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CONNECTICUT
SITING COUNCIL

June 20, 2005

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

Re: Docket No. F-2005 – Connecticut Siting Council Review of the Ten-Year Forecast of Connecticut Electric Loads and Resources

Dear Mr. Phelps:

The United Illuminating Company hereby submits an original and twenty (20) copies of its responses to the Council's Pre-Hearing Interrogatories 1, 2, 4 and 5. Copies have been sent to all persons on the service list for this proceeding.

Respectfully submitted,

THE UNITED ILLUMINATING COMPANY

by Michael A. Coretto (dc)
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Director – Regulatory Strategy &
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MAC

Response to Pre-Hearing Interrogatory Question 1

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

A – CSC- 1: As shown in Exhibits 1 and 2, UI's ten-year change in system requirements has been 9.8%. This is an average annual percentage change of about 0.94% per year. UI's peak load over this same time frame (1994 – 2004) has increased by 6.2%, or about 0.6% per year.

This historical trend would seem to indicate that the energy forecast is rising faster than the peak forecast. However, a closer look at the data shows that 2004 dramatically influences this relationship. As Exhibits 1 and 2 also show, the 2004 sales were 3.1% higher than 2003, but the 2004 peak was 5.8% *lower* than 2003. The sales growth experienced in 2004 has only been exceeded in 2 of the last 10 years.

This difference in ten-year change is somewhat different than the reported change in last years 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.

Response to Pre-Hearing Interrogatory Question 2

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 and Data Acquisition (SCADA) system is a computer based system. Remote Terminal Units (RTU's) in each transmission substation and each 115 kV/13.8 kV distribution substation monitor voltage continuously. These RTU's are polled on a rotating basis by the SCADA Master Station at UI's System Operations Center in Shelton. Each RTU is polled every 3 – 5 seconds typically 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 continuously 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 (DFR's) have been installed in selected transmission substations. These devices will trigger and start recording for 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 are very high, typically 6000 times a second. Typical record lengths range from less than one second to two to three seconds.

Dynamic Swing Recorders (DSR's) 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 DFR's and DSR's 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 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 amongst 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 amongst 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 again is designed for the purpose of matching 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.

Non-UI owned 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.

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

<u>NPCC Criteria</u>

A-03 Emergency Operating Procedure

A-06 Operating Reserve Criteria

A-11 Special Protection System Criteria

<u>NPCC Guides</u>

B-03 Guidelines for Inter-AREA Voltage Control

B-07 Automatic Underfrequency Load Shedding Program Relaying Guideline

<u>NPCC Procedures</u>

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

Response to Pre-Hearing Interrogatory Question 4

Q – CSC- 4: 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)? Explain.

A – CSC- 4: The normal weather forecast in Exhibit 1 developed by taking the prior year's actual results 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.

Response to Pre-Hearing Interrogatory Question 5

Q – CSC - 5: In Exhibit 2, is the extreme weather forecast based on a 90/10 scenario (i.e. the peak forecast has a 10 percent chance of being exceeded)? Explain.

A – CSC- 5: 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 possible 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 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.