



# STATE OF CONNECTICUT

## CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051

Phone: (860) 827-2935 Fax: (860) 827-2950

E-Mail: [siting.council@po.state.ct.us](mailto:siting.council@po.state.ct.us)

[www.ct.gov/csc](http://www.ct.gov/csc)

February 11, 2005

TO: Parties and Intervenors

FROM: S. Derek Phelps, Executive Director

RE: **DOCKET NO. 272** - The Connecticut Light and Power Company and The United Illuminating Company application for a Certificate of Environmental Compatibility and Public Need for the construction of a new 345-kV electric transmission line and associated facilities between the Scovill Rock Switching Station in Middletown and the Norwalk Substation in Norwalk, Connecticut. This includes construction of the Beseck Switching Station in Wallingford, East Devon Substation in Milford, and Singer Substation in Bridgeport and modifications to the Scovill Rock Switching Station and the Norwalk Substation and certain interconnections.

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Attached please find a submission by KEMA, Inc. of the Comparison of TOVs after 2 cycles and 6 cycles for Selected EnerNex Transient Switching Study Cases, extracted from the ROC Report. Participants of the technical meeting scheduled for Monday, February 14, 2005 should review this material and be prepared to discuss this data.

Also, please be advised that at a public meeting of the Connecticut Siting Council (Council) held on February 11, 2004, the Council considered and approved the request from Attorney Peter Boucher and Attorney General Richard Blumenthal to have a transcript made of the technical meeting to be held on February 14, 2005.

SDP/FOC

Enclosure

# **Comparison of TOVs after 2 cycles and 6 cycles for Selected EnerNex Transient Switching Study Cases**

Prepared by KEMA Inc. for Connecticut Siting Council

February 14, 2005

## **Scenarios included in comparison:**

### 1. Case 5: Case 5 with no extra cable

- Case 5 – Case 5 at 30, 40, 50 and 70% load Base system strength
- Case5-EQ8-C2 – Case 5 at 40, 50 and 70% load 80% system strength and extra capacitors

### 2. Case 5A: Case 5 with 20 miles of additional cable

- Case 5A – Case 5A at 30, 40, 50 and 70% load and full system strength
- Case5A-EQ8-C2 – Case 5A at 30, 40, 50 and 70% load 80% system strength and extra capacitors

### 3. Case 5B: Case 5 with 5 miles of additional cable

- Case 5B – Case 5B at 30, 40, 50 and 70% load and full system strength
- Case5B-EQ8-C2 – Case 5B at 30, 40, 50 and 70% load 80% system strength and extra capacitors

### 4. Case 5C: Case 5 with 10 miles of additional cable

- Case 5C – Case 5C at 30, 40, 50 and 70% load and full system strength
- Case5C-EQ8-C2 – Case 5C at 30, 40, 50 and 70% load 80% system strength and extra capacitors

**Table 1 - Comparison of Selected EnerNex Transient Switching Study Results**

**a. Maximum TOV (> 1.60)- 2 Cycle**

Base Case

| Case No. | 5    | 5B    | 5C     | 5A     |
|----------|------|-------|--------|--------|
|          | 0 mi | +5 mi | +10 mi | +20 mi |
| 30%      | 1.79 | 1.73  | 1.64   | 2.03   |
| 40%      | 1.72 | 1.65  | None   | 1.84   |
| 50%      | None | None  | None   | None   |
| 70%      | 1.83 | 1.71  | 1.64   | None   |

Reduced System Strength plus Extra capacitors

| Case No. | 5    | 5B(alt load) | 5C (alt load) | 5A     |
|----------|------|--------------|---------------|--------|
|          | 0 mi | +5 mi        | +10 mi        | +20 mi |
| 30%      | None | 1.66         | 1.95          | 2.07   |
| 40%      | None | 1.61         | 1.83          | 1.87   |
| 50%      | None | None         | 1.71          | 1.72   |
| 70%      | 1.76 | None         | None          | None   |

**b. Maximum TOV (> 1.55) - 6 Cycle**

Base Case

| Case No. | 5    | 5B    | 5C     | 5A     |
|----------|------|-------|--------|--------|
|          | 0 mi | +5 mi | +10 mi | +20 mi |
| 30%      | 1.59 | None  | None   | 1.66   |
| 40%      | None | None  | None   | None   |
| 50%      | None | None  | None   | None   |
| 70%      | None | None  | None   | None   |

Reduced System Strength plus Extra capacitors

| Case No. | 5    | 5B(alt load) | 5C(alt load) | 5A     |
|----------|------|--------------|--------------|--------|
|          | 0 mi | +5 mi        | +10 mi       | +20 mi |
| 30%      | N/A  | None         | 1.69         | 1.65   |
| 40%      | None | None         | 1.59         | None   |
| 50%      | None | None         | None         | None   |
| 70%      | None | None         | None         | None   |

**c. Maximum TOV - 2 Cycle/6 Cycle Voltage**

Base Case

|            | 2C   | 6C   | 2C    | 6C    | 2C     | 6C     | 2C     | 6C     |
|------------|------|------|-------|-------|--------|--------|--------|--------|
| Case No.   | 5    | 5    | 5B    | 5B    | 5C     | 5C     | 5A     | 5A     |
| Load level | 0 mi | 0 mi | +5 mi | +5 mi | +10 mi | +10 mi | +20 mi | +20 mi |
| 30%        | 1.79 | 1.51 | 1.73  | 1.53  | 1.64   | 1.50   | 2.03   | 1.66   |
| 40%        | 1.72 | 1.46 | 1.65  | 1.48  | None   | N/A    | 1.84   | 1.52   |
| 50%        | None | N/A  | None  | N/A   | None   | N/A    | None   | N/A    |
| 70%        | 1.83 | 1.46 | 1.71  | 1.40  | 1.64   | 1.40   | None   | N/A    |

Reduced System Strength plus Extra capacitors

|            | 2C   | 6C   | 2C           | 6C           | 2C           | 6C           | 2C     | 6C     |
|------------|------|------|--------------|--------------|--------------|--------------|--------|--------|
| Case No.   | 5    | 5    | 5B(alt load) | 5B(alt load) | 5C(alt load) | 5C(alt load) | 5A     | 5A     |
| Load level | 0 mi | 0 mi | +5 mi        | +5 mi        | +10 mi       | +10 mi       | +20 mi | +20 mi |
| 30%        | None | N/A  | 1.66         | 1.46         | 1.95         | 1.68         | 2.07   | 1.65   |
| 40%        | None | N/A  | 1.61         | 1.29         | 1.83         | 1.57         | 1.87   | 1.53   |
| 50%        | None | N/A  | None         | N/A          | 1.71         | 1.50         | 1.72   | 1.37   |
| 70%        | 1.76 | 1.48 | None         | N/A          | None         | N/A          | None   | N/A    |

Table 2 - TOVs that Exceed Threshold after 2 Cycles by Substation

| File   | SWITCHING EVENT |                  | SYSTEM CONDITIONS |      |             |             | TOV 2 C > 1.60 |       |       |       |       |       |       |       |       |       |   |
|--------|-----------------|------------------|-------------------|------|-------------|-------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---|
|        | TYPE            | LOCATION         | LOAD LEVEL        | CAPS | SHUNT REACS | LINE OUT    | PT345          | PT115 | NW345 | NV115 | ED345 | BK345 | ESHOR | FB115 | STONY | ROCKY |   |
| BC-5   | Phase           | East Devon       | 30                | 0    | 500         |             |                |       |       |       | 1.63  |       |       |       |       |       |   |
| BC-5   | Phase B         | Norwalk 345      | 30                | 0    | 500         | PT345-LM34  | 1.63           | 1.61  | 1.68  |       | 1.67  |       |       |       | 1.64  |       |   |
| BC-5   | Phase           | Norwalk Junction | 30                | 0    | 500         | BK345-ED34  |                |       | 1.78  |       | 1.79  |       |       |       |       |       |   |
| BC-5   | Phase B         | Norwalk 345      | 30                | 0    | 500         | BK345-ED34  |                |       |       |       | 1.64  |       |       |       |       |       |   |
| BC-5   | Phase B         | Norwalk 345      | 30                | 0    | 500         | LM345-PLVF  |                |       | 1.66  |       | 1.68  |       |       |       |       |       |   |
| BC-5B  | Phase           | Norwalk Junction | 30                | 0    | 500         |             |                |       | 1.67  |       | 1.65  |       |       |       |       |       |   |
| BC-5B  | Phase           | Norwalk Junction | 30                | 0    | 500         | PT345-LM34  |                |       | 1.62  |       | 1.62  |       |       |       |       |       |   |
| BC-5B  | Phase           | Singer           | 30                | 0    | 500         | BK345-ED34  | 1.65           |       | 1.70  |       | 1.73  |       |       |       |       |       |   |
| BC-5B  | Phase           | Norwalk Junction | 30                | 0    | 500         | LM345-PLVA  |                |       | 1.64  |       | 1.66  |       |       |       |       |       |   |
| BC-5B  | Phase           | Singer           | 30                | 0    | 500         | LM345-PLVA  |                |       | 1.70  |       | 1.67  |       |       |       |       |       |   |
| BC-5B  | Phase           | Norwalk 345      | 30                | 0    | 500         | LM345-PLVA  |                |       | 1.69  |       | 1.73  |       |       |       |       |       |   |
| BC-5C  | Phase           | Norwalk Junction | 30                | 0    | 650         | BK345-ED34  |                |       | 1.62  |       | 1.64  |       |       |       |       |       |   |
| BC-5A  | Phase           | East Devon       | 30                | 0    | 920         | PT345-LM34  | 1.62           |       | 1.66  |       | 1.65  |       |       |       |       |       |   |
| BC-5A  | Phase           | Plumtree         | 30                | 0    | 920         | BK345-ED34  |                |       |       |       | 1.61  |       |       |       |       |       |   |
| BC-5A  | Phase           | Norwalk Junction | 30                | 0    | 920         | BK345-ED34  |                |       | 2.01  |       | 2.03  |       |       |       |       |       |   |
| BC-5A  | Phase           | East Devon       | 30                | 0    | 920         | LM345-PLVA  |                |       | 1.61  |       | 1.61  |       |       |       |       |       |   |
| RSX-5B | Phase           | Singer           | 30                | 0    | 500         |             |                |       | 1.65  |       | 1.64  |       |       |       |       |       |   |
| RSX-5C | Phase           | East Devon       | 30                | 0    | 650         |             |                |       |       |       | 1.66  |       |       |       |       |       |   |
| RSX-5C | Phase           | East Devon       | 30                | 0    | 650         | PT345-LM34  | 1.80           | 1.76  | 1.88  |       | 1.84  |       |       |       | 1.78  | 1.67  |   |
| RSX-5C | Phase           | Plumtree         | 30                | 0    | 650         | BK345-ED34  | 1.69           | 1.69  | 1.75  |       | 1.76  |       |       |       | 1.69  | 1.63  |   |
| RSX-5C | Phase           | Norwalk Junction | 30                | 0    | 650         | BK345-ED34  |                |       | 1.95  |       | 1.89  |       |       |       |       |       |   |
| RSX-5C | Phase           | East Devon       | 30                | 0    | 650         | NE138-NOT13 |                |       |       |       | 1.66  |       |       |       |       |       |   |
| RSX-5C | Phase           | East Devon       | 30                | 0    | 650         | LM345-PLVA  |                |       | 1.64  |       | 1.62  |       |       |       |       |       |   |
| RSX-5A | Phase           | East Devon       | 30                | 0    | 920         | PT345-LM34  |                |       | 1.67  |       | 1.65  |       |       |       |       |       |   |
| RSX-5A | Phase           | Plumtree         | 30                | 0    | 920         | BK345-ED34  |                |       |       |       | 1.61  |       |       |       |       |       |   |
| RSX-5A | Phase           | Norwalk Junction | 30                | 0    | 920         | BK345-ED34  | 1.61           |       | 2.03  |       | 2.07  |       |       |       |       |       |   |
| RSX-5A | Phase           | East Devon       | 30                | 0    | 920         | LM345-PLVA  |                |       | 1.69  |       | 1.69  |       |       |       |       |       |   |
| RSX-5A | Phase           | Norwalk Junction | 30                | 0    | 500         | BK345-ED34  |                |       | 1.72  |       | 1.72  |       |       |       |       |       |   |
| BC-5   | Phase           | Norwalk Junction | 40                | 0    | 500         | PT345-LM34  |                |       | 1.62  |       | 1.65  |       |       |       |       |       |   |
| BC-5B  | Phase           | Singer           | 40                | 0    | 500         | LM345-PLVA  |                |       |       |       | 1.63  |       |       |       |       |       |   |
| BC-5A  | Phase           | Norwalk Junction | 40                | 0    | 920         | BK345-ED34  |                |       | 1.81  |       | 1.84  |       |       |       |       |       |   |
| RSX-5B | Phase           | Singer           | 40                | 0    | 500         |             |                |       |       |       | 1.61  |       |       |       |       |       |   |
| RSX-5C | Phase           | East Devon       | 40                | 0    | 650         | NW345       |                |       | 1.62  |       | 1.79  |       |       |       |       |       |   |
| RSX-5C | Phase           | Norwalk Junction | 40                | 0    | 650         | NW345       |                |       | 1.83  |       | 1.87  |       |       |       |       |       |   |
| RSX-5A | Phase           | Norwalk Junction | 40                | 0    | 920         | BK345-ED34  |                |       | 1.83  |       | 1.71  |       |       |       |       |       |   |
| RSX-5C | Phase           | Norwalk Junction | 50                | 434  | 840         | BK345-ED34  |                |       | 1.68  |       | 1.65  |       |       |       |       |       |   |
| RSX-5A | Phase           | Norwalk Junction | 50                | 434  | 1110        | BK345-ED34  |                |       | 1.72  |       | 1.65  |       |       |       |       |       |   |
| BC-5   | Phase           | Singer           | 70                | 1249 | 900         |             |                |       |       |       |       |       |       |       |       | 1.64  |   |
| BC-5   | Phase           | Norwalk Junction | 70                | 1249 | 900         | PT345-LM34  |                |       |       |       |       |       |       |       |       | 1.83  |   |
| BC-5B  | Phase           | Norwalk Junction | 70                | 1249 | 900         | PT345-LM34  |                |       |       |       |       |       |       |       |       | 1.71  |   |
| BC-5C  | Phase           | Norwalk Junction | 70                | 1249 | 1050        | PT345-LM34  |                |       |       |       |       |       |       |       |       | 1.64  |   |
| RSX-5  | Phase           | Norwalk Junction | 70                | 1382 | 900         | PT345-LM34  |                |       |       |       |       |       |       |       |       | 1.76  |   |
|        |                 |                  |                   |      |             |             | No. of TOVs:   | 6     | 3     | 30    | 2     | 33    | 0     | 5     | 0     | 3     | 7 |

Table 3 - TOVs that Exceed Threshold after 6 Cycles by Substation

| File   | SWITCHING EVENT |                  | SYSTEM CONDITIONS |      |       |            |      | TOV 6 C > 1.55 |      |      |       |       |      |       |      |      |
|--------|-----------------|------------------|-------------------|------|-------|------------|------|----------------|------|------|-------|-------|------|-------|------|------|
|        | TYPE            | LOCATION         | LOAD              | CAPS | SHUNT | LINE OUT   | P    | PT115          | NW34 | NW11 | ED345 | BK345 | ESHO | FB115 | STON | ROCK |
| BC-5   | Phase           | East Devon       | 30                | 0    | 500   |            |      |                |      |      |       |       |      |       |      |      |
| BC-5   | Phase Br        | Norwalk 345      | 30                | 0    | 500   | PT345-LM34 |      | 1.57           |      |      | 1.59  |       |      |       |      |      |
| BC-5   | Phase Br        | Norwalk 345      | 30                | 0    | 500   | LM345-PLVF |      |                |      |      | 1.56  |       |      |       |      |      |
| BC-5A  | Phase           | Norwalk Junction | 30                | 0    | 920   | BK345-ED34 |      | 1.63           |      |      | 1.66  |       |      |       |      |      |
| BC-5A  | Phase           | East Devon       | 30                | 0    | 920   | LM345-PLVA |      |                |      |      |       |       |      |       |      |      |
| RSX-5C | Phase           | East Devon       | 30                | 0    | 650   | PT345-LM34 | 1.58 |                |      |      |       |       |      |       | 1.57 |      |
| RSX-5C | Phase           | Plumtree         | 30                | 0    | 650   | BK345-ED34 |      |                |      |      | 1.56  |       |      |       |      |      |
| RSX-5C | Phase           | Norwalk Junction | 30                | 0    | 650   | BK345-ED34 |      | 1.68           |      |      | 1.69  |       |      |       |      |      |
| RSX-5C | Phase           | East Devon       | 30                | 0    | 650   | LM345-PLVA |      |                |      |      |       | 1.57  |      |       |      |      |
| RSX-5A | Phase           | Norwalk Junction | 30                | 0    | 920   | BK345-ED34 |      | 1.63           |      |      | 1.65  |       |      |       |      |      |
| RSX-5C | Phase           | Norwalk Junction | 40                | 0    | 650   | NW345      |      | 1.57           |      |      | 1.59  |       |      |       |      |      |
| BC-5C  | Phase BU        | Plumtree 345     | 70                | 1249 | 1050  |            |      |                |      |      |       |       |      |       |      | 1.57 |

No. of TOVs: 0 1 5 0 7 0 1 0 1 1