930	$111,848	$110,437	$104,363	$100,545	$104,116	$101,371	$99,446	$96,093	$90,751	$990,748
HVAC (Equipment)	$116,932	$128,874	$133,033	$138,262	$142,167	$148,103	$155,964	$165,181	$177,382	$187,748	$275,437	$290,444	$303,059	$318,340	$331,941	$340,478	$370,748	$377,592	$433,966	$426,395	$2,112,146
Lighting	$160,404	$161,329	$137,552	$123,166	$124,749	$112,860	$112,757	$223,879	$228,984	$233,111	$248,737	$253,226	$257,411	$263,402	$266,815	$272,873	$317,086	$326,097	$335,113	$343,848	$2,022,254
Other	$30,395	$32,077	$34,617	$39,375	$39,479	$45,554	$51,176	$56,613	$66,644	$74,061	$121,821	$134,023	$146,673	$161,049	$168,017	$182,508	$198,558	$209,568	$225,826	$231,822	$859,443
Water Heating	$106,417	$112,265	$121,301	$126,173	$134,139	$144,760	$151,499	$160,665	$165,549	$173,434	$205,115	$208,458	$215,903	$219,320	$335,119	$339,471	$357,588	$366,557	$370,922	$384,296	$1,876,753
Total	***$561,286***	***$590,571***	***$588,364***	***$594,302***	***$615,117***	***$628,606***	***$655,810***	***$799,564***	***$837,417***	***$869,138***	***$1,051,927***	***$1,086,898***	***$1,139,880***	***$1,176,679***	***$1,360,165***	***$1,402,051***	***$1,560,060***	***$1,624,505***	***$1,712,210***	***$1,730,140***	***$8,931,250***

7 Commercial and Industrial Energy Efficiency Potential Estimates (2012 to 2031)

This section of the report presents the estimates of electric technical, economic, and maximum achievable potential for the state of Vermont as well as the EVT and BED territories separately.

Figure 7-1 and Table 7-2 below summarize the technical, economic, and maximum achievable savings potential (as a % of forecast sales) for the Vermont service area by 2031. The maximum achievable potential presented here is for a market penetration scenario which assumes the installation of efficient measures in 90% of the available commercial and industrial (C&I) market. If 90% market penetration for all cost-effective measures can be reached over the next 20 years, the maximum achievable potential for electric energy efficiency savings in the commercial and industrial sector is 641,271 MWh (approximately 11.3% of projected commercial and industrial sales in 2031). Energy efficiency measures and programs can also serve to lessen summer and winter peak demand.

Figure 7-1: 2031 Summary of C&I Energy Efficiency Potential

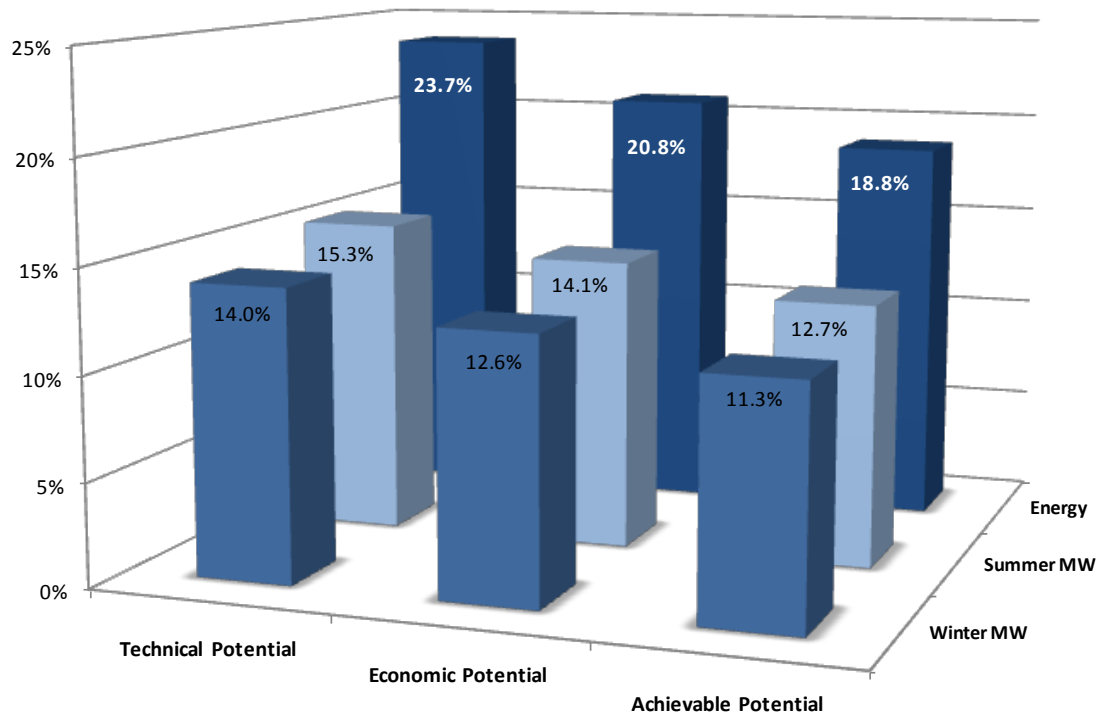


Table 6-1 also presents the separate technical, economic, and maximum achievable estimates for the EVT and BED service territories. In general the BED territory had slightly higher percentage estimates of technical, economic, and achievable potential. Of the combined 639,051 MWh of achievable potential energy savings, the BED territory achievable electric energy savings was 60,336 MWh (19.0% of 2031 BED sales). The EVT territory was estimated to have a maximum achievable potential of 578,715 MWh (18.7% of 2031 EVT territory sales).

Table 7-1: 2031 Summary of C&I Energy and Demand Savings Potential

	Energy		Demand			
	MWh	% of 2031 MWh Sales	Summer MW	% of 2031 Summer Peak	Winter MW	% of 2031 Winter Peak
State-wide						
Technical Potential	808,470	23.7%	109.3	15.3%	65.6	14.0%
Economic Potential	710,057	20.8%	100.3	14.1%	59.1	12.6%
Maximum Achievable Potential	639,051	18.8%	90.3	12.7%	53.2	11.3%
EVT Territory						
Technical Potential	731,794	23.7%	99.1	13.9%	59.6	12.7%
Economic Potential	643,016	20.8%	91.0	12.8%	53.8	11.5%
Maximum Achievable Potential	578,715	18.7%	81.9	11.5%	48.4	10.3%
BED Territory						
Technical Potential	76,676	24.1%	10.2	1.4%	6.0	1.3%
Economic Potential	67,040	21.1%	9.3	1.3%	5.3	1.1%
Maximum Achievable Potential	60,336	19.0%	8.4	1.2%	4.8	1.0%

7.1 Energy Efficiency Measures Examined

Close to one hundred fifty (150) commercial and industrial electric energy efficiency measures were included in the energy savings analysis for the C&I sector. Below, Table 7-2 provides a brief listing of the various commercial and industrial energy efficiency programs or measures considered in this analysis. The list of energy efficiency measures examined was based mainly on what was found in the Vermont TRM and what is found in other studies and field experience.

Appendix 3 provides a brief discussion of each measure or program as well as the savings, useful life, cost assumptions, and VT SCT benefit-cost ratios at the "measure" level.

Table 7-2: Measures and Programs Included in the Commercial/Industrial Sector Analysis

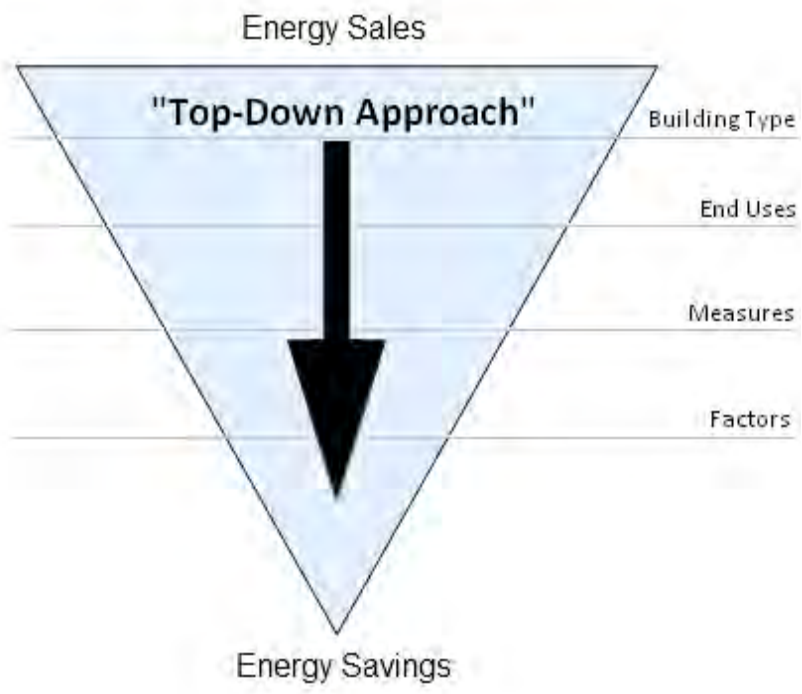
End-Use Type	Measures Included
Space Heating	*Heat Pumps (Ground Source, Water Source, High Efficiency) *HVAC Tune-up *Insulation (Wall, Ceiling, etc.) *EMS/Controls
Space Cooling	*Heat Pumps (Ground Source, Water Source, High Efficiency) *HVAC Tune-up *Economizers *High-efficiency AC and Chillers *Absorption Cooling *Demand Controlled Ventilation
Ventilation	*Ventilation Motors and VFD's *Stove Hood *Energy Recovery System *Demand Controled Ventilation
Water Heating	*Heat Pump Water Heater *Fuel Switch *Low Flow Showerhead/Faucet Aerator *High Efficiency Clothes Washers *High Efficiency Tank and Booster Water Heaters
Lighting	*LED Lighting Systems (Indoor and Outdoor) *Lighting Controls *LED Exit Signs *Refrigerated Case Lighting *High Efficiency T8 and T5 Systems
Cooking	*High Efficiency Cooking Equipment
Refrigeration	*Vending Machines/Vending Misers *Reach-In Freezers *Covers for Display Cases *Evaporator Fan Controls
Office Equipment/ Computers	*Smart Power Strips *Power Supplies *LCD Monitors
Process	*Industrial Process *Water/Wastewater Treatment Optimization
Other	*Efficient Televisions (Plasma, LCD) *Energy Star Dehumidifiers *Air Compressors

7.2 Commercial and Industrial Sector Savings Methodology Overview

In all areas of the country, the residential sector has benefited from significantly more studies done on energy conservation related issues than any other sector. Hard data for many of the inputs needed for this analysis in the commercial and industrial sectors in Vermont was unavailable. In general, the preference for data sources in this study followed the order of: data provided by the DPS, EVT, and BED, TRM data, other Vermont-specific data, region specific data, national data, and engineering estimates. In the absence of better data, estimates had to be made based on the engineers' and analysts' judgment derived from experience elsewhere and an understanding of the types of factors that may influence the saturation of a specific measure one way or the other in Vermont.

In contrast to the residential sector analysis, the commercial and industrial sector analysis was modeled using what is called a "top-down" approach. As shown in Figure 7-2, the top-down potential estimate begins with a disaggregated energy sales forecast over the 2012-2031 time period, and then estimates what percentage of these sales a given efficiency measure will save.

Figure 7-2: Commercial/Industrial Sector Methodology – Top-Down Approach



As in comparable studies, the choice of building segments is driven by the need to facilitate the analysis and modeling of potential electrical efficiency improvements. Therefore, buildings designated into selected building segments need to be reasonably similar in terms of major design and operating considerations such as building size, mechanical and electrical systems, annual operating hours, etc. In this study, the sales data are broken down by building type and end-use (see Tables 7.3 and 7.4 below) before the savings percent factor is applied. The breakdown of energy use by building type was informed by data provided by Efficiency Vermont as well as the 2009 Vermont Commercial Market Characterization Study. New construction sales are based on forecasted load growth in the commercial sector from 2012 to 2031.

Table 7-3: 2031 Sales by Industry Type

	Industry Type	MWh Sales	% of MWh Sales
1	Office	510,701	14.8%
2	Retail	550,887	16.0%
3	Other	983,893	28.5%
4	New Construction	294,003	9.4%
5	Industrial	1,028,797	30.2%
6	Street Lighting	38,252	1.1%
	Total	3,406,533	100.0%

The next step in a top-down approach is to gather data on end-use consumption for each C&I building segment. Within each building type, sales were allocated to end uses based on data available from the EIA's 2003 Commercial Building Energy Consumption Survey and 2006 Manufacturing Energy Consumption Survey. Information is given by region; therefore the data that is used in this analysis includes Vermont and surrounding states. To adjust for Vermont-specific characteristics, commercial end use shares were then adjusted to match Vermont forecasted sales for heating, cooling, and other end uses. Below, Table 7-4 shows the percent breakdown of end-use by building segment.

Table 7-4: 2031 Sales by End-Use

End-Use	MWh Sales	% of MWh Sales
Space Heating	49,212,017	1.4%
Space Cooling	233,137,607	6.8%
Ventilation	295,809,482	8.7%
Water Heating	34,662,463	1.0%
Lighting	1,149,549,210	33.8%
Cooking	13,174,600	0.4%
Refrigeration	306,072,739	8.9%
Office Equipment	60,197,432	1.8%
Computers	143,676,948	4.2%
Process	776,185,965	22.8%
Other	344,854,249	10.1%
Total	3,406,533	100.0%

The end-uses were then broken down into measure categories, explained in section 7.3. After measures were examined and saturation data was gathered, the technical, economic and achievable cases were calculated using the formula below:

$$\text{Achievable Potential of C\&I Sector} = \text{Total End-Use MWh (by segment)} * \text{Base Case Factor} * \text{Remaining Factor} * \text{Convertible Factor} * \text{Savings Factor}$$

Where:

- **Total End-Use MWh** (by market segment) is the total annual electric energy used by electric end-use in each market segment. This is the end-use electricity consumption that the efficient technology replaces or affects. For example, if the efficient measure is a CFL, the total end-use MWh is all electricity used for lighting in the specific market segment.

- **Base Case factor** is the fraction of the end-use energy that is applicable for the efficient technology in a given market segment. For example, for a high-efficiency lighting technology, this would be the fraction of the energy use that is for fluorescent lighting.

- **Remaining factor** is the fraction of applicable dwelling units or floor space that has not yet been converted to the efficient measure; (*i.e.* one minus the fraction of households or floor space that already has the energy-efficiency measure installed).

- **Convertible factor** is the fraction of the applicable dwelling units (or floor space) that is technically feasible for conversion to the efficient technology from an *engineering* perspective (e.g., it may not be possible to apply water pipe insulation in all buildings due to access difficulties).

- **Savings factor** is the percentage reduction in end-use energy consumption resulting from application of the efficient technology.

In this analysis, it was assumed that for those measures designed to impact the same end-use, the measure or program with the highest current market penetration would typically be installed first, followed by the measure(s) with the next highest market penetration. Presumably, the measures with the highest market penetrations are perceived as the most attractive based on costs, savings, or ease of implementation. Ranking the installation order in this manner also mimics the pattern of installation that is already occurring in the current market.

In instances where there were two (or more) competing technologies for the same electric end use, such as heat pump water heaters and high efficiency electric storage water heaters, a percent of the available population was assigned to each measure using the applicability factor.

Fuel-switching was analyzed in this analysis for electric water heating and dryers. These measures consist of replacement electric water and/or drying equipment in favor of natural gas, oil, or propane units. Fuel switching was treated as a competing measure to other electric efficiency options. As a result, only a fraction of the total eligible facilities were included in the fuel switch options.

The majority of measures were analyzed under both the replace-on-burnout and early retirement option. In the technical potential, 50% of the eligible remaining market was reserved for early retirement and the remaining 50% of the eligible market was analyzed through the replace-on-burnout approach. If both measures proved to be cost effective, the 50/50 split remained through the economic and achievable potential scenarios. The assumption of a 50/50 split remained through the achievable potential to allow for overall linear participation, budgets, and savings in lieu of alternate periods of program growth and contraction.

7.3 Technical and Economic Potential Savings

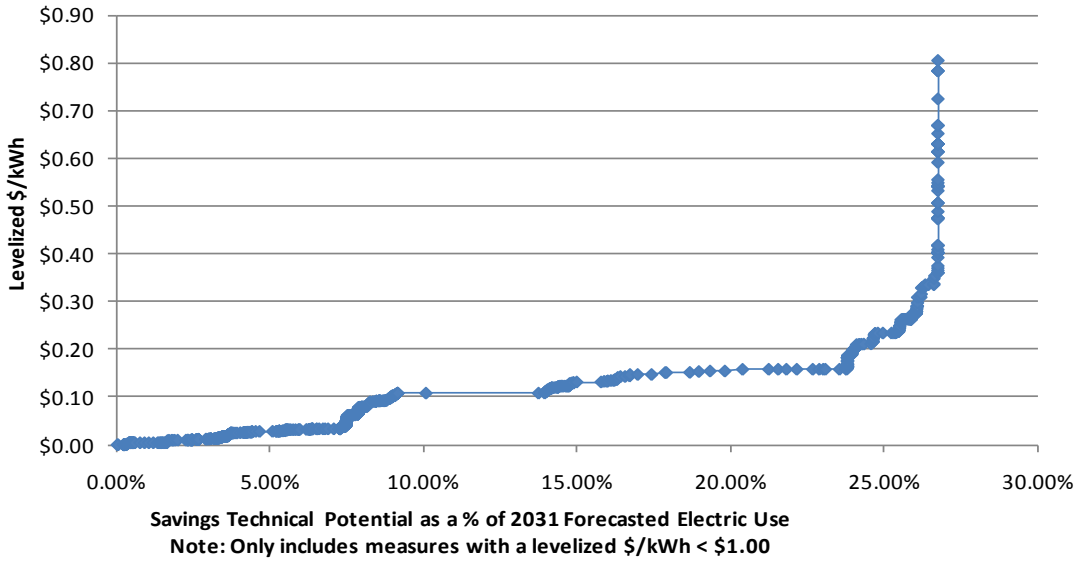
The technical potential represents the savings that could be captured if 100 percent of inefficient electric equipment were replaced instantaneously (where they are deemed to be technically feasible). As shown below in Table 7-5 the total technical potential savings for the Vermont commercial and industrial sector are 808,470 MWh, or 23.7% of forecast C&I MWh sales in 2031. The greatest share of energy savings technical potential is expected from lighting measures providing 44.2% of the technical potential savings. Industrial process measures are expected to constitute about 15.8% of the technical potential, while space cooling, refrigeration, and ventilation contribute around 10% each. The technical potential for winter peak demand savings is 236 MW, or 48% of 2031 forecast winter peak demand. The potential for summer peak savings is approximately 173 MW (39% of the 2031 summer peak demand forecast).

Table 7-5: Technical Energy and Demand Potential and Percentage Share of C&I Forecast Energy Sales and Peak Demand Savings in 2031

	Technical Potential		
	Energy (MWh)	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Space Heating	15,721	0.0	1.2
Space Cooling	65,042	22.9	0.1
Ventilation	88,481	9.4	5.3
Water Heating	8,598	0.3	0.4
Lighting	357,670	41.7	23.2
Cooking	649	0.1	0.1
Refrigeration	80,184	4.3	4.4
Office Equipment	8,585	0.2	0.2
Computers	34,825	1.5	2.0
Process	127,745	27.2	27.3
Other	20,970	1.6	1.4
TOTAL	**808,470**	**109**	**66**
% of 2031 Commercial/Industrial Sales	*23.7%*	*16.0%*	*12.7%*

Below, Figure 7-3 presents the electric energy efficiency technical potential results for the C&I sector in the form of a supply curve. The supply curve demonstrates the technical potential savings (as a % of 2031 forecast kWh sales) at varied levelized costs per lifetime kWh saved amounts. For example, more than 9% of savings can be achieved at a cost per lifetime kWh saved of $0.10 or less. To obtain increased electric energy from efficiency resources, it is necessary to move to the right on the curve and choose progressively more costly resources. It should be noted that the levelized costs are based on electric savings and do not factor in associated non-electric benefits, nor do they include program administrative costs.

Figure 7-3: Commercial/Industrial Electric Efficiency Supply Curve



The economic potential calculations were made by incorporating the various measure assumptions (savings, cost, and useful life, etc) into the cost-effectiveness screening tool.[50] Any programmatic costs (e.g., marketing, analysis, and administration) were ignored in the economic potential analysis in order to screen whether energy efficient technologies were cost-effective on their own merit prior to any assistance or marketing endeavors from utilities or other organizations.

For the economic potential scenario, the study assumed 100% of all cost-effective measures eligible for installation were installed. Cost-effectiveness was determined as all measures with a VT SCT benefit-cost ratio greater than or equal 1.0. As seen in Table 7-6 below, the economic potential, based on the result of the individual measure VT SCT tests, is 710,057 MWh, or 20.8% of forecast commercial and industrial MWh sales in 2031. Economic summer peak demand savings is 100 MW, or 14.7% of forecast commercial and industrial peak demand.

[50] The cost-effectiveness of a measure is based on each measure's full savings potential, before any adjustments for interactive impacts. After identifying which measures passed screening, we made an additional adjustment for interactive effects in order to finalize estimates of overall economic potential.

Table 7-6: Economic Energy and Demand Potential and Percentage Share of C&I Forecast Energy Sales and Peak Demand in 2031

	Economic Potential		
	Energy (MWh)	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Space Heating	14,637	0.0	1.2
Space Cooling	57,888	20.3	0.1
Ventilation	39,852	6.4	1.9
Water Heating	7,999	0.3	0.4
Lighting	343,232	39.9	21.9
Cooking	649	0.1	0.1
Refrigeration	69,696	3.6	3.7
Office Equipment	7,339	0.1	0.2
Computers	25,132	1.2	1.4
Process	127,745	27.2	27.3
Other	15,889	1.2	1.0
TOTAL	**710,057**	**100**	**59**
% of 2031 Commercial/Industrial Sales	*20.8%*	*14.7%*	*11.4%*

7.4 Maximum Achievable Potential Savings

The maximum achievable potential is a subset of the economic potential and is limited by various market and adoption barriers, including the assumed 50/50 split of replace-on-burnout and early retirement measures.

7.4.1 Estimating Achievable Savings in the Commercial & Industrial Sector

In the base case scenario, the commercial and industrial achievable potential represents the attainable savings if the market penetration of high efficiency electric equipment reaches 90% of the remaining eligible market between 2012 and 2031. The methodology for estimating energy efficiency measure adoption in the commercial and industrial sector each year from 2012 through 2031 is based on measure-specific ramping assumptions in each year. Because of the "top-down" methodology, the number of customers is difficult to determine. With new technologies, there is often low awareness of the technology among consumers and there may be a hesitancy to purchase the technology because of its newness. A program could then be designed to not only provide incentives, but to increase awareness and promote the technology's reliability. In contrast, a mature technology may already have high willingness and awareness values and, thus, the adoption curve would follow a flatter trend over time.

7.4.2 Commercial and Industrial Maximum Achievable Savings Potential

The maximum achievable potential is a subset of the economic potential and is limited by two main factors:

1) The achievable potential for this study represents the attainable savings if the market penetration of high efficiency electric equipment reaches 90% of the remaining market by the year 2031 (where measures are deemed to be technically feasible).

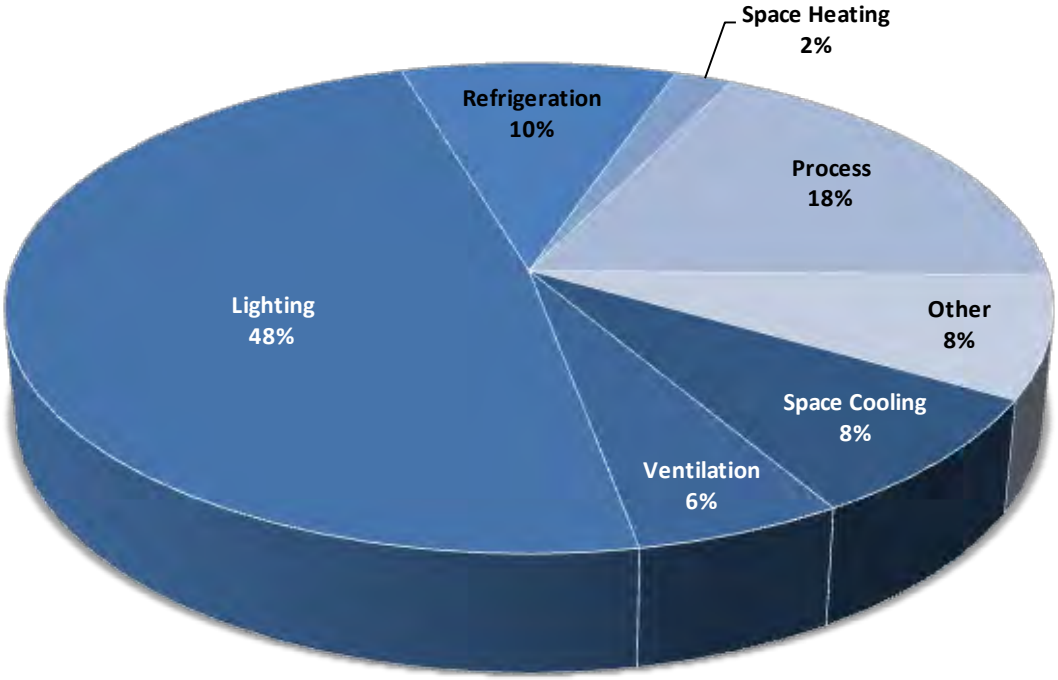
2) The 20 year program time period occasionally impacted the overall cost-effectiveness of a measure. Marginally cost-effective measures that were retained in the technical and economic potential screens (both of which assume immediate implementation) were excluded if the impacts of the discount rate, avoided costs forecast, and retail rate forecasts over the 20 year time period impacted a measure's cost-effectiveness in such a way that the 20 year costs were higher than the lifetime benefits under the VT SCT.

Table 7-7: Maximum Achievable Energy and Demand Potential and Percentage Share of Commercial and Industrial Forecast Energy Sales and Peak Demand in 2031

	Maximum Achievable Potential		
	Energy (MWh)	Summer Peak Demand (MW)	Winter Peak Demand (MW)
Space Heating	13,173	0.0	1.0
Space Cooling	52,099	18.3	0.1
Ventilation	35,867	5.7	1.8
Water Heating	7,199	0.3	0.3
Lighting	308,909	35.9	19.7
Cooking	584	0.1	0.1
Refrigeration	62,726	3.2	3.3
Office Equipment	6,605	0.1	0.1
Computers	22,619	1.1	1.2
Process	114,971	24.5	24.5
Other	14,301	1.1	0.9
TOTAL	**639,051**	**90**	**53**
% of 2031 Commercial/Industrial Sales	*18.8%*	*13.2%*	*10.3%*

For the maximum achievable scenario the achievable potential savings are 639,051 MWh or 18.8% of projected 2031 kWh sales. The base case scenario also achieves 90 MW summer peak demand savings, or 13.2% of the 2031 small and large commercial and industrial summer peak demand forecast. Figure 7-4 provides a breakdown of the electric end-use savings as a percent of the total maximum achievable energy savings potential. About 48% of the achievable cost effective savings is from high efficiency lighting, followed by processes and refrigeration. Lighting is usually the dominant end-use for achievable savings because every commercial and industrial customer has lighting, whereas only a small portion have upgraded to energy efficient systems.

Figure 7-4: Sector End-use Savings as a % of Total Achievable Potential – 2031



* "Other" category includes: Water Heating, Cooking, Office Equipment/Computers

Table 7-8 through Table 7-10 depict the cumulative annual energy and demand savings, by end-use, for the commercial/industrial sector. In addition to the statewide maximum achievable potential, the maximum achievable potential for the EVT and BED service territories are also included.

Table 7-8: Cumulative Annual C&I (MWh) Savings Potential for VT (Statewide), EVT Territory, and BED Territory

Energy Savings (MWh)																				
Territory	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
EVT Territory	28,292	58,210	89,552	122,068	155,483	189,496	223,781	257,939	291,608	324,382	355,842	386,009	414,694	442,084	468,107	492,765	516,087	538,126	558,960	578,715
BED Territory	2,986	6,139	9,437	12,853	16,358	19,919	23,503	27,067	30,574	33,982	37,246	40,372	43,341	46,173	48,865	51,416	53,831	56,116	58,280	60,336
VT Statewide	*31,278*	*64,349*	*98,989*	*134,922*	*171,841*	*209,415*	*247,284*	*285,006*	*322,182*	*358,364*	*393,088*	*426,381*	*458,035*	*488,257*	*516,971*	*544,181*	*569,919*	*594,243*	*617,240*	*639,051*

Table 7-9: Cumulative Annual C&I Winter Peak Demand (MW) Savings Potential for VT (Statewide), EVT Territory, and BED Territory

Winter Peak Demand Savings (MW)																				
Territory	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
EVT Territory	2.2	4.6	7.1	9.7	12.4	15.2	18.0	20.9	23.8	26.6	29.3	32.0	34.5	36.9	39.2	41.4	43.4	45.3	47.1	48.4
BED Territory	0.2	0.5	0.7	1.0	1.2	1.5	1.8	2.1	2.4	2.7	2.9	3.2	3.4	3.7	3.9	4.1	4.3	4.5	4.7	4.8
VT Statewide	*2.4*	*5.0*	*7.8*	*10.6*	*13.6*	*16.7*	*19.9*	*23.0*	*26.2*	*29.3*	*32.3*	*35.2*	*37.9*	*40.6*	*43.1*	*45.5*	*47.7*	*49.8*	*51.7*	*53.2*

Table 7-10: Cumulative Annual C&I Summer Peak Demand (MW) Savings Potential for VT (Statewide), EVT Territory, and BED Territory

Summer Peak Demand Savings (MW)																				
Territory	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
EVT Territory	3.6	7.5	11.5	15.8	20.2	24.7	29.4	34.0	38.6	43.2	47.7	52.0	56.1	60.1	63.9	67.5	70.9	74.1	77.1	81.9
BED Territory	0.4	0.8	1.2	1.6	2.1	2.5	3.0	3.5	4.0	4.4	4.9	5.3	5.7	6.1	6.5	6.9	7.2	7.5	7.9	8.4
VT Statewide	*4.0*	*8.2*	*12.7*	*17.4*	*22.3*	*27.3*	*32.4*	*37.5*	*42.6*	*47.6*	*52.5*	*57.3*	*61.8*	*66.2*	*70.4*	*74.3*	*78.1*	*81.6*	*84.9*	*90.3*

7.4.3 Maximum Achievable Potential Benefits & Costs

For the maximum achievable potential, the 80%-90% target market penetration assumes that consumers would receive a financial incentive equal to 100% of the measure cost. For the replace on burnout approach, the incentive was 100% of the incremental cost to bridge the gap between the cost of standard efficiency equipment and high efficiency equipment. For retrofit and early retirement measures, the incentive was equal to 100% of the full measure cost.

In addition, an overall non-incentive or administrative cost per first year kWh saved was assigned to each measure in order to calculate the achievable cost-effectiveness tests. Administrative costs in 2012 were determined based on the 2007-2009 average of non-incentive costs reported by EVT in their annual report filings.[51] In all subsequent years, the administrative cost per kWh was escalated by the annual rate of inflation (2.6%).

In 2012, a cost of ~ $0.15 per kWh was used for all new construction measures based on the three-year average non-incentive costs calculated for EVT's current Business New Construction Program. All other measures were assigned an administrative cost per kWh of ~$0.20 based on the Business Existing Buildings Program.

The overall benefit/cost screening results for the commercial and industrial sector maximum achievable potential are shown below in Table 7-11. The net present value costs of roughly $222.4 million dollars represent total measure costs as well as the associated costs (i.e. marketing, labor, monitoring, etc.) of administering energy efficiency programs and participant costs between 2012 and 2031. The net present value benefits of $744.0 million represent the lifetime benefits of all measures installed during the same time period. In addition to the electric benefits received, the net present value benefit dollars include the impacts of reduced fuel consumption, water savings, and other O&M benefits. Although the maximum achievable potential estimates would require a substantial investment in energy efficiency over the long term, the resulting energy and demand savings would result in a net savings of over $521.5 million dollars (present worth 2012).

Table 7-11: Overall Commercial and Industrial Sector Cost Effectiveness Screening Results
(dollars in millions)

	Benefits				Costs			
	Electric	Non-Electric	Non-Energy	Total Benefits	Measure	Admin	Total Costs	B/C Ratio
	(in millions)				in millions			
State-wide								
NPV $2012	$730.4	$2.9	$10.6	$743.9	$115.1	$107.3	$222.4	3.3
EVT Territory								
NPV $2012	$661.9	$2.6	$9.6	$674.1	$103.9	$97.1	$201.0	3.4
BED Territory								
NPV $2012	$68.5	$0.3	$1.0	$69.8	$11.2	$10.2	$21.4	3.3

The annual incentive and administrative cost associated with the maximum achievable potential savings are presented in greater detail in Table 7-12. In total, the $2012 NPV of incentives is $132.3 million from 2012-2031. Total incentive costs are greater than the NPV measure cost recorded in the VT

[51] Non-incentive costs refer to the Total Efficiency Vermont Costs reported by EVT net of all incentives to participants and/or trade allies. It does not include participant or other third party costs.

societal test ($115.1 million) because incentives were calculated as 100% of the measure cost whereas the VT societal test has applied a 10% reduction to energy efficiency measure costs for all calculations.

Administrative costs are $107.3 million and range annually from 37% - 53% of the total estimated annual dollars necessary to achieve the targeted maximum achievable potential. Because administrative costs are tied directly to first year kWh savings, administrative costs are sensitive to the number of measures being installed each year and are not a predetermined fraction of the total budget. Additionally, administrative budgets are expected to increase at a more rapid pace in the 2nd decade as programs are expected to see new measures being installed on an annual basis as well as the reintroduction of measures installed during the 1st decade reach the end of their original useful life.

Table 7-12: Incentive and Administrative Costs Associated with the Commercial and Industrial Maximum Achievable Potential

Incentive Costs																					
Territory	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**NPV**
EVT Territory	$9,230,886	$9,662,269	$10,021,893	$10,305,368	$10,641,126	$10,951,338	$10,994,858	$10,962,088	$10,933,668	$10,743,159	$11,764,376	$11,708,218	$12,881,604	$12,787,809	$13,180,561	$16,842,337	$16,957,131	$16,839,336	$17,006,643	$16,754,695	$119,436,916
BED Territory	$997,117	$1,043,178	$1,081,357	$1,111,229	$1,146,761	$1,179,530	$1,183,389	$1,179,082	$1,175,336	$1,154,112	$1,262,158	$1,255,681	$1,385,168	$1,375,036	$1,413,120	$1,810,374	$1,822,706	$1,809,889	$1,828,100	$1,800,874	$12,855,350
VT Statewide	***$10,228,003***	***$10,705,447***	***$11,103,249***	***$11,416,597***	***$11,787,886***	***$12,130,868***	***$12,178,246***	***$12,141,170***	***$12,109,004***	***$11,897,270***	***$13,026,534***	***$12,963,900***	***$14,266,772***	***$14,162,845***	***$14,593,680***	***$18,652,711***	***$18,779,837***	***$18,649,225***	***$18,834,743***	***$18,555,568***	***$132,292,266***
Administrative Costs																					
Territory	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**NPV**
EVT Territory	$5,527,750	$6,006,339	$6,463,628	$6,893,835	$7,535,183	$8,040,467	$8,406,226	$8,678,402	$9,144,040	$9,334,448	$10,411,554	$10,570,686	$11,571,032	$11,741,223	$13,008,534	$16,762,271	$17,539,905	$17,878,609	$18,546,768	$18,764,178	$97,116,209
BED Territory	$582,917	$632,519	$679,629	$723,719	$790,704	$842,957	$880,171	$907,530	$956,155	$975,263	$1,089,716	$1,106,235	$1,211,249	$1,229,400	$1,347,651	$1,753,024	$1,835,514	$1,870,591	$1,941,667	$1,964,028	$10,172,915
VT Statewide	***$6,110,668***	***$6,638,858***	***$7,143,257***	***$7,617,554***	***$8,325,887***	***$8,883,424***	***$9,286,397***	***$9,585,932***	***$10,100,196***	***$10,309,711***	***$11,501,270***	***$11,676,922***	***$12,782,280***	***$12,970,622***	***$14,356,185***	***$18,515,296***	***$19,375,419***	***$19,749,200***	***$20,488,435***	***$20,728,206***	***$107,289,124***

8 Overall Conclusions and Recommendations

In summary, the potential for electric energy efficiency in Vermont by 2031 is significant. The estimated maximum achievable potential electricity savings would amount to 1,533,411 MWh a year (a 26% reduction in projected 2031 MWh sales). Energy efficiency resources can also serve to reduce the overall winter peak over the same time period by 240 MW, or 23.7% of the forecasted 2031 winter peak. Achievable summer peak savings are 256.8 MW, or 20.5% of the summer peak. Table 8-1 below summarizes the electricity savings potential in Vermont by 2031.

Table 8-1: Maximum Achievable Potential Summary

	Cumulative Annual MWh Savings 2031	Cumulative Winter MW Savings 2031	Cumulative Summer MW Savings	NPV Benefits $2012	NPV Costs $2012	VT Societal B/C Ratio
				$ in millions		
Residential Sector	894,360	186.8	140.4	$1,576	$811	1.9
Commercial/Industrial Sector	639,051	53.2	90.3	$744	$222	3.3
All Sectors Combined	***1,533,411***	***240.0***	***230.7***	***$2,320***	***$1,033***	***2.2***

The results of this study demonstrate that cost effective electric energy efficiency resources can play an expanded role in Vermont's energy resource mix over the next two decades. Table 8-1 also displays the present value of benefits and costs associated with implementing the maximum achievable potential energy savings in Vermont as well as the overall VT Societal Test benefit/cost ratio of 2.2. The potential net present savings to ratepayers in Vermont for implementation of cost effective electric energy efficiency programs over the next 20 years are approximately $1.287 billion in 2012 dollars.

8.1 Differences between the 2011 and 2006 Vermont Electric Energy Efficiency Potential Studies

Overall the estimates for maximum achievable electric energy efficiency potential in this study are greater than those reported in 2006.

Table 8-2: Differences between 2011 and 2006 VT Electric Energy Efficiency Potential Studies

	2006 Study		2011 Study	
	MWh	%	MWh	%
Max. Achievable Potential	1,286,824	19.4%	1,533,411	26.0%

Although there are numerous similarities between the two studies, there are also specific differences that were critical to the higher estimates of potential found in Table 8-2. Some of these differences include:

- The 2011 study included numerous additional measures compared to the 2006 study. For example, consumer electronics are treated as a comprehensive end use in the residential sector in the 2011 analysis yet were relatively absent in the 2006 study.
- Emerging technologies were included in greater detail in the 2011 analysis and included behavioral based energy conservation measures.
- The 2011 study targeted up to 90% of the remaining potential; the 2006 study targeted a cap of 80% of the total market. In 2006 a measure with that was already 40% energy efficient could only capture an additional 40% of the market, whereas in the 2011 the maximum achievable potential was 90% of the remaining market.

- Avoided costs have changed over time. As a result, there may some additional cost effective measures in 2011 that were not found to pass the VT Societal benefit-cost test in 2006.
- The 2011 study places greater emphasis on an early replacement programmatic strategy and includes many more energy efficiency measures for the new construction market.
- The 2011 study assumes an incentive level for energy efficiency measures of 100% of measure cost. The 2006 study selected a target incentive level of 50% of energy efficiency measure cost. The greater incentive level in 2011 should allow for higher market penetration over the long term.

8.2 Concluding Thoughts

It is clear that electric energy efficiency programs could save residents of Vermont a substantial amount of electricity by 2031. The electric energy efficiency potential estimates and the VT Societal Test savings provided in this report are based upon the 2011 planning load forecast provided by VELCO as well as appliance saturation data, data on energy efficiency measure costs and savings, and measure lives available at the time of this study. Over time, additional technologies are likely to become available in the market that may serve to increase the potential for energy and demand savings and warrant additional attention.

Finally, actual energy and demand savings will depend upon the level and degree of Vermont residences and business participation in the DSM programs offered by EVT and BED. In addition, the estimated savings and budgets are based upon a current forecast of unconstrained budgets amounts for DSM programs over the 20 year period of 2012-2031. Actual budget amounts are subject to annual review and approval by the Vermont Public Service Board. Therefore, while the figures presented in this report represent the best current estimates of savings and costs, actual results will be different.