Commonly Asked Questions About Electric Transmission Planning

Q. Who sets the threshold for "reliability"?

R. The responsibility for defining "reliability" depends on the entity that regulates the utility. In the case of VELCO, the Federal Energy Regulatory Commission (FERC), the North American Electric Reliability Corporation (NERC) and the Independent System Operator for New England (ISO-NE) are the entities that set the reliability threshold by establishing objective standards that VELCO must meet. Reliability on the subtransmission system is primarily regulated by the Vermont Public Service Board. Public Service Board approval (section 248) is required for the implementation of a transmission solution or a non-transmission solution.

Q. How is electrical demand growth projected?

R. Forecasters use various approaches to forecasting demand, depending upon on the time frame, the size and homogeneity of the area under study, available data and other factors. Forecasters need to understand the behavior of electric demand based on historical data and be able to model this behavior relative to changes in electric prices, weather, economic activity, and so on. The forecast models are calibrated against historical data to ensure that the models can predict historic load behavior with reasonable accuracy. The models generate the forecast using as inputs future economic projections, such as population growth, income growth, appliance saturation, efficiency trends, and so on.

Q. Can new technologies and renewable energy sources avoid the need for transmission line upgrades and new lines? Are transmission lines antiquated technology?

R. Improving the electric infrastructure is an integral part of meeting the level of reliability that modern society has come to expect and that federal and regional standards require. No viable substitute for transmission lines currently exists to move power from one location to another. New technologies have been and will continue to be used to make better use of the electric infrastructure, such as the addition of "smart" devices that may make the operation of the system more efficient, and provide the consumers and operators the ability to better control demand, but they don't eliminate the fundamental need for moving power from where it is generated to where it is consumed. Renewable energy sources are a necessary component of the mix of resources needed to meet growing demand for electricity, particularly in light of today's increased sensitivity to the environmental impacts of our modern society. Deployment of renewable resources may postpone the need for additional transmission. If renewable energy resources are located away from electric demand, or existing transmission does not have the capacity to accommodate the renewable resources, transmission reinforcements may be needed.

Q. Can "smart grid" technology mitigate the need for additional transmission capacity?

R. Smart grid is an evolving concept that means different things to different people. Despite that continuing evolution, there is general agreement that a goal of smart grid is to postpone the need for additional transmission capacity by lowering peak demands and making more efficient use of existing transmission facilities. As smart grid technology is developed and implemented, system planners will be able to determine the capability and limits of the emerging technology to defer or avoid transmission upgrades or new transmission. The three-year cycle for updating Vermont's long-range transmission plan will allow planners to continually update information about smart grid implementation and its impact on demand.

Q. How are the impacts of new or upgraded transmission lines measured, in terms of: Energy efficiency? Reliability? Aesthetics? Finances? Health concerns?

R. **Efficiency**: Transmission line upgrades and new lines can reduce losses energy and consequently improve the energy efficiency of the electric system. The lower the losses on the system, the more efficient the system is. The improved efficiency can be estimated by using computer software designed for this purpose.

Reliability: Transmission upgrades are proposed as solutions to specific reliability concerns. Specific and mandatory standards for measuring reliability apply to transmission operators. More information about the standards appears in Section 2.2 of the Transmission Planning Process section of the Plan.

Aesthetic: Vermont has a body of regulations dealing with aesthetic impacts. Projects are evaluated first as to whether they have an adverse impact on their surroundings, and, if they are found to have an adverse impact, then the evaluation looks at whether the impact is unduly adverse. Aesthetic experts make recommendations about how to interpret these standards, and, ultimately, the Public Service Board weighs the public benefits and the aesthetic impacts of any project. Transmission upgrades must be designed to minimize aesthetic impacts while taking into consideration other factors such as feasibility, cost, and reliability. VELCO seeks public input on its transmission line designs and works with landowners and other stakeholders to mitigate aesthetic impacts wherever possible.

Finances: The decision to upgrade the transmission system is almost always based on a reliability need and not finances. There are two kinds of exceptions. First, sometimes a transmission upgrade is undertaken because it can reduce the operating cost of the electric system by reducing system losses or by reducing or eliminating system constraints. Several projects are currently proposed or are under discussion around New England to help bring power from renewable sources to market. These examples of "economic transmission" will go through a regional review process at the Independent System Operator for New England (ISO-NE). If such a project is proposed in Vermont, it will also require Public Service Board permitting.

Health concerns: Health concerns are generally expressed in terms of the potential effects of electric and magnetic fields, which have been studied extensively for decades. A good source of information on the current state of research can be found in the National Institute of Health Publication Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields. For each proposed transmission project, the electric and magnetic fields are estimated or measured before and after a transmission line is upgraded. Transmission upgrades are typically designed in such a way to minimize exposure to electric and magnetic fields.

Q. Can conservation efforts and energy efficiency diminish demand and reduce the need for additional transmission capability?

R. Conservation efforts and energy efficiency can diminish demand and thereby defer or avoid transmission projects or change their scale. However, not every transmission project can be avoided through conservation and energy efficiency. First, some projects are needed today at levels of demand that have already been reached, even with robust energy efficiency measures. Second, the ability to defer transmission through energy efficiency relies on a complex set of factors involving scale, duration, and coincidence with peak demands for electricity. To effectively avoid transmission, an energy efficiency or "demand response" program has to have sufficient funding to achieve the needed level of energy savings, and then be sufficiently robust, dependable, and enduring to reduce peak electrical demand. While Vermont has made significant investments in energy efficiency programs, energy efficiency can defer transmission only if it is sufficiently large, implemented in the right location, coincident with the peak hours, has a sufficiently long life, and can be guaranteed to perform as projected.

Q. What is the role of Efficiency Vermont (EVT) in transmission planning?

R. Efficiency Vermont (EVT) is playing a key role in transmission planning. EVT has the expertise necessary to estimate the amount of load reduction that can be achieved in various parts of the state, for a given budget level and other factors. In fact, EVT is presently preparing a 20-year forecast of demand reduction that can help inform future load forecasts.

Q. How are transmission projects funded?

R. To fund transmission projects, VELCO seeks capital in the form of equity investments and loans. If it is determined that some portion or all of a transmission project provides benefit to the New England Region, which is served by an interconnected electrical grid, approximately 96 percent of the annual carrying cost of the project is returned to VELCO from other transmission owners in New England. The remaining approximately four percent of annual carrying costs for projects benefiting the region, and those portions of the project that do not provide a regional benefit, are supported by Vermont's distribution utilities. Vermont also pays an approximately four percent share of projects with regional benefit that are built elsewhere in New England.

Q. Does VELCO profit from more transmission projects?

R. VELCO's rates of return on transmission projects are set by the Federal Energy Regulatory Commission (FERC), which regulates VELCO and other transmission companies. VELCO's earnings are passed on to the Vermont utilities that own VELCO. The Vermont utilities use these earnings to reduce their operating costs, and consequently the revenue they must seek from Vermonters through electric rates.

Q. Will the current recession reduce electrical demand by reducing industrial and commercial activity?

R. Yes, electrical demand is expected to be lower in the short-term. However, past experience has shown that during recessionary periods, the effects of the recession are transient and growth in electrical demand resumes. The methods of forecasting electric demand assumes peaks and valleys, and is based on trends viewed over multiple years. In addition, the three-year updating process for the Vermont Long-Range Transmission Plan gives VELCO the opportunity to adjust its forecasts frequently.

Q. Why don't we wait to see the impact of the recession before committing more resources?

R. Once a reliability concern has been identified, regulations governing transmission operators require that they resolve the concern or risk significant financial penalties. It takes many years to implement a solution from the time a reliability concern has first been identified. Many of the reliability concerns identified in the 2009 Vermont Long Range Transmission Plan occur at load levels significantly below the present all-time peak level. Therefore, these concerns are relevant even without any further growth in load. Other concerns are related to regional power transfers, and these concerns are also unaffected by the economy.

Q. What role can distributed generation play in serving as an alternative to building transmission?

R. Distributed generation can postpone the need for transmission upgrades provided it is a large scale deployment, reliable, dependable, and can withstand disturbances.

Q. Instead of building new lines, can we make upgrades to our existing power lines with smart grid technology, including usage sensors, advanced metering systems, and digital controls?

R. "Smart" devices are already in use on the Vermont's transmission network today to provide real-time data about system operations, and further smart grid technology is in the planning stages. Local distribution companies are just beginning to add advanced metering that reaches to the customer and has the potential to influence customer usage patterns. Even once "smart meters" are in place at the distribution level, state regulatory changes in pricing structures will need to be made before "time of use" price signals provide an incentive for customers to reduce demand at times of peak, thereby realizing the potential of smart grid technology to improve system reliability. Until these further developments come to fruition, reliability planning and upgrades to maintain reliability must occur to meet mandatory federal reliability standards.

Q. Can we replace the 1960s-era conductors (cables) on the existing lines with state-of-the art aluminum/carbon-fiber to give the lines much higher current-carrying capability?

R. Yes, new technology is being utilized where applicable. VELCO and other transmission owners in New England have used new types of wires that allow a higher capacity. As with any new technology, new conductor technology is expensive. In addition, it is uncertain how reliable these new wires will be under prolonged system operation. Therefore, these technologies are being adopted at a prudent pace. Finally, using smaller conductors at higher current levels increases losses, reduces the energy efficiency of the system and may require the installation of other hardware to reliably operate the transmission system with a full utilization of these new conductors. The life-cycle cost of these new conductors may be higher than using typical line construction. Time will tell.

Q. What are non-transmission alternatives?

R. "Non-transmission alternatives" are actions that do not involve transmission upgrades taken to address electric reliability issues. These measures generally include energy efficiency, demand response, generation, or combinations thereof. Energy efficiency is encouraged by the state of Vermont to reduce energy consumption. Demand response is the process by which customer demand is disconnected by the system operator when needed, generally with a payment to the customer for allowing the disconnection. Generation is constructed to supply the electrical demand. Although these measures are implemented routinely for reasons other than

system reliability, they may also serve as alternatives to transmission upgrades when a reliability concern is identified. Hybrid solutions include combination of these measures and transmission upgrades.

Q. What is the process for considering alternatives to increasing transmission capacity? Who decides?

R. First, utility planners determine whether a reliability concern exists by analyzing the electric system. Then they determine what transmission solution would likely best resolve the concern. This transmission solution choice is preliminary, and is done at this stage to permit the comparison of the transmission solution to other alternatives, both in cost and reliability. Next, planners complete a screening using three questions (see following question), approved by the Public Service Board, to determine whether a non-transmission alternative may be a viable alternative. If the screening determines that a non-transmission alternative may be viable, a complete analysis will be performed to determine whether non-transmission alternatives are cost-effective and equivalent. Based on the characteristics of the study area and the nature of the reliability concern, a number of non-transmission alternatives will be evaluated to confirm that they can resolve the reliability concern identified. For reliability concerns on the transmission system (the high-voltage electric grid), VELCO makes the determination. For reliability concerns on the sub-transmission system (the lower voltage part of the transmission system), the other Vermont utilities make the determination.

Q. What are the three questions used to screen reliability issues for the potential to apply non-transmission solutions?

R. The screening questions are as follows:

1. Is the proposed project's cost expected to exceed $2 million?
2. Could elimination or deferral of all or part of the upgrade be accomplished through the use of non-transmission alternatives?
3. Is the likely reduction in costs from the potential elimination or deferral of all or part of the upgrade greater than $1,000,000?

Q. Does any potential exist for wireless transmission of electricity?

R. No, to our knowledge, electricity cannot be transmitted by current wireless technology.

Q. What is the impact of smart grid technology on the long term plan? If none, why not?

R. No smart grid impact has been included in the current long-range plan because the impact is not known and quantifiable at this time. The three-year update cycle for the long-range plan will require VELCO to look more closely at this question in 2010 and 2011.

Q. Can VELCO build future transmission lines underground?

R. Yes, but it has been estimated that underground transmission lines cost ten times as much or more to build as overhead lines. The extra costs would be borne by electric customers in Vermont and would likely not be shared with the region. For these reasons, the Public Service Board has required underground construction in only very limited circumstances. In addition, recent attempts at adding significant underground transmission in New England have revealed technical challenges that may require significant replacement of existing

equipment, adding cost and operational complexity. For these reasons, we expect that most transmission lines will remain overhead in the near and medium term at least.

Q. What is VELCO's legal obligation to assure electric reliability?

R. As a transmission provider, VELCO is subject to regulation by the Federal Energy Regulatory Commission (FERC). One of these regulations is to design and operate the system to meet mandatory reliability criteria. FERC has delegated authority to the North American Electric Reliability Corporation (NERC) to monitor and enforce reliability standards. The mandatory standards have financial penalties for violations. In addition to FERC and NERC, regional operators, such as ISO-NE, ensure that all transmission owners comply with these standards.

Q. What happens if Vermont Yankee goes offline in 2012? What would be the impact on current planning for electric power generation and distribution?

R. Vermont Yankee (VY) is a significant resource for supplying energy to Vermont load. However, VY is located electrically outside of the Vermont load pocket, which means that, from a power flow perspective, we can consider that VY is located in New Hampshire or Massachusetts. If VY power were to become unavailable, the Vermont utilities would need to replace the VY power with either internal or external power sources. If power sources are installed within Vermont in the right locations, additional transmission capacity may not be needed. VY plays a significant role in supporting the regional system. Therefore, in its absence, the system would be weaker, and Vermont would be negatively affected because Vermont is supported by transmission infrastructure located in New Hampshire and Massachusetts. Whether VY retires or not, recent studies suggest that reinforcements may be needed to comply with regional transmission planning standards. These reinforcements may impact Vermont depending on where these reinforcements are constructed. If VY goes off-line in 2012, the needed reinforcements may be more extensive.

Q. What is the difference between electrical generation, transmission and distribution?

R. The electrical system is comprised of three major processes, generation, transmission and distribution. Generation is the process of creating electricity. The electricity from the generators is "transformed" to a higher voltage so that it can be transported efficiently, and then is moved using transmission lines, sometimes over relatively long distances. The electricity is again transformed so that it can be used by consumers. Distribution delivers electricity from the transmission system to residential, commercial and industrial facilities at usable voltage levels. In Vermont, the three system components – generation, transmission, and distribution – are largely operated by separate companies, although a few distribution companies own the lower voltage "subtransmission" facilities and generate a portion of the power that serves their customers.