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April 18, 2006

Mr. S. Derek Phelps
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: DOCKET NO. F2006 – Connecticut Siting Council Review of the Ten-Year Forecast of Connecticut Electric Loads and Resources

Dear Mr. Phelps:

The United Illuminating Company (UI) hereby submits an original and twenty (20) copies to the Connecticut Siting Council's Interrogatories, CSC 1, 2, 3, 4, 5 and 6, in the above referenced docket.

Respectfully submitted,

THE UNITED ILLUMINATING COMPANY

by [signature]
Michael A. Coretto.
Director – Regulatory Strategy & Retail Access

MAC
Enclosures

/Service List

Interrogatory CSC-1

The United Illuminating Company
Docket CSC F-2006

Witness: Michael A. Coretto

Q-CSC-1: Compare and discuss the historical 10-year change to the ten-year forecast for both the system requirements and peaks.

A-CSC-1: As shown in Exhibits 1 and 2, UI's ten-year change in system requirements has been 12.6%. This is an average annual percentage change of about 1.2% per year. UI's peak load over this same time frame (1995 – 2005) has increased by 16.3%, or about 1.6% per year.

It is difficult, however, to draw conclusions from this historical trend. Just one year ago, similar data showed that the energy consumption grew at 9.8% over the 1994-2004 ten-year period while the peak load increased by 6.4%.

This year's reported changes are much different than the ten-year change in last year's report, but both continue to demonstrate the sensitivity of UI's peak load to extreme weather. When extreme weather occurs for several consecutive days, UI's peak load increases substantially. A few extreme weather days in a row will dramatically increase UI's peak load, but will not have a dramatic effect on the annual sales or system requirements. However, increased customer consumption due to home size or lifestyle changes would increase the sales (or system requirements) and have a smaller impact on the peak load.

Q-CSC-2: List the technologies that the United Illuminating Company (UI) has in place to monitor and communicate voltage fluctuations? Identify those transmission system conditions and actions to maintain and protect the grid and customers.

A-CSC-2: UI has a number of devices and systems for monitoring and communicating voltage conditions including: SCADA, Power Quality Monitors, Digital Fault Recorders and Dynamic Swing Recorders and Digital Recording Meters. Each device is described below.

The UI Supervisory Control and Data Acquisition (SCADA) system is a computer based system. Remote Terminal Units (RTUs) in each transmission substation and each 115 kV/13.8 kV distribution substation monitor voltage continuously. These RTUs are polled on a rotating basis by the SCADA Master Station at UI's System Operations Center in Shelton. Each RTU is polled typically every 3 – 5 seconds and changes in voltage are reported back to the Master Station. The Master Station alerts the UI System Operators if the voltages exceed the alarm limits set for each substation. This system also similarly monitors and records line currents and system frequency.

The Power Quality Monitors monitor the voltage on the 13.8 kV buses in each 115 kV/13.8 kV distribution substation. These monitors continuously sample the voltage at a very high sample rate (approximately 6000 times a second) and record a minimum, maximum and average value once per minute. These monitors also trigger additional, more detailed recordings if the voltages or harmonic distortion exceeds preset limits. This monitoring system also similarly records substation currents and system frequency. These power quality monitors are polled on a rotating basis continually throughout the day via modem connections.

Digital Fault Recorders (DFRs) have been installed in selected transmission substations. These devices will trigger and start recording transmission system disturbances such as faults (short circuits). The recordings are triggered on high current and/or low voltage. The sampling and recording rate on these recordings is very high (typically 6000 times a second). Typical record lengths range from less than one second to two to three seconds.

Dynamic Swing Recorders (DSRs) have also been installed in selected transmission substations. These devices are similar to digital fault recorders except the sampling and recording rates are slower (typically 600 times a second), and the recording lengths are longer (several minutes). These devices only record when triggered and are triggered by voltage or frequency deviations outside preset limits.

Both the DFRs and DSRs are polled continually throughout the day and upon activation send an alarm through the UI SCADA system.

Some 13.8 kV distribution feeders have been equipped with digital recording meters that record voltage, current, MW and MVAr values, which are then stored in the UI SCADA system.

UI has a number of systems in place to take action in response to abnormal or undesirable system conditions.

Each system element (transmission line, transformer, distribution circuit, etc.) is protected by protective relay schemes which are designed to detect faults or short circuits and to trip circuit breakers to isolate those faults. These protective relay schemes are designed to be sensitive enough to isolate the faulted element as quickly as possible while being selective enough to isolate only the faulted element and to limit the extent of the outage.

UI also has a Northeast Power Coordinating Council (NPCC) mandated Underfrequency Load Shedding Scheme. This scheme functions to automatically shed load if the system frequency falls below preset levels. Normal system frequency is 60 Hertz. The Underfrequency Load Shedding Scheme will shed an aggregate load among all of the UI 115 kV/13.8 kV distribution substations of 10 percent of UI's total load if the frequency falls to 59.3 Hertz and will shed an additional aggregate load of 15 percent of UI's total load if the frequency falls below 58.8 Hertz. The purpose of this load shedding scheme is to balance load and generation if a system disturbance should occur that results in a significant sudden imbalance of load and generation within which generation is deficient. This load imbalance is most likely to occur if the interconnected transmission system were to separate into smaller islands.

In addition, this same load shedding scheme includes the ability to manually shed up to 50 percent of UI's total load, in aggregate, among all 115 kV/13.8 kV distribution substations. This load shedding can be initiated by the UI System Operations Center via SCADA. This feature of the scheme is also mandated by NPCC and is designed to match load with available generation in an attempt to maintain a portion of the interconnected transmission system, rather than experience a total system outage. This manual load shedding would only be initiated at the direction of or with permission from ISO-NE through CONVEX.

UI also has an ISO-NE mandated voltage reduction scheme. This scheme may be initiated by the UI System Operator at the direction of ISO-NE to reduce system voltage by five percent. This reduces system load and is used to compensate for generation deficiencies at peak load periods.

In order to maintain system voltages at acceptable levels, UI also has 115 kV capacitor banks which are controlled automatically through local monitoring and control equipment and manually through SCADA. In addition, UI can control 115 kV transmission voltages by changing tap position on Load Tap Changing (LTC) 345 kV/115 kV autotransformers. UI also has a Power Factor Correction (PFC) program integral to its SCADA system which automatically switches 13.8 kV substation and pole-top mounted capacitors to maintain near unity power factor at the 13.8 kV bus level. This PFC software program supports the 13.8 kV distribution voltages and the 115 kV transmission voltages by reducing the reactive power losses on the distribution and transmission system. Both the capacitors and LTC autotransformers are used on a daily basis to fine tune system voltage and are not intended for nor are they sufficient tools for response to major system disturbances.

Generation (UI owns no generation) interconnected to the transmission system also has a responsibility to maintain system target voltages on an ongoing basis at the buses to which they are connected. CONVEX has the authority to order a generator to vary the generator's real and reactive power output in order to maintain a specific transmission bus voltage level.
IS THE REST OF THIS ANSWER NEEDED?

The following is a list of NPCC, ISO-NE and UI criteria, procedures and guides that apply to maintaining system voltage and frequency.

NPCC Criteria

A-03 Emergency Operating Procedure

A-06 Operating Reserve Criteria

A-11 Special Protection System Criteria

NPCC Guides

B-03 Guidelines for Inter-Area Voltage Control

B-07 Automatic Underfrequency Load Shedding Program Relaying Guideline

NPCC Procedures

C-04 Monitoring Procedure for Guidelines for Inter-Area Voltage Control

C-06 Monitoring Procedures for Emergency Operation Criteria

C-11 Monitoring Procedures for Interconnected System Frequency Response

C-20 Procedure During Abnormal Operating Conditions

ISO-NE Master Satellite Procedure

MS-02 Abnormal Conditions Alert

NEPOOL Operating Procedures

NOP-4 Action During a Capacity Deficiency

NOP-6 System Restoration

NOP-7 Action in an Emergency

NOP-12 Voltage and Reactive Control

NOP-13 Standards for Voltage Reduction and Load Shedding Capability

UI Operating Procedures

OP-D22 Radio Controlled Capacitor Banks Power Factor Control Program

OP-E02 Load Reduction by Voltage Reduction

OP-E04 Action During a Capacity Deficiency

OP-E06 Restoration of the UI System After a Blackout

OP-E07 Emergency Load Relief

OP-E08 Voluntary Load Curtailment – UI Company

OP-E17 Voluntary Load Curtailment – Large Customers

OP-E19 Transmission System Emergency Overload Protection Scheme New Haven Harbor Runback

OP-E25 Transmission Line Loading Bridgeport Harbor Runback Special Protection Scheme

OP-E33 Radio and TV Appeals for Voluntary Load Curtailment

OP-E39 Ansonia Substation – 1570 Line Overhead

Interrogatory CSC-3

The United Illuminating Company
Docket CSC F-2006

Witness: Pat McDonnell

Q-CSC-3: Estimate the total number of megawatts of load reduction for UI's territory due to the Conservation and Load Management (C&LM) program for each year from 2006 through 2015. (The number of megawatts for each year would be the sum of the existing and projected C&LM effects.)

A-CSC-3: The forecast demand reduction for Conservation Program years 2006-2016 is shown in the Table below:

Year	Forecast Summer Peak Demand Reduction MW	Cumulative Forecast Summer Peak Demand Reduction MW
2006	9.00	9.00
2007	9.05	18.05
2008	9.13	27.18
2009	9.16	36.34
2010	9.22	45.56
2011	11.16	56.72
2012	13.16	69.88
2013	13.20	83.08
2014	13.29	96.37
2015	13.36	109.73
2016	13.48	123.21

Interrogatory CSC-4

The United Illuminating Company — Witness: Pat McDonnell
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Q-CSC-4: Describe any new and/or innovative C&LM energy savings measures that UI has recently put into use or is considering.

A-CSC-4: A significant effort in the residential area is now being focused on central air conditioning systems. There can be large numbers of these units operating during the summer peak. Studies have shown that many of these systems may not have been properly installed, or may have leaky ductwork, dirty filters, too much or too little refrigerant, or other problems. Significant savings can result from tuning up these systems. This summer, UI's trade allies in the HVAC contractor community are projected to perform thousands of system tune-ups using Federally Mandated Congestion Charge (FMCC) mitigation funding as described in DPUC docket 05-07-14PH1.

Since studies have shown that leakage from residential air distribution duct work is very common, and in many cases may be as high as 30%, there may be significant opportunity in this area. Measuring leakage and sealing existing ductwork is not a straightforward matter, so UI is now finalizing development of a pilot program for this summer to explore duct sealing opportunities and program logistics. If the pilot is successful, the program could be expanded later this year and/or in future years.

<u>Interrogatory CSC-5</u>

The United Illuminating Company
Docket CSC F-2006

Witness: Michael A. Coretto

Q-CSC-5: In Exhibit 1, is the normal weather system peak forecast based on a 50/50 scenario (i.e. the peak forecast has a 50 percent chance of being exceeded)? If no, approximately what is the probability of the peak being exceeded in a given year?

A-CSC-5: The normal weather forecast in Exhibit 1 is developed by taking the prior year's actual results (sales) and correcting, or normalizing, to account for the impacts of weather, based on historical weather patterns.

Since the weather conditions that are used are long term historical averages, the peak load forecast has a 50/50 chance of being exceeded based on the variability of weather. There are other variables that impact the sales and peak load forecast, such as economic conditions. These variables are not treated probabilistically in the development of the load forecast. This makes it difficult to determine a single probability for the load forecast that encompasses all variables.

Interrogatory CSC-6

The United Illuminating Company
Docket CSC F-2006

Witness: Michael A. Coretto

Q-CSC-6: In Exhibit 2, is the extreme weather system peak forecast based on a 90/10 scenario (i.e. the peak forecast has a 10 percent chance of being exceeded)? If no, approximately what is the probability of the peak being exceeded in a given year?

A-CSC-6: As in prior years, the extreme weather forecast shown in Exhibit 2 portrays a potential result of extreme weather. Taken together with the normal weather forecast of Exhibit 1, it forms a bandwidth of future load levels.

The extreme weather forecast was developed using a deterministic methodology as opposed to a probabilistic methodology. Historical weather effects were analyzed for the past 10 years and the year that yielded the largest variability due to weather was chosen as a proxy for the effects of extreme weather. As such, there is not a specific probability that can be assigned to the resulting peak and system requirements forecast.