REPORT OF APPLICANTS AND ISO-NEW ENGLAND
REGARDING 2/14/05 TECHNICAL MEETING

The Connecticut Light and Power Company and The United Illuminating Company (together, the "Companies") and ISO New England Inc. ("ISO-NE") submit this report to the Connecticut Siting Council ("Council") regarding the February 14, 2005 technical meeting in Docket No. 272. As requested by the Council, this report identifies (1) the issues addressed at the technical meeting; (2) the areas of agreement between the Companies/ISO-NE and the Council's consultant, KEMA; and (3) the areas of potential disagreement between the Companies/ISO-NE and KEMA.

The Issues Addressed at the Technical Meeting

The issues for the technical meeting were framed in the January 18, 2005 KEMA white paper, entitled "Observations on the Reliability and Operability Committee's Final Report." The KEMA white paper notes that there were four key findings of the December 20, 2004 Final Report of the Reliability and Operability Committee ("ROC Group"):

> "1. Options including either 13 miles or 24 miles of underground cable between Norwalk and Devon are acceptable
>
> 2. Additional undergrounding beyond 24 miles is not feasible
>
> 3. Neither C-Type filters or other types of mitigation will help
>
> 4. VSC HVDC solutions are not feasible for the SWCT system."

The KEMA white paper agreed with findings 1 and 4, and stated that findings 2 and 3 were not directly supported in the Final Report. The issues identified in the KEMA white paper formed the basis for further analysis and explanation by the Companies and ISO-NE, as well as the basis for the technical meeting discussion. The technical meeting also afforded an opportunity to

assure a common understanding of study cases and results. Based on the technical meeting, it appears that the areas of agreement have increased, and the areas of disagreement have narrowed.

Areas of Agreement between the Companies/ISO-NE and KEMA

The Companies and ISO-NE believe that there is agreement with KEMA as to several fundamental technical issues:

1. **Options including 13 miles or 24 miles of underground cable between Norwalk and East Devon are technologically feasible.**

2. **Adding 10 or 20 miles to the 24 mile option is not technologically feasible.**

3. **Although computer modeling suggests that C-Type filters could be effective in mitigating temporary overvoltages ("TOVs") and therefore could conceptually enable some additional undergrounding beyond the Companies' proposed 24 miles, C-Type filters have never been used to mitigate TOVs and whether or not the risk of using them in this application is acceptable presents a question of engineering judgment.**

4. **VSC HVDC is not feasible for the SWCT system.**

The Companies and ISO-NE also believe that there is agreement with KEMA as to several supporting technical issues:

1. Establishing a safety margin of 0.25 per unit for TOVs and equipment withstand capability is appropriate and reasonable.

2. The potential for high TOVs increases with the amount of cable (capacitance) as the linear miles of underground cable increases from 24 miles.

    - EnerNex modeled 1,776 configurations for each extension case in addition to the base 24 mile case, for a total of 7,104 cases. This resulted in evaluating approximately 71,000 measured points (each case includes evaluation of 10 points).
    - For the 24 mile option, at 2 cycles there were 134 instances where TOVs were into the safety margin of 1.6 – 1.8 per unit, and no instances where a TOV exceeded the equipment capability (more than 1.8 per unit). In contrast, for the 24 + 5 mile option, there were 195 instances where TOVs were into the safety margin, and were at higher levels than for the 24 mile option; and 15

instances where TOVs exceeded the equipment capability, 4 of which were greater than 2.0 per unit. The trend continued, with increasing numbers of high TOVs for the 24 + 10 mile and 24 + 20 mile cases.

- The TOVs at 2 cycles for the 24 +5 mile case included TOVs at all load levels, including TOVs exceeding equipment capability at both 30% and 40% load.
- EnerNex did not perform analysis with zero load, and did not consider high system voltages associated with black start restoration efforts.

3. In order to maximize the amount of underground cable, the Companies have revised their original proposal to include:

   - The use of XLPE cable.
   - Replacement of surge arresters.
   - Use of 500kV equipment at substations.
   - Procedures to operate only one HPFF cable in the Bethel to Norwalk line under most conditions.

4. C-Type filters have not been used in other installations to mitigate TOVs.

5. GE investigated improved tuning and deployment of the C-Type filters, for purposes of computer modeling of the potential impact on TOVs.

   - 4x50 MVAR C-Type filters tuned at 1.9 pu of 60 Hz were placed at Plumtree, Norwalk, Singer, and East Devon 345kV.
     - GE's modeling results for the improved C-Type filters indicated that, on paper, the C-Type filters reduced maximum TOV levels. Based upon the more than 650 cases as in Table 8 of the GE report in Appendix D of the December 20, 2004 ROC Report, the GE comparison of maximum TOVs for the 24 mile case is:

	Including Rocky River 115kV		Excluding Rocky River 115kV	
	2 CY	6 CY	2 CY	6 CY
Without C filters	1.66	1.66	1.66	1.47
With C filters	1.54	1.54	1.35	1.31

6. C-Type filters may appropriately be considered for use in a test application to mitigate local TOV problems, such as at Rocky River or Stony Hill. C-Type filters may also appropriately be considered in the future at Ansonia, Hawthorne or Bunker Hill if capacitor banks are added at these substations.

   - These are non-critical applications, where failure of the C-Type filters would not have drastic system-wide consequences.

- Experience gained in these applications can be useful in evaluating the use of C-Type filters in the future.

7. Gas insulated transmission lines are not feasible for the SWCT system.

Areas of Potential Disagreement between the Companies/ISO-NE and KEMA

The Companies and ISO-NE believe additional miles of underground cable, beyond the 24 linear miles of XLPE cable proposed between East Devon and Norwalk substations, are not technologically feasible. The KEMA white paper had identified KEMA's interest in reviewing more extensive information supporting the conclusions in the December 2004 Final ROC report. Mr. Gunther of EnerNex provided data on TOVs for the 24 mile case, and for the addition of 5, 10, and 20 miles. Ms. Pratico of GE provided information on the evaluation of C-Type filters for reducing TOVs.

At the end of the technical meeting, Mr. Wakefield of KEMA stated that 5 miles of additional underground cable beyond the proposed 24 miles may be acceptable with some mitigation, but questioned whether it is advisable to do so given that he shares and understands the risks and concerns of using C-Type filters for an application for which they have never been used. The risks associated with reliance on C-Type filters and the consequences of failure, the fact that there is no prior experience anywhere in the world in using C-Type filters to mitigate TOVs, and the additional EnerNex modeling results regarding increasing TOVs associated with increasing lengths of underground cable (see areas of agreement, above) are significant considerations. Because Mr. Wakefield stated in his closing remarks that KEMA would be considering this further, the Companies and ISO-NE are not sure whether KEMA agrees that as a matter of engineering judgment, no more that 24 miles of cable should be installed. The Companies and ISO-NE have therefore listed this as an area of *potential* disagreement.