

JCOTS

Emerging Technology Issues Advisory Committee

May 18, 2005

The Joint Commission on Technology and Science's Emerging Technology Issues Advisory Committee held its first meeting on May 18, 2005 in Richmond. Co-chairmen Delegate Joe T. May, Delegate Thomas D. Rust, and Senator Stephen D. Newman were all present at the meeting, along with other citizen advisory committee members representing a variety of public and private sector entities.

The meeting focused on examining the Commonwealth's existing policies associated with decisions to use underground and overhead transmission lines, and to discuss the formulation of criteria and policies to guide future decisions regarding the placement of transmission lines in the Commonwealth. Delegate May indicated that this is an issue with statewide implications as Virginia becomes increasingly urbanized, although currently the focus of this issue is on a proposal to build additional transmission lines in western Loudoun County. This is not a simple issue, and factors such as the need for adequate power and aesthetics are frequently in conflict. He indicated that people with an interest in transmission lines issues are invited to share their views with the committee, and that these views might often be disparate.

Patrick Sloyan, Chairman of the Western Loudoun Stakeholders, a group of government and citizen groups who advocate the placement of transmission lines underground, provided an overview of the current situation in Loudoun County. Mr. Sloyan indicated that a current proposal by Dominion Power to build a 230-kilowatt transmission line through western Loudoun would have a significant environmental impact. Part of this impact would involve cutting down trees along a 12-mile stretch of the Washington & Old Dominion Park Trail, a trail covered by a canopy of old trees used by more than 2 million bikers, hikers, rollerbladers and horseback riders annually. Mr. Sloyan stated that the proposal was based on Dominion's need to clear a path for 128 towers, each at least 110 feet high along a corridor at least 100 feet wide. Mr. Sloyan also alleged that the radiation from the corona surrounding the lines will be a source of ozone, and that the electromagnetic fields produced by the lines is a source of controversy for its possible relationship to cancer in children. In addition to these concerns, Mr. Sloyan stated that the existing 6,1000 miles of transmission lines in Virginia are eyesores.

Mr. Sloyan suggested that an alternative to Dominion's proposal would be to place the transmission lines underground. This would make the lines invulnerable to surface storms and they would not be an eyesore. He indicated that the Loudoun Board of Supervisors, the towns of Hamilton and Purcellville, and some members of the Leesburg Town Council all support the use of underground transmission lines.

While Mr. Sloyan acknowledged that he is not an expert in this area, he shared that his research has taught him that XLPE cables constantly monitored by a fiber optic line have been put into place in Los Angeles, and in Europe and Asia, and are part of recent proposals adopted for new lines in Connecticut, Massachusetts, Long Island, New York, and Chicago. XLPE involves the use of a cable sheathed and buried in concrete, which negates the need for a costly cooling system flowing along an underground line. He alleges that the underground technology

considered by Dominion was outdated, and would require pumping stations to push an oil-based coolant along the line, which also leads to a risk of potential oil leaks.

Mr. Sloyan closed by suggesting that the key issue for the Virginia legislature to consider is at what point there should be a shift from overhead to underground transmission lines. He indicated that if decisions were made solely as a matter of capital cost, then overhead transmission lines would win out. Generally, a rule of thumb is that capital costs of underground versus overhead are five to one. However, if you take into account that underground lines are not affected by damaging storms, that corona and electromagnetic radiation is eliminated from the atmosphere, and routine maintenance costs are reduced, underground transmission lines are roughly double the cost of overhead lines looking at lifetime costs. Mr. Sloyan suggests that these additional costs could be spread between ratepayers and Dominion Power. In addition, use of underground lines will not erode local real estate values, and hence local real estate tax revenues. Mr. Sloyan challenged the Emerging Advisory Committee to develop a new definition of “real costs” when reviewing transmission line proposals.

After Mr. Sloyan’s presentation, Senator Newman indicated that the Advisory Committee would be best to proceed by focusing on hard facts, figures, and costs. Delegate May commented that although most of Loudoun County wants the transmission lines underground, the State Corporation Commission ultimately makes the final decision. In addition, Dominion Power’s charge as a utility corporation is to provide power at the lowest cost to its customers. Therefore, the issue at hand is very complex with many competing interests. The policy for how the Commonwealth delivers electricity has not changed much over the past 75 years, and part of the Advisory Committee’s discussions might revisit these policies.

Mr. Paul D. Koonce, Chief Executive Officer of Dominion Energy, addressed the Advisory Committee. He highlighted Dominion’s long history of providing reliable electric service at a reasonable cost to its customers. He indicated that currently less than 50 miles of Virginia’s 6,100 miles of transmission lines are underground. When determining where to place lines, Dominion considers reliability, operability, and cost. While overhead lines experience more frequent outages, they are generally of shorter duration than underground outages because it is easier to pinpoint the source of the failure. Dominion has found that lengthier power outages may be unacceptable to customers. Mr. Koonce indicated that Dominion embraces the use of new technologies where they work, and where they will provide heightened reliability, operability and cost efficiency for its customers.

Mr. John Smatlak, Manager of Transmission Systems for Dominion Energy, joined Mr. Koonce in his presentation. He indicated that underground cable is more expensive than overhead cable, in part because of the labor required to dig the necessary trenches. Dominion does have a preference for overhead lines. In the few situations where underground lines have been used, it has been in situations where overhead was not really an option, such as in Crystal City which is populated with tall, close together office buildings, and under the Elizabeth River in Norfolk where overhead lines would have crossed shipping lanes.

Mr. Koonce indicated that the preference for overhead lines is in the best interest of its customers from a cost perspective, and that Dominion has a responsibility to build a reliable system in as

cost-effective manner as possible. He estimated that an underground project is eight to ten times more expensive than an overhead project. Voltage lines need to release heat, and because underground lines hold in the heat, less power is able to flow through each line. Therefore, two to three cables are needed to carry the same amount of power as one overhead line. While overhead lines have a life cycle of 30 years, it is estimated that underground lines will begin to fail after 20 years. Finally, best practices would indicate that alternative back feed methods be available in the case of a line failure, because redundancy will keep an outage time down to days instead of weeks. However, there is no way to back feed in the current Loudoun proposal. The use of long lines make the likelihood of long failures increase, and this is an unacceptable risk for Dominion.

In follow-up to the indication of the increased costs, Senator Newman asked Dominion to prepare a breakdown of the cost information in order to compare the conflicting testimony that the Advisory Committee has heard. Other members of the Advisory Committee suggested that JCOTS look at benchmarks, such as Los Angeles, which determined that it cost \$5 million per mile of underground cable.

Mr. Harry Orton of Orton Consulting addressed the Advisory Committee about his experience in working with transmission lines. Mr. Orton is an engineer with expertise in underground cables diagnostics. He has performed consulting work around the world involving the use of underground transmission lines.

Mr. Orton brought with him to the meeting a cross-segment of the type of cable now used for underground transmission lines. The cable consists of several layers, with an inner layer of copper surrounded by a semiconductor screen, plastic polyethylene, another semiconductor screen to control the electrical field within the cable, an aluminum sheath, and a pvc jacket to prevent corrosion.

In providing electricity, there are three phases: generation, transmission, and distribution. The transmission network is complicated, and is the focus of this meeting. Other countries and localities have successfully used underground transmission lines. For example, New York City has not had any overhead lines since the 1890s; Singapore is 100 percent underground; and Connecticut has recently enacted underground power line legislation. In Europe, approximately forty percent of the total transmission line cable used today is placed underground.

Mr. Orton described several of the environmental advantages of underground transmission lines. The lines have little visual impact; have low electromagnetic field radiation; produce no corona discharge; do not result in radio or television interference; are not a threat to start brush fires; experience minimal lightening problems; provide for increased worker safety; and generally allow for good working conditions. Underground lines also create power grid security. Underground lines are not affected by ice, snow, rain, dust, hurricanes, or tornadoes. In addition, there are no visible elements subject to theft. Economic advantages include low maintenance costs, minimal land use, and little to no impact on the value of surrounding land and buildings.

Operationally, the underground lines have a high reliability rate and cause few faults in the power system, and diagnostic tools are available to locate any problems.

However, Mr. Orton shared that underground transmission lines also have some disadvantages when compared with overhead lines. The initial costs are higher for the installation of underground lines. However, Mr. Orton cautioned that these initial costs should be weighed in light of lifetime costs, as the cost differential decreases over time. Some also argue that the life of an underground cable is shorter than that of an overhead line, but experts are finding that the life of the cable is actually exceeding its design value. When an outage occurs, typical restoration time is between seven to ten days, while the response time for an overhead line is only one day. Even if it is possible to locate the fault instantaneously, it still takes longer to repair. To lay underground lines, a continuous trench is required, which is labor-intensive. The imposition of an underground line does modify the soil thermal conditions by one to two degrees around the line. Finally, there is a 45 to 75 mile limitation on the length of a given line.

Using the example of a 225 voltage line, the cost of installing the line underground is five to ten times more than using overhead. Data concerning the lifetime costs of underground lines is not available, due to recent advances in technology. However, with distribution voltage, the cost ratio has been found to decline over the lifetime of the line. There likely still is a cost differential between overhead and underground lines over the lifetime of the line, but it would be less than five times the overhead costs.

Dr. Tim Lough, a special projects engineer with the State Corporation Commission (SCC) explained to the Advisory Committee the role that the SCC plays in transmission line placement and approval. The SCC is an independent state agency established by the Constitution of Virginia. Title 56 of the Code of Virginia provides statutory guidance for transmission lines in the Commonwealth. In reviewing applications for transmission lines, the SCC Commissioners consider the facts of the given case, and applies their interpretation of the relevant law.

Dr. Lough explained that the staff of the SCC is separate from the Commission. The Commission ultimately makes its determinations independent of the staff, and the staff's recommendations are not necessarily representative of the Commission's decision. The staff's recommendation is often just one of several recommendations that may be submitted to the Commission by interested parties.

Information about the staff guidelines is available on the SCC's website. A submitted proposal must cover the need for the line, including historical and load growth data and engineering justifications; estimated costs; a description of the proposed project and alternatives considered; impact of the line on scenic, environmental, and historical features; and health aspects of the proposed line. There is no difference in the factors considered between an application for an overhead or underground proposal. The Commission weighs the relevant issues set forth in the record and the factors set forth in the Code, along with any alternatives. In reaching a decision the Commission attempts to balance potentially conflicting or non-commensurate objectives.

In response to questions, Dr. Lough indicated that there are currently three transmission line applications pending, not including one decision that was recently appealed to the Virginia

Supreme Court. The SCC usually receives two applications a year, on average. An uncontested case usually takes about six months to approve. When alternatives are proposed, they do not necessarily involve an underground alternative – an alternative proposal may involve a different route for a proposed line. All of the alternatives considered by the Commission depends on what has been entered into the record. It is possible that the staff could request additional information concerning an underground alternative, and anyone may suggest an alternative at the hearing stage. There are no limitations on who may participate in a hearing. Notice of a proposal must be given to affected localities, and consideration is given to local comprehensive plans and zoning.

Members of the Advisory Committee commented that the cost summaries submitted to the SCC are generally direct costs, but that other costs, such as depreciation in nearby real estate value are not taken into consideration unless provided by someone contesting an application. Delegate May indicated that in his opinion, these types of costs need to be taken into consideration in order to be equitable and fair.

Todd Hafner, Director of Planning and Development for the Northern Virginia Regional Park Authority (NVRPA), next addressed the Advisory Committee. He shared that transmission lines have an effect on parks and natural resources in the Commonwealth. The NVRPA has 19 parks and owns over 10,000 acres in six heavily populated areas. Their mission is to preserve and protect these cultural and environmental resources. Because the impact of overhead transmission lines on the parks can be severe, Mr. Hafner urged the site specific factors must be considered with each application and technological advances and capabilities must be analyzed.

Impacts on the parks include loss of trees for right-of-ways. Protection of existing tree coverage is important in developing areas, and underground lines allows for more narrow right-of-ways and less overall tree loss. Overhead lines impact scenic views provided by parks, and may also affect recreational resources, such as golf courses or trails. Construction can disrupt natural habitats, create habitat fragmentation, and disrupt the natural ecosystems. Construction of underground lines may also have some of these impacts, but the effects are possibly much less.

The final speaker on the agenda was Dr. Jaime de la Ree, Associate Professor and Head of the Department of Electrical and Computer Engineering at Virginia Tech. In the overall picture of electricity generation and distribution, he indicated that the cushion is growing smaller and between capacity and demand.

In reviewing the reliability of overhead transmission lines, Dr. de la Ree indicated that it is an oversimplification to blame major power failures on these lines. For example, although the large blackouts in this country have involved overhead lines, other complex factors came into play in determining the cause.

He noted that a few speakers had mentioned concerns about the electromagnetic field produced by overhead lines. This was a large concern in the late 1980s and early 1990s. However, the National Institute of Health conducted a study of this issue, and did not find anything conclusive indicating that EMF caused cancer or other health risks.

Finally, in considering the use of underground transmission lines in places such as Singapore, it is important to keep important factors in mind. For example, Singapore demands much less capacity than many places in the United States. Singapore is only 270 square miles, while the Commonwealth is 4300 square miles.

The Advisory Committee next solicited public comment from the audience. Several members of the Loudoun County Board of Supervisors, or their representatives, supported the review of existing policies concerning use of transmission lines and the creation of sound criteria for consideration. It was suggested that a policy that gives a locality more options in addressing this issue might be appropriate. Loudoun County passed a resolution asking the SCC to require Dominion Power to present an analysis of an underground alternative, something that has thus far been left to interveners in the Loudoun case. Several individuals living in neighborhoods affected by current overhead line proposals also spoke in favor of moving towards use of underground lines, and urged Dominion to consider an underground alternative. It was also suggested that legislation be adopted requiring the SCC to consider all costs, and not just direct capital costs.

In closing the meeting, Delegate May indicated that the Advisory Committee has three goals in reviewing this issue. First, the Advisory Committee will learn what the problems and issues are concerning the use of transmission lines. Secondly, he would like to see the current situation in Loudoun County resolved to include the use of underground lines without interceding legislation. Finally, he would like to work towards creating a policy that could be adopted by the SCC to help resolve future situations, and make adjustments in the Code to require a fair and equitable approach to reviewing applications.