DIRECT TESTIMONY
OF
GERRY SHEERIN, P. ENG
ON BEHALF OF
PIEDMONT ENVIRONMENTAL COUNCIL
BEFORE THE
STATE CORPORATION COMMISSION OF VIRGINIA
CASE NOS. PUE-2007-00031 AND PUE-2007-00033

Q: PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A: Gerry Sheerin. Sheerin Technical, 25 Eastville Avenue, Toronto, Ontario Canada M1M 2N6

Q: WHAT IS YOUR PROFESSION?

A: I am a qualified professional electrical engineer licensed in the Province of Ontario, Canada.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL TRAINING AND EXPERIENCE.

A. My current curriculum vitae is attached hereto as Exhibit GS-1.

Q. DESCRIBE ANY PROFESSIONAL ASSOCIATIONS OF WHICH YOU ARE A MEMBER.

A. I am a member of Professional Engineers Ontario.

Q. PLEASE BRIEFLY SUMMARIZE YOUR EMPLOYMENT HISTORY AND PROFESSIONAL EXPERIENCE.

A. I have been employed by EHV Power for the last seven years. This has been in a number of senior engineering and project management positions and ultimately Vice President Projects and Engineering. EHV designs and installs high-voltage underground cable systems. Previously, I was employed for twenty years by Ontario Hydro, one of the largest electrical power utilities in Canada. At Ontario Hydro my responsibilities

included the commissioning, maintenance and repair program for a 220 mile system of high-voltage underground cables. Before that I worked with Canada Wire, a high-voltage cable system manufacturer for nine years.

Q. WHAT DOES EHV POWER DO?

A. EHV primarily is a constructor of underground high-voltage power cable systems. EHV Power began operations in 1997 when the cable manufacturer Alcatel Canada Wire & Cable closed its high-voltage cable manufacturing plant in Toronto, Ontario. The principals of EHV Power had all been employed in the High-Voltage Cable Installation Group at Alcatel. Since its formation EHV Power has been active in Canada, the US and the Caribbean installing 69kV, 115kVand 230kV cables and supplying specialized accessories. These activities have included all of the popular cable constructions such as Solid Dielectric, High Pressure Fluid Filled and Low Pressure Fluid Filled cables. I provided project management and engineering support for the company's tendering and construction activities and also engineering support to customers in the area of high-voltage power cable condition assessment and maintenance and repair activities.

Q. PLEASE DESCRIBE YOUR RESPONSIBILITIES AND EXPERIENCE AT EHV WITH RESPECT TO UNDERGROUND HIGH-VOLTAGE TRANSMISSION FACILITIES.

A. EHV Power is a designer and installer of high-voltage underground cable systems with secondary focus on the maintenance, repair and relocation of existing high-voltage cable systems. My responsibilities have included cable system design, cost estimation, preparation of tender submissions, project scheduling, management of construction activities and including the supervision of others involved in such activities. I also

conducted assessments of the condition and reliability of older high-voltage cable systems for EHV's utility clients.

Q. DESCRIBE ANY OTHER EXPERIENCE YOU HAVE WITH HIGH-VOLTAGE UNDERGROUND CABLE.

A. My experience in high-voltage cables includes 20 years at Ontario Hydro in positions such as Cable Supervisor, Transmission Lines Superintendent and Group Leader Cables. In those capacities I was actively involved in directing the maintenance-and-repair programs for operating cable installations and the commissioning of new cable systems.

Q. HAVE YOU TESTIFIED BEFORE AS AN EXPERT WITNESS?

A. Yes, once in a 2006 Virginia State Corporation Commission hearing into an overhead 230 kV transmission line in Loudoun County, Virginia.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THESE PROCEEDINGS?

A. Counsel for the Piedmont Environmental Council requested that I analyze the feasibility of installing a power transmission cable system underground between the 502 Junction substation to the Loudoun substation should the Virginia State Corporation Commission determine that the additional transmission line capacity for which Dominion Virginia Power (DVP) and Trans-Allegheny Interstate Line Company have applied is needed. The purpose of my testimony is to report on my analysis, discuss the reliability of underground cable systems, and respond to certain parts of the testimony of Mr. Koonce of DVP and Messrs P. Jeffrey Palermo and Richard A. Wakefield of KEMA on behalf of DVP.

Q. MR. SHEERIN, DOES YOU TESTIMONY APPLY EQUALLY TO BOTH THE PREFERRED AND ALTERNATE ROUTE?

A. Yes, it does.

Q. ARE YOU OFFERING ANY OPINION ON THE SUBJECT OF NEED FOR THE ADDITIONAL TRANSMISSION CAPABILITY SOUGHT BY DVP, OR WHETHER THERE MAY BE SUPERIOR ALTERNATIVES?

A. No. Those subjects are covered in the testimonies of Drs. Hyde Merrill, Daniel Violette, and Benjamin Sovacool

Q. ARE HIGH VOLTAGE UNDERGROUND CABLES COMMONLY INSTALLED IN ELECTRIC UTILITY TRANSMISSION SYSTEMS?

A. Yes. There are many examples of underground power transmission throughout North America, Europe, the Middle East, Africa, Asia, Australia and New Zealand. Many of these cables have been in operation for decades.

Q. IS IT USUAL FOR ELECTRIC UTILITIES TO INSTALL UNDERGROUND SECTIONS IN A HIGH VOLTAGE TRANSMISSION SYSTEM?

A. Generally electric utilities prefer to install all of their transmission system overhead. This provides the lowest construction costs, maintains uniform system characteristics and simplifies maintenance activities over the life of the installation. However, not all areas where power transmission is required are suitable for an above-ground system to be constructed. In those situations electrical utilities accept the higher cost and greater system complexity by installing underground cables. While initial construction costs of underground cable are higher than for aboveground, operating and

maintenance costs can be less than for overhead systems, due in part to the higher reliability of underground cables.

Q. UNDER WHAT KIND OF CIRCUMSTANCES MIGHT YOU FIND UTILITIES TURNING TO UNDERGROUND CABLES?

A. The most common reason for a utility selecting underground transmission instead of overhead, is a lack of available land for an overhead transmission line corridor. The right of way needed for an underground cable is significantly less wide than the right of way required for an equivalently sized overhead transmission line. Typically planners will opt for an underground installation in built-up urban area. Other reasons might include legislated restrictions on overhead construction, height restrictions adjacent to airport flight paths, public opposition to the visual impact of overhead lines or to the perceived public safety issue of electric and magnetic fields emanating from the lines.

Q. ARE UNDERGROUND CABLES LESS RELIABLE THAN OVERHEAD LINES?

A. No, in general, high voltage underground cables are more reliable than overhead transmission lines. If an underground cable is supplied by a reputable manufacturer and installed by a qualified and knowledgeable contractor, the results should be outstanding in terms of reliability. A properly installed underground cable should still be operating reliably more than forty years after commissioning. While overhead transmission lines are also reliable from a catastrophic failure viewpoint, they are prone to short term failures due to extreme weather conditions, undergrowth encroachment on the space surrounding the conductors and damage from construction equipment or airborne debris, or even industrial pollution.

Q. WHAT WAS YOUR EXPERIENCE WITH UNDERGROUND CABLES AT ONTARIO HYDRO?

A. Ontario Hydro operated over 200 miles of underground power transmission cable with excellent reliability. These underground cables were installed from 1947 to the present day. They included low pressure fluid filled cables, high pressure pipe type cables and cross linked polyethylene cables.

Q. DID YOUR EXPERIENCE WITH ONTARIO HYDRO INCLUDE ANY INVOLVEMENT WITH OVERHEAD TRANSMISSION LINES?

A. Yes.

Q. WERE THESE LINES RELIABLE?

A. Generally yes, as long as ongoing maintenance was satisfactory. However, overhead lines are particularly vulnerable to faults caused by the encroachment of neglected undergrowth and by severe weather conditions.

Q. DESCRIBE, GENERALLY, THE CONSTRUCTION METHOD THAT DVP PROPOSES FOR INSTALLATION OF AN UNDERGROUND CABLE AS AN ALTERNATIVE TO AN OVERHEAD LINE.

A. DVP proposes using single trenches, each of which would contain a pair of Direct Current Solid Dielectric Cables. Each trench would be 18 inches wide and spaced 10 feet apart. A separate trench would be used for each pair of cables. Each trench would be filled with a low thermal resistivity backfill material (such as limestone) which would be compacted to a high density. The trench would then be covered by a thick concrete slab. Joint bays or manholes for cable jointing would be positioned at intervals of approximately 2,000 feet. Deviations from this style of construction might occur at the

crossings of major highway or sensitive environmental areas. At those locations horizontal directional drilling would be the most effective method of installing individual conduits into which the cables could be pulled.

Q. ARE YOU AWARE THAT MR. KOONCE OF DVP HAS ESTIMATED THAT THE COST OF SUCH AN UNDERGROUND CABLE INSTALLATION WOULD BE $328 MILLION?

A. Yes.

Q. DO YOU BELIEVE THAT IS A REASONABLE ESTIMATE?

A. I believe it to be at the high end of the range of likely costs. We have been provided no backup work papers, independent study or other information as to how Mr. Koonce made his estimate. I would be very surprised if an actual detailed estimate did not produce a value at least 20% lower.

Q. WHY IS THAT, MR. SHEERIN?

A. Firstly because electric utilities tend to incorporate into their estimates all of the worst case eventualities that may possibly occur during construction. Secondly the construction of long trenches through fields on this scale can be done very efficiently at lower unit costs than with shorter installations in more urban environments. Thirdly, by comparing the cost per mile from the budgeted $328 million against the cost of previously installed High-Voltage cable installations. Finally, the DVP estimate is based on installing three circuits while the KEMA report suggests that two parallel circuits may be adequate for the required power transmission. Taken together these factors suggest to me that the current cost estimates are on the high side.

Q. MR. SHEERIN, ARE YOU TESTIFYING ON THE COST THAT MR. KOONCE ESTIMATED FOR THE AC-DC CONVERTER STATIONS?

A. No, I am not.

Q. HOW LONG DO YOU BELIEVE IT WOULD TAKE TO CONSTRUCT A 41 MILE UNDERGROUND CABLE SECTION?

A. I believe this could be constructed in about two years.

Q. IN YOUR OPINION, DOES THE UNDERGROUND ALTERNATIVE OF DVP REPRESENT A PRUDENT AND REASONABLE OPTION FOR THE STATE CORPORATION COMMISSION TO CONSIDER REQUIRING, SHOULD THERE BE A DETERMINATION THAT AN ADDITIONAL POWER LINE IS NEEDED?

A. Yes.

Q. HAVE YOU REVIEWED THE REPORT PREPARED BY MESSRS P. JEFFREY PALERMO AND RICHARD A. WAKEFIELD OF KEMA?

A. Yes.

Q. DO YOU AGREE WITH THEIR CONCLUSIONS REGARDING THE USE OF DC UNDERGROUND CABLES?

A. No, not entirely. Their conclusions appear to be heavily weighted toward utilizing the lowest cost method of transmission line construction. With this limitation in mind it would be very difficult for any alternative to be successful regardless of the intrinsic technical or aesthetic merits that it may offer.

Q. DOES THE KEMA REPORT MAKE ANY COMMENT ON THE RELIABILITY OF UNDERGROUND HIGH-VOLTAGE CABLES?

A. Not directly, the comments in this report on the underground options are very cursory. There is a suggestion that the risk of cable failure is increased if the number of splices is increased. This is a curious suggestion since properly installed splices, made under the supervision of the cable manufacturer, have an extremely high success rate. In my experience, splice or termination failures are only likely if the cables have been installed by contractors who do not utilize properly qualified and experienced craftsmen following the manufacturers' procedures. It is true that the contractors who follow all appropriate procedures may not be the lowest bidders for a project such as this, but in the long run the money saved by using the cheapest installer is quickly swamped by the cost of problems experienced later. If a High-Voltage cable installation is approached as an infrastructure project with an effective life expectancy of 50 or more years, then a high level of installation expertise is essential. To ensure expert installation it is prudent to utilize company inspectors who are themselves experienced and can truly monitor the quality level of the installation of cables, splices and terminations.

Q. THANK YOU, MR. SHEERIN, NO FURTHER QUESTIONS.