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Fueling Vermont's Future

Comprehensive Energy Plan and Greenhouse Gas Action Plan

Pursuant to 30 V.S.A. §202b

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CHAPTER 1 - INTRODUCTION

The earth belongs to the living, not to the dead. The will and power of man aspire with his life, by nature's law. . . The generations of men may be considered as bodies or corporations. Each generation has the usufruct of the earth during the period of its continuance. When it ceases to exist, the usufruct passes on the succeeding generation, free and unencumbered, and so on, successively, from one generation to another forever. We may consider each generation a distinct nation, with a right, by the will of its majority, to bind themselves, but none to bind the succeeding generation, more than the inhabitants of another country.

letter of Thomas Jefferson to John W. Eppes, June 24, 1813

. . .now, rather than distributing the wealth of the present, we are stealing the wealth of the future. . .

Paul Hawken, *The Ecology of Commerce*, 1994, 5

Include tomorrow's child in every decision you make.

Ray Anderson, Co-Chair of the President's Council on Economic Development

From the time of Thomas Jefferson, individuals in both public and private life have been creating visions and agendas to guide decision-makers as they address issues related to business and economic activity, the environment, energy and other natural resources. Jefferson uses the authority of natural law to support his belief that each generation is entitled to use a portion of the earth's resources for a limited time, while no generation has authority to bind or encumber these natural resources for future generations who are similarly entitled during their respective lives. Hawken's timely comment on recent generations' excessive use of resources and the legacy of environmental damage and depletion we are leaving is alarming. At a public forum sponsored by the Partnership of Environmental Technology and Science, Inc. (POETS), Ray Anderson offered a vision for a restorative economy that includes future generations in current decisions and integrates the environment and the economy. With new environmental technologies and serious, creative effort, commerce and human activities can be re-designed to end waste and emissions so that nothing is made that requires future vigilance or government regulation.

This Plan, *Fueling Vermont's Future: Comprehensive Energy Plan and Greenhouse Gas Action Plan*, lays out a vision for meeting Vermont's energy needs in a manner that draws on new technologies, renewable resources, sustainable development, and increased energy efficiency gains. This Plan is an update and revision of previous Department of Public Service (DPS) efforts. In 1989, Governor Madeleine Kunin first called for a comprehensive review of all forms of energy used in Vermont and a plan to modify that energy use to improve environmental quality, affordability, and renewability. The 1991 *Vermont Comprehensive Energy Plan*, the first Vermont plan to address all forms of energy use, was the outcome of that mandate. The Vermont Legislature subsequently established the requirement for a periodically updated state energy plan (30 V.S.A. §202b). Preparing for Vermont's energy needs is closely related to efforts to control Vermont's greenhouse gas emissions, which come primarily from energy use. This document also serves as the state's *Greenhouse Gas Action Plan*, presenting policies that can reduce greenhouse gas emissions from energy related and non-energy related source categories. (Estimates of Vermont's 1990 greenhouse gas emissions were prepared in 1994 in accordance with the EPA *States Workbook*.) Policies in this Plan that are assessed using computer modeling are evaluated on the basis of their impact on sustainability, energy efficiency, security, economic vitality, and environmental soundness. Policies that promote capturing

methane emissions from landfills and farm waste are, despite their small energy impacts, particularly important in reducing non-energy related emissions.

What is *Fueling Vermont's Future* All About?

This is a resource document for citizens and policy makers. Volumes 1 and 2 of this Plan both follow the organization described below. Volume 1 is a summarized version, with selected tables and figures. In Volume 1, Chapter 4, specific recommendations follow most of the policies. Volume 2 is unabridged, it includes a full set of tables and figures, although Chapter 4 does not have numbered recommendations as appear in Volume 1. Chapter 5, discussion of a set of policies called the "composite case," appears only in Volume 2, and Appendices 2 - 5 appear only in Volume 2. Both volumes include references and an index.

Chapter 2 - Energy Use and Human Well-Being: Energy Goals for Vermont's Future focuses on defining and discussing the nine energy goals that are part of Vermont's state energy policy. State policy provides that energy supply and energy use should be safe, adequate, reliable, secure, sustainable, environmentally sound, efficient, and affordable, and should support economic vitality.

Chapter 3 - Vermont's Energy Use: Past, Present, and Future is divided into three major sections:

Section I. HISTORY AND BACKGROUND begins with a history of Vermont's energy use, tracing the major changes in fuel sources and uses from the time of the Native Americans to the present. Next, recent energy planning efforts and legislation on the international, national, and state levels are outlined, and the state's role in energy planning is described.

Section II. CURRENT ENERGY USE describes and graphically illustrates Vermont's recent and current energy use. Energy use is analyzed among sectors, end uses, and fuel sources, with use among fuel sources receiving the most extensive analysis. Each fuel source used in Vermont is considered individually, with accompanying descriptions of future trends and issues associated with the fuel. The state's electricity use is discussed by considering electricity as a single fuel and also by investigating the individual fuels that provide electric power. The section ends with an exploration of energy sources and technologies that are not extensively used now, but are likely to be used more in the future.

Section III. FUTURE ENERGY USE presents a base case forecast for energy use in Vermont through 2015 (although the forecast was modeled through 2020). This base case forecast represents a "business as usual" scenario, assuming that current trends continue and no changes occur in state and national energy policy. The primary purpose of the base case forecast is to serve as a comparison for impacts of various policies examined in Chapters 4 and 5, although it also illustrates well the 20 year impact of current trends. Economic, demographic, and energy use projections for Vermont are presented in this section.

Chapter 4 - Energy Options for Vermont: Policy Analyses is the heart of the Plan, focusing on specific policies that meet all or some of the state's energy and environmental goals. The analysis of many policies relies on a forecast model that projects the impacts of the policies through 2020. In Volume 1, most policies have recommended actions. In Volume 2, each modeled policy is presented with several tables and graphs that show its impacts in contrast to the base case forecast.

Chapter 4 is divided into five major policy sections:

Section I. ENERGY SOURCES AND SUPPLY outlines policies regarding wood, wind, solar, hydroelectric, and methane energy sources, as well as traditional fuel sources. In addition, policies are

proposed that are related to the production and distribution of energy, competition in the electric industry, and using energy taxation to meet Vermont's energy goals.

Section II. TRANSPORTATION proposes policies that would implement least cost planning for transportation, increase the efficiency of vehicles, reduce vehicle miles traveled, reduce transportation-related emissions, and internalize the costs of transportation more fully through transportation energy taxation.

Section III. BUILDINGS AND EQUIPMENT contains the policies that seek to improve energy use in both new and existing homes, commercial buildings, and industrial facilities.

Section IV. AFFORDABILITY focuses on policies that can make energy use more efficient in low income housing. Affordability issues for all consumers are explored in other sections of the Plan as well, including the transportation section and the taxation subsections. A policy in this section proposes establishing a statewide affordability program to take effect when Vermont initiates retail competition.

Section V. GOVERNMENT ENERGY USE AND ENERGY POLICY proposes policies to improve government's energy use in buildings, equipment, and vehicles; government energy planning; and public education and information about energy use.

Chapter 5 - Charting Vermont's Energy Future: The Composite Policy Case (Volume 2 only) presents a scenario for energy use in Vermont through 2020, using a set of policies selected from the inventory modeled in Chapter 4. Policies in the composite case are modeled as though they were implemented together to illustrate their combined impacts. Impacts of this composite policy case are described, graphically illustrated, and compared to impacts of the base case scenario. In conclusion, a few areas are identified that can produce the greatest impacts toward meeting our energy and environmental goals:

- Improving transportation energy use;
- Internalizing energy costs and improving economic efficiency; and
- Increasing the use of renewable energy sources.

Highlights from Research and Policy Modeling

- Dynamic impact modeling of a set of selected policies (the composite policy case) shows that compared to the "business as usual" base case forecast, total energy use could decrease 16.2% and renewable energy use could increase 38.7% cumulatively through 2020, while greenhouse gas emissions could decrease by 53.3 million CO₂ equivalent tons or 21.4%. In addition, employment could improve by 100,000 job-years or 1.0% cumulatively through 2020 compared to the base case. (See Chapter 3 for a discussion of the base case and Chapter 5 for a full discussion of the composite policy case.)
 - Transportation is the largest energy end use in Vermont, accounting for about 44% of our total energy use in 1995. The transportation sector offers the single greatest opportunity for energy savings, reduced emissions, and decreased reliance on oil. Under the composite policy case, transportation energy use could be cut by 29.8% cumulatively through 2020 compared to the base case projections.
 - The marketplace operates inefficiently in one critical aspect with regard to energy prices. Many energy costs are not reflected in energy prices, resulting in inefficient choices by consumers. Projections for future energy use suggest that between 1997 and 2020 at least \$19.5 billion in costs to society due to emissions from energy use will not be included in the price of energy in Vermont.
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(The value for air emissions costs through 2020 was developed as part of the base case forecast.) Energy costs that are more fully reflected in energy prices can make our energy use more efficient and ensure that polluters pay their fair share.

- Opportunities to replace non-renewable energy sources with renewable sources should not be missed. This is especially true when new energy sources are needed as a result of increased demand, or when old power plants are retired. Expiration of Vermont Yankee nuclear station's license in 2012 offers a rare opportunity to substantially increase our use of renewables and avoid increasing greenhouse gas emission levels.
- With implementation of policies selected for the composite case, cumulative acid rain precursors and ground level ozone precursors could be significantly reduced (by 24.1% and 29.9% respectively) through 2020 compared to base case projections.
- Greenhouse gas emissions in the state are projected to grow significantly over 1990 levels. Strong policies at the state, national, and international levels are needed if we are to control these emissions. The projected average annual growth rate for greenhouse gases between 1995-2020 can be reduced from 1.65% under the base case to 0.48% under the composite policy case.

Appendices with Supporting Information

- Appendix 1. Abbreviations list and glossary.
 - Appendix 2. Summary of selected Vermont statutes related to energy planning efforts
 - Appendix 3. Energy information available to the public from Vermont Department of Public Service
 - Appendix 4. Energy planning by state agencies, Regional Planning Commissions and towns
 - Appendix 5. Detailed data tables for modeled policies in Chapters 4 and 5
 - Appendix 6. Vermont greenhouse gas emissions from non-energy and energy sources
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