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Please Reply to Hartford

February 9, 2005

Ms. Pamela B. Katz, Chairman
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06054

Re: Docket No. 272

Dear Chairman Katz:

Pursuant to the Siting Council's memorandum dated February 4, 2005, the Wilsons will make available to the Siting Council Steven Boggs. Ph.D. of NonLinear Systems, Inc. and Melvyn Hopkins of CGIT Westboro, Inc. to participate at the February 14, 2005 technical meeting concerning technical issues.

The curriculum vitae of each witness it attached. Steven Boggs, Ph.D. will be available to respond to the Council's questions regarding issues of reliability and operability of overhead and underground (including GITL) power lines. Melvyn Hopkins will be available to explain the installation, design, characteristics of GITL cable. Both Messrs. Boggs and Hopkins will be able to compare and contrast the various power lines under consideration by the Council and, specifically, the design characteristics and feasibility of various underground high voltage transmission lines. While each individual is familiar with findings contained in the ROC and KEMA Reports and will be able to comment on such findings, neither expert has undertaken the extensive analysis necessary of the issues considered in the ROC and KEMA Reports to render an <u>independent</u> analysis of these issues. However, they are familiar with the issues identified in the Reports' findings and can provide the Council with insight on the factors and variables employed by independent electrical engineering firms to derive these findings.

Very truly yours,

REID and RIEGE, P.C.

Thomas M. Armstrong

TMA:slp
Enclosure
Cc: Service List

19907.001/380093.1

NONLINEAR SYSTEMS INC.

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# Dr. Steven A. Boggs

**Position:** Director, Electrical Insulation Research Center and Research Professor of Electrical Engineering, Physics, and Materials Science, University of Connecticut

**Education:** MBA, University of Toronto, 1987

Ph.D. (physics), University of Toronto, 1972

M.Sc. (physics), University of Toronto, 1969

B.A. (physics), Reed College, Portland, Oregon, 1968

**Positions Held:** Director, Engineering and Research
Underground Systems, Inc.
February 1987 - October 1993

Senior Physicist, Ontario Hydro
January 1983 - February, 1987

Research Engineer/Physicist, Ontario Hydro
January 1975 to January, 1983

**Experience:** During his 12 years with the Research Division of Ontario Hydro, Steve conducted research in the areas of solid dielectrics, thermal design of underground cable, and $SF_6$-insulated systems including $SF_6$-insulated transmission lines. He was project leader of the team which developed the EPRI Thermal Property Analyzer (TPA) for measurement of soil thermal properties relevant to underground power transmission, the first instrument to be licensed by EPRI. In the area of $SF_6$-insulated systems, he pioneered the study of fast transient phenomena in gas-insulated substations (GIS) and trasmission lines (GITL), including transient groundrise, disconnector-induced transients, and statistical modeling of disconnector operation. Much of this work was carried out in cooperation with the major manufacturers including Alsthom, ASEA, Brown-Boveri (later ABB), and Siemens, all of which were subcontractors under his direction during an EPRI-sponsored project to improve the reliability of solid dielectric spacers for $SF_6$-insulated substations and transmission line. Steve was elected a Fellow of the IEEE for his contributions to the understanding of $SF_6$ insulated power apparatus. At Underground Systems, Inc., Steve patented the high temperature superconducting power cable design which was developed by Pirelli and American Superconductor with EPRI participation. He also invented a new transmission class cable termination design which has been fully qualified. Steve is author of nearly 200 technical publications, a Contributing Editor to Electrical Insulation Magazine, and an active participant of the IEEE Insulated Conductors Committee which deals with power cable. Steve has consulted for the ITAIPU Hydro Electric Project in Brazil, FURNAS (Rio de Janeiro), S&C Electric, ABB, and numerous US utilities.

# Melvyn Hopkins
**CGIT Westboro, Inc.**
**30 Oak Street**
**Westboro, MA 01581**
**(508) 836-4000 (Telephone)**
**(508) 366-6113 (Facsimile)**
**www.azz.com**


**Education**:

BSEE, Wayne State University, Detroit, Michigan

**Experience**:

Thirty five years experience in the design, construction and installation of SF6 apparatus.

Mr. Hopkins has over 35 years experience in the design, construction and installation of SF6 apparatus. After graduating with a BSEE from Wayne State University in Detroit, he started in the Westinghouse Circuit Breaker division in 1968 working on the design of Gas Insulated Substations (GIS) and Gas Insulated Lines (GIL). In 1978, he moved to the CGIT SF6 bus facility in Westboro, Massachusetts. He holds 6 patents in the areas of SF6 technology and is active in the IEEE substations committee, NEMA SG15 and the NEMA SF6 task force. In the past, he has participated in CIGRE joint working groups to define the principles of operation, performance and reliability of Gas Insulated Lines (GIL).

Mr. Hopkins is currently the Engineering and Quality Manager for AZZ/CGIT.

Mr. Hopkins can provide information to the Siting Council on the following topics:

- Reliability of Gas Insulated Lines.

CGIT bus has an excellent reliability record. The first installation was a 242 kV direct buried GIL in 1977. Since then CGIT has accumulated over a million meter years of service experience. The Mean Time to Failure (MTTF) for a 1 kilometer (3300 ft) circuit of CGIT is 71 years.

- CGIT has flexibility in design and installation.

The GIL can be installed above ground, in open or covered trenches or direct buried. Systems as large as 20,000 ft have been installed. The GIL is flexible and can often follow the contour of the land. For more abrupt changes in elevation mitered elbows are used to change direction. No matter what the terrain the GIL can be installed.

- CGIT has high current carrying capacity often twice the capacity of conventional cable technology.

A single 362 kV circuit of GIL can carry over 3000 amps. The addition of a spare phase would reduce the outage time should there ever be a problem.

With losses of only about 50 Watts/phase foot the GIL can have much lower operating costs that conventional cable.

- CGIT has much lower capacitance than conventional cable, typically about 16 pF/ft.

This means that the GIL has a much longer critical length than conventional cable.

- Public Access.

All high voltage equipment should be installed to limit public access. Overhead lines are mounted to poles. Conventional cable is buried underground. Access to the GIL can be achieved by a fence or placed in a covered trench either above or below grade.

Some of the safe operating principles of GIL include:

- External magnetic fields are extremely low. Typical values for a 400 kV GIL are 10 $\mu T$ at 1 meter and 5 $\mu T$ at two meters distance.
- The GIL is completely dead front and grounded.
- Operating pressures are low. Typically less than 60 psig.
- CGIT has never had an internal fault, which has punctured the enclosure. Typical gas compartments are large which limits the pressure rise due to an internal fault to a very safe level without the need of a rupture disk.