

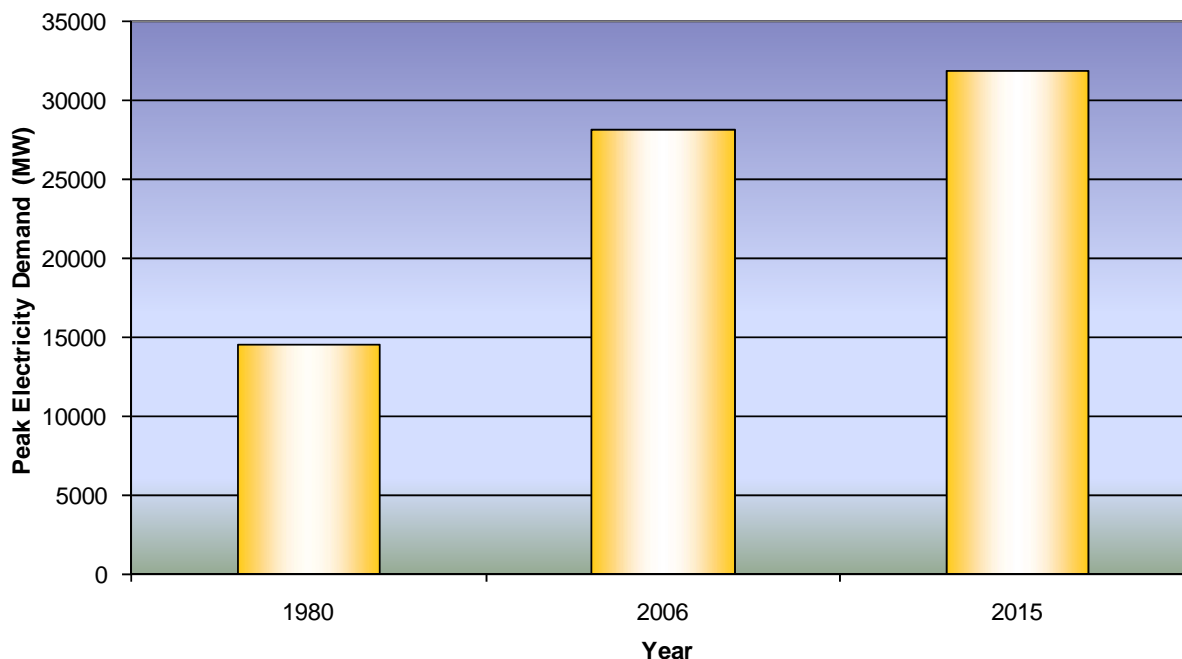
4 Industry Dynamics

VELCO's obligation to create this plan, and its underlying technical analysis, is founded in its responsibility for electric reliability planning for the state's transmission system. Although this is a technical task that uses a specific planning methodology discussed in section 2 above, transmission planning takes place in a larger context of industry, economic, environmental and social issues that will influence decision-making. This section describes the larger context and, where appropriate, touches on its potential implications for transmission and alternatives. Among the contextual issues are:

- **Carbon dioxide regulations** – Several countries and states have enacted or are enacting limits on the total amount of carbon dioxide that may be emitted annually. Many states in the northeastern US (including Vermont) have begun a mandatory, market-based effort, called RGGI (Regional Greenhouse Gas Initiative), to reduce greenhouse gas emissions. Most analysts are expecting the United States to enact federal limits sometime in the next decade. These limits could financially disadvantage higher carbon emission plants such as coal compared to non-emitting sources such as nuclear or renewable energy resources.
- **Electric demand growth** – Electric demand has been increasing not only because of population and economic growth but also because of other factors such as increased use of air conditioning and high consumption electric devices, including plasma TVs and large refrigerators. Another unknown is the potential increased demand associated with commercialization of plug-in hybrid cars. It is not yet known how recent economic trends will affect demand. New infrastructure (transmission and generation) will likely be needed if electric demand continues to increase.
- **Fossil fuel costs** – Fossil fuel costs are volatile, especially natural gas. Prices have increased three to as much as ten times what they were in the 1990s.
- **Renewable portfolio standards (RPS)** – Many states, including most in New England, are enacting or have enacted renewable portfolio requirements. These requirements typically mandate that a certain percentage of a utility's generation capacity be from renewable energy sources such as solar, wind and biomass. The transmission system may need to be reinforced to accommodate this additional generation, depending on its size and location.
- **"Smart" technology investments** – New technologies are becoming commercially available to better operate the power system, and provide customers with more information about their power usage, potentially leading to greater energy efficiency and demand reductions.

These and other factors impact the way utilities look at meeting growing customer demand. The power system must be designed to reliably and affordably serve the electric demand, especially the peak usage forecasted for current and future years. The demand for electricity at peak periods of usage has been growing in New England and is projected to continue to grow for the foreseeable future. In fact, the peak demand in 2006 was nearly twice the peak demand of 1980.

Figure 4-1. New England’s peak electric consumption has nearly doubled since 1980 and is projected to grow to 32,000 to 34,000 MW by 2015 (source: ISO-NE).



Between 1980 and 2006 the population in New England increased from 14.5 million to 28.1 million and is expected to grow to nearly 32 million by 2015. By 2015 New England’s peak electric demand per person is expected to be about 80 percent higher than what it was in 1980. This growth in peak demand per person is being driven by several factors such as economic growth and increased use of electric intensive appliances.

4.1 Demand and Usage Reduction

Reducing electric demand, especially during peak periods of usage, and reducing total electric usage are areas of increasing focus for utilities. Power systems must be designed to handle the maximum consumption (called the “peak demand”) by customers. By reducing the growth in peak demand, investments in new electric facilities such as power plants, transmission and distribution may be deferred.

State energy policy, rising fossil fuel prices and more cost effective, state-of-the-art technologies are spurring customers to monitor and control their energy consumption, and considerable investments are being made to develop and implement demand reducing techniques. Vermont is a leader in the design and delivery of energy-efficiency, or demand-side management programs to its customers. In fact, according to DPS, Vermont’s demand reduction programs have lowered electric consumption by 460 giga-watt hours (GWh). This figure represents an eight percent reduction in electric use and is nearly the

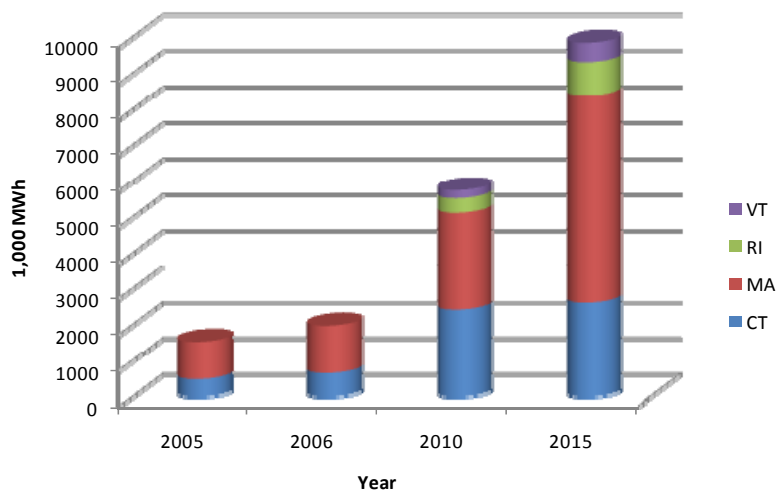
equivalent electric usage of Vermont’s third largest local distribution utility, Vermont Electric Cooperative (VEC).

Around New England, utilities supported by regulators and legislators also are working to keep demand in check by making significant investments in energy reduction programs or DSM. According to ISO-NE, DSM and related programs are reducing New England’s peak electricity demand by over 1,600 MW, one-and-a-half times the peak electric demand of the entire state of Vermont. Without these programs New England’s peak demand would be about six percent higher than it is today.

4.2 Renewable Energy Resources

Renewable energy resources such as wind, solar and biomass are seeing increased application for electric generation to help meet energy needs. The demand for these resources is increasing in part as a result of state policies. Vermont law includes a goal that 20 percent of its power should come from renewable sources by 2017 and a program called the [Sustainably Priced Energy Enterprise Program \(SPEED\)](#) to help reach the goal. Connecticut, Maine, Massachusetts and Rhode Island have adopted Renewable Portfolio Standards (RPSs) that require a certain amount of generation to come from renewable sources. The ISO-NE is projecting that by 2015 nearly 10 million MWh of electricity, representing 6.5 percent of New England’s electricity needs, will come from new renewable resources as a result of these state policies

Figure 4-2. New England Renewable Portfolio Standards and Goals (source: ISO-NE).



Note: Vermont has a statutory goal whereas the other states have renewable portfolio requirements.

These policies are having an impact. According to March 2, 2009, testimony by the CEO of ISO New England to the Federal Energy Regulatory Commission, 3400 megawatts of renewable projects are proposed in the ISO New England.

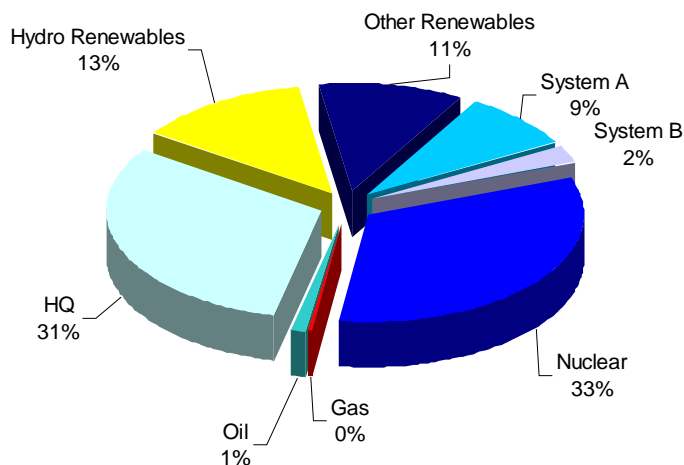
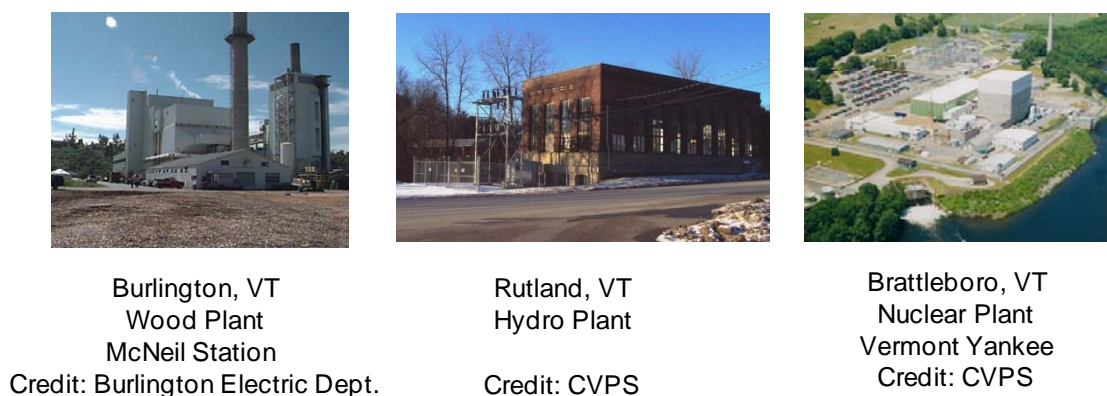
Unlike **baseload** generation, which can operate around the clock, solar and wind are intermittent resources. For example, when a cloud passes over a solar generator, or the wind is not blowing, the power system must have other “backup” generating resources available. The transmission system must

be capable of moving both intermittent renewable and “backup” electricity from where it is made to where it is needed.

4.3 Conventional Generation

Currently, Vermont customers receive substantial amounts of power under large contracts with both Entergy (Vermont Yankee) and Hydro Quebec in Canada. These two resources comprise nearly two-thirds of Vermont’s energy supply commitments. In addition to these sources, Vermont utilities also purchase their energy from the wholesale New England power market (System), and from gas, oil and other renewable electricity power producers. About 31 percent of Vermont’s electric needs are met by importing power from Hydro Quebec (HQ) in Canada and an additional nine percent (known as “System A”) comes from other New England states.

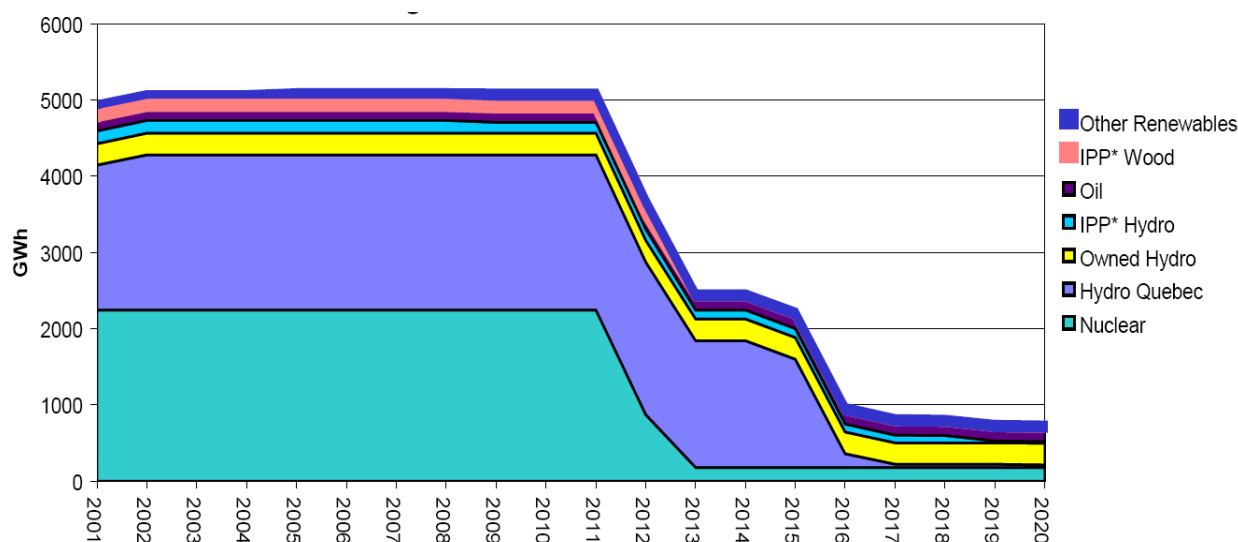
Figure 4-3. Vermont power plant examples and power generation resources.



Source: VDPS. HQ = Hydro Quebec (Canada), System A = imports from New England states, and System B are renewable resources where Vermont utilities have sold the “Renewable Energy Credits.”

Because Vermont receives a substantial amount of power from Hydro Quebec through a substation called Highgate in northern Vermont and Vermont Yankee in southern Vermont, the impact of these resources on transmission must be carefully studied. In the “base case” for transmission planning purposes, planners assume that Vermont Yankee and Hydro Quebec continue to be available resources throughout the 20-year planning horizon. As indicated in Figure 4-4, however, the contracts for Vermont Yankee and Hydro Quebec expire over the 2011 to 2017 time period, so **sensitivity studies** are performed to assess the potential impact of these power generation resources on the transmission system in Vermont.

Figure 4-4. Vermont’s contracted for power supply (source: “VERMONT’S ENERGY FUTURE” document used for a Deliberative Polling Event held in Burlington Vermont on November 3-4, 2007).



In addition, other generation supply realities from Vermont’s summer peak period are examined in the analyses. These include low local hydro power availability due to low water conditions that may occur during hot, dry summers.

4.4 Other Transmission Drivers

The transmission analysis performed by VELCO examines potential transmission system enhancements from a system reliability perspective only. There are other potential driving factors for new or enhanced transmission facilities in New England. Some of those factors were described at the beginning of this section. Many of the potential renewable power sources in New England, such as wind power, may be located far from load centers in New England and far from the more robust and higher capacity transmission corridors. In order to fully utilize these renewable resources, new and/or rebuilt transmission infrastructure may be necessary. Lack of transmission facilities will limit or preclude these renewable resources.

Yet another potential driving force for new transmission infrastructure in New England is economics. The fuel mix for new electric generation sources in New England is limited (due both to fuel/resource availability and greenhouse gas limitation policies). New transmission infrastructure may provide access

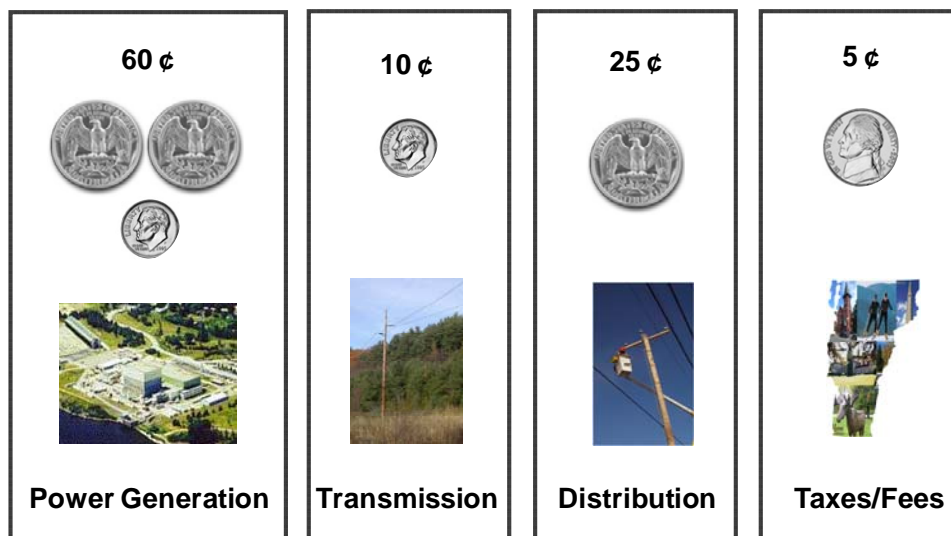
to potentially lower cost and renewable energy sources within or outside of New England. Projects are now before ISO-NE as proposed economic transmission upgrades and other projects are under consideration by market participants.

Any of these drivers may trigger potential new transmission projects in Vermont to connect renewable power resources, import power from neighboring regions to address Vermont’s or the region’s needs, or meet other emerging demands. When and if such proposals materialize, they will be reviewed within Vermont in terms of facility permitting and siting through processes that provide extensive opportunities for public input. Those proposals, since they are not driven by reliability, are not discussed or described in VELCO’s Long Range Transmission Plan, because this document is focused on reliability issues. Nevertheless, these non-reliability-based transmission issues are clearly part of the current environment in Vermont and the region.

4.5 Funding of Transmission and its Alternatives

Typically, around 60 cents of every dollar of an average electric bill goes to paying for power generation costs, including the cost of fuel. Transmission currently makes up around 10 cents for every dollar on the utility bill, distribution about 25 cents, and other charges including renewable and energy-efficiency programs make up the remainder of a bill (five cents). Planned projects around New England are expected to increase the cost of transmission in the next several years.

Figure 4-5. What a dollar of the utility bill pays for (representative).



While electric transmission is a relatively small portion of the cost in the electric business, a new major transmission project typically costs from tens to hundreds of millions of dollars. To minimize the impact on customer bills, the cost of transmission projects is recovered from customers over a long period (typically 30 to 40 years).