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September 24, 2004

VIA HAND DELIVERY

Ms. Pamela Katz
Chairman
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06501

Re: Docket No. 272

Dear Chairman Katz:

Enclosed are the original and twenty (20) copies of the Direct Testimony of John Prete Concerning Magnetic Field Modeling.

Very truly yours,

Brian T. Henebry

BTH/da
Enclosure

cc: Service List

{W1319559}

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STATE OF CONNECTICUT

SITING COUNCIL

Re:	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 Scovill Rock Switching Station in Middletown and Norwalk Substation in Norwalk, Connecticut Including the Reconstruction of Portions of Existing 115-kV and 345-kV Electric Transmission Lines, the Construction of the Beseck Switching Station in Wallingford, East Devon Substation in Milford, and Singer Substation in Bridgeport, Modifications at Scovill Rock Switching Station and Norwalk Substation and the Reconfiguration of Certain Interconnections	)	Docket 272 September 24, 2004

DIRECT TESTIMONY OF JOHN PRETE
CONCERNING MAGNETIC FIELD MODELING

Q. Mr. Prete, please identify the purpose of this testimony.

A. In this testimony, I will explain why the Companies believe that the magnetic field modeling assumptions in the "15 GW Case" lead to the most appropriate representation of the magnetic fields that are associated with the existing overhead lines between Beseck and East Devon, and that are likely to be associated with the proposed lines between those points, under typical system conditions.

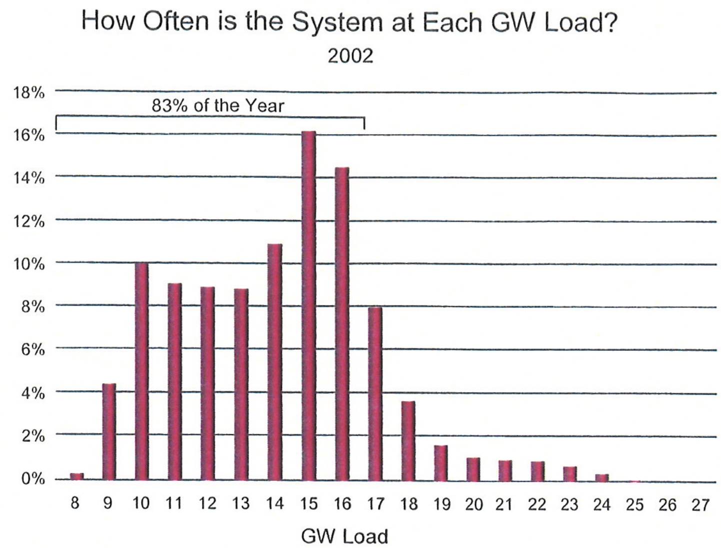
Q. Why does the "15 GW Case" fairly represent the magnetic fields that are associated with these existing lines, and that are likely to be associated with the proposed lines, under typical conditions?

A. Magnetic fields are produced by currents, which are measured in amperes. The currents on transmission lines, in turn, are predominantly determined by two factors: (1)

customer load ("demand") and (2) the generation dispatch to serve that load. The demand determines how much power must be generated for delivery to customers. The generation dispatch determines the sources from which the required amount of power is transmitted, and therefore both the magnitude and direction of the current on a given line. To model typical magnetic fields expected to be associated with a given line, you have to start with line currents that can fairly be said to be typical – that is, produced by conditions that can be expected to be present for enough of the time to be considered representative. Both the customer demand and the generation dispatch in the "15 GW case" are expected to be representative of conditions that exist most of the time.

15 GW New England Load

The starting point for the "15 GW Case" is a 15 GW system-wide New England load. This was the actual average load during 2002, which is the year in which the New England historic peak occurred. As shown in the figure below, the 15 GW value is not just an average number, but represents a load within a relatively narrow range in which the system operates most of the time. Minimum load and peak load conditions occur in only a small number of hours in the year. For the majority of the hours in the year, the load is below or, if above, fairly close to, the average load of 15 GW.



Generation Dispatch

The "15 GW Case" assumes that the only large generating units "on" in SWCT are Bridgeport Energy and Bridgeport Harbor, producing a total of 759 MW. Under average energy demand periods, much of the generation in SWCT is not economic. This generation dispatch represents an economic generation dispatch. While it might be considered "light" relative to the total installed capacity of 2,188 MW in SWCT, it is a reasonable assumption because it is economic. Of course, an assumption that more generation in SWCT was "on" would result in lower currents in the transmission lines serving SWCT and thus lower magnetic fields.

Q. Why isn't the "27.7 GW Case" a better reference than the "15 GW Case" for evaluating the magnetic fields that are likely to be associated with the existing and proposed lines under most conditions?

A. The 27.7 GW case does not represent typical or normal conditions, or even normal conditions that might exist in the distant future when the New England average load may have grown to 27.7 GW, nearly twice what it is today. The 27.7 GW case was developed in system planning to stress the system under an assumed peak load condition.

While the transmission system must be planned to perform reliably even if stressed by generation being unavailable at a time of peak load (in accordance with national and regional reliability standards), these are not typical conditions that could be expected to occur for a significant amount of time in a given year, if they occur at all.

Q. Why do you refer to the peak load as occurring "for an hour"?

A. That is the definition of a peak load. It is the highest hourly load that occurs in the course of an entire year.

Q. What do you mean by a generation dispatch that "stresses the system"?

A. The transmission system must be designed to serve expected peak loads with multiple generators assumed out of service in accordance with national and regional reliability standards. The planning technique of "stressing the system" assumes that multiple generators that would have been dispatched are unavailable. In order to design a robust transmission solution, ISO-NE's SWCT Working Group assumed, in its "Dispatch 2," that at peak load, multiple units within SWCT were unavailable, so that the only significant generation "on" is Devon 7, Devon 8, Milford 1, and Bridgeport Harbor 3 (a total of 867 MW out of a possible 2,188 MW.) As the Companies have previously testified, this is an appropriate assumption for planning purposes, because the system must be designed to operate even under conditions that have a low probability of occurring. It is not, however, appropriate to use this assumption to model typical or representative conditions, such as typical magnetic field levels.

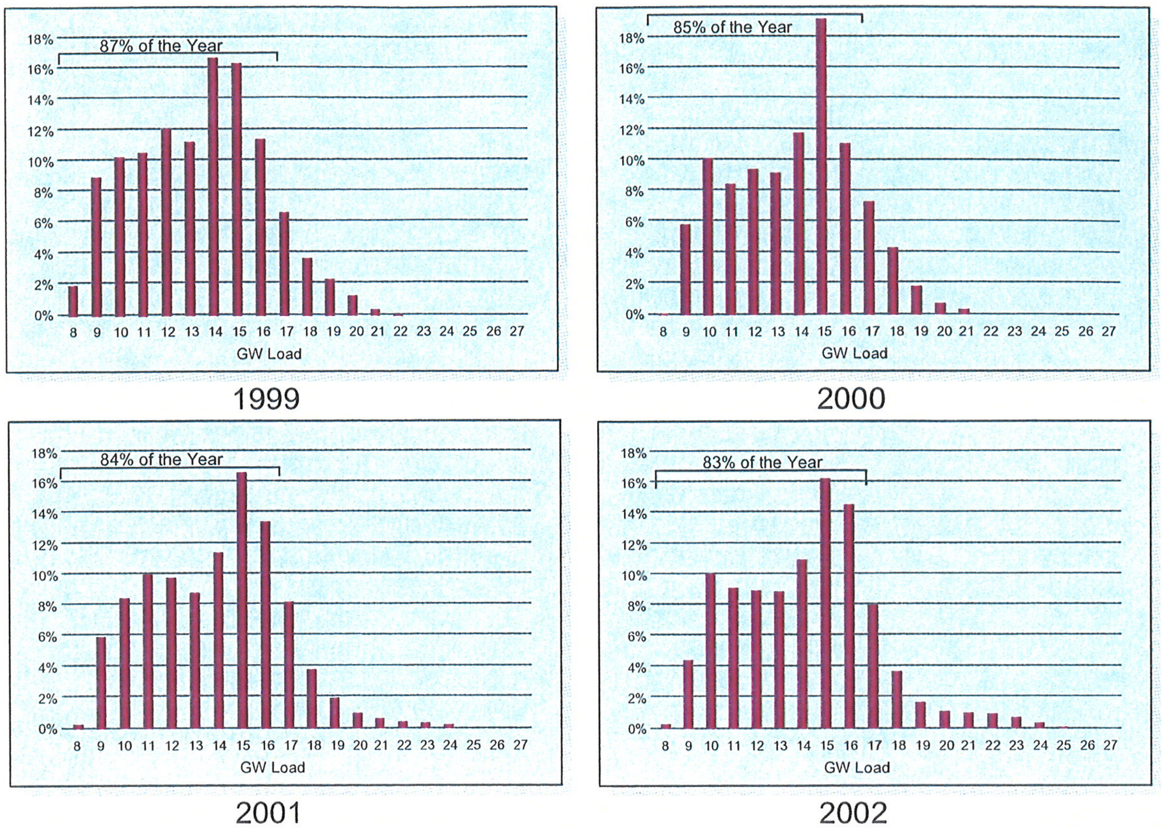
Q. How do the line currents in the "15 GW Case" compare to those in the "27.7 GW Case."

A. It is important to understand that the increase in the line currents (and thus in the magnetic fields) between the two "Cases" is not proportional to the difference between 15 GW and 27.7 GW. This is largely because of the differences in the assumed generation dispatches, as just explained, and increased transfers on the 1385 cable between Connecticut and Long Island. As stated in response to Q-W-M-O-005, the power on the proposed 345-kV line between Beseck and East Devon is 254 MVA (425 amps) in the "15 GW Case," but 896 MVA (1,500 amps) in the "27.7 GW Case". Comparing these two cases, the assumed New England load increases by 85%, but the current on the Beseck to East Devon lines is increased by 253%.

Q. So, the "15 GW Case" describes line currents, and therefore, magnetic fields that are representative of those that are likely to occur now and that will be likely to occur when the new lines are built. But the average load is going to grow, isn't it?

A. Yes. But this growth in average load is gradual, less than 2% per year. As the average load grows, it remains the case that for most hours in the year, the load is in a relatively narrow range that includes the 15 GW value. The following figures show the hourly distribution of loads for the years 1999 – 2002, and demonstrate the relatively small change in the range of energy load over the years.

How Often is the System at Each GW Load?



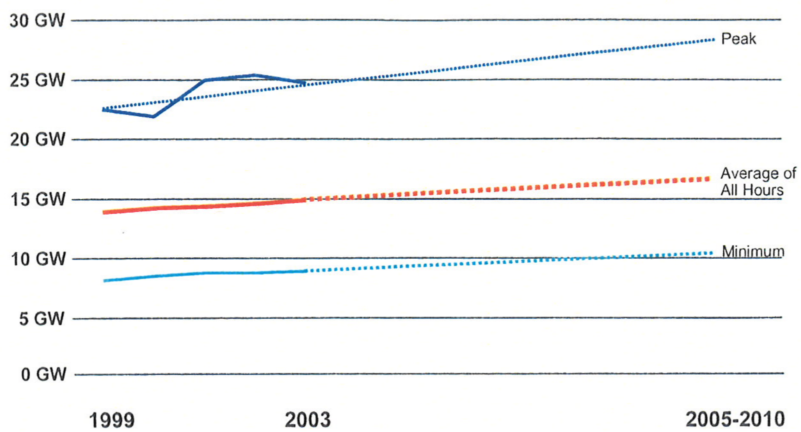
Q. When is the 27.7 GW peak predicted to occur?

A. The latest NEPOOL 2004-2013 Forecast Report of Capacity, Energy, Loads, and Transmission (2004 CELT Report) estimates that the 27.7 GW peak will more than likely occur by 2010. With extreme weather conditions, it could occur as early as 2005.

Q. What will the average load be when the 27.7 GW peak load occurs?

A. Extrapolating the historic curves for the growth of peak and average load, as shown in the figure below, suggests that when a New England peak load of 27.7 GW is reached, the average load would be about 16.8 GW.

System Load Over Five Years
With Extrapolation to Peak 27.7GW



Q. When is a 30.0 GW peak predicted to occur?

A. The 2004 CELT Report estimates that, with extreme weather conditions, this peak could occur by 2013. The occurrence of this peak under normal weather conditions is beyond the 2013 horizon of the report.

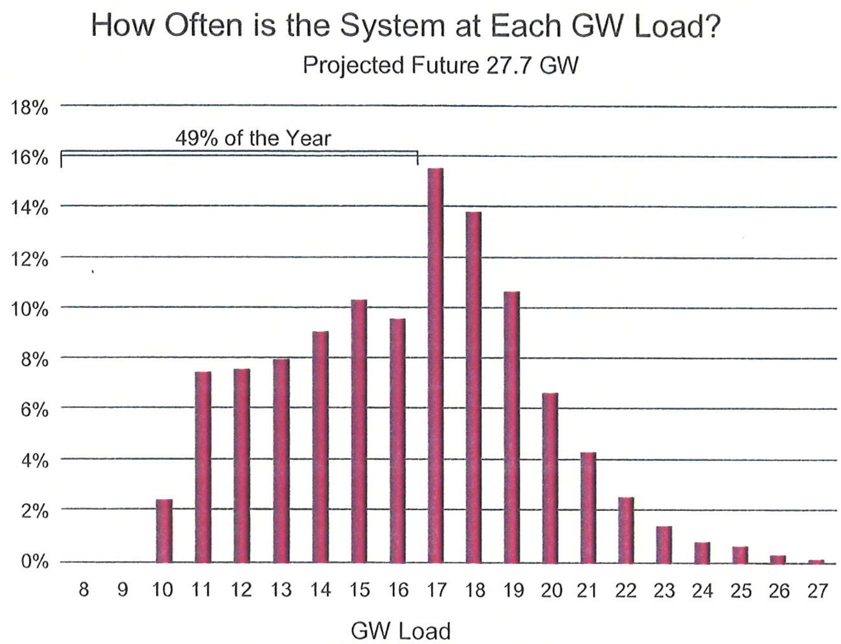
Q. What will be the average New England load when the peak reaches 30.0 GW?

A. If we continue to extend the growth curve for the average load, we estimate an average load of approximately 18 GW when the New England peak reaches 30 GW.

Q. Why is it fair to use the 15 GW case if we are looking into the future where the average New England loads might reach 17 or 18 GW?

A. As the load distribution figures provided with this testimony demonstrate, as the average load grows, most of the hours of load remain within a range that does not vary greatly. Even when the average grows to 17 GW, the load is still at or below 15GW for many of the hours, and not far above for many more. (See the figure below.) Moreover, it is reasonable to expect that, as peak load grows above 27.7 GW and approaches 30

GW, either additional generation or additional transmission will need to be added to the system. In order to construct a "case" that would be typical for a 17 GW or 18 GW average load, we would have to make assumptions about the addition of new system elements, or at least new economic generation dispatches. The number of assumptions that we would have to make would render the results highly speculative.



Q. If the dispatch that you used for the 15 GW case did not change, how would the current on the proposed 345 kV line between Beseck and East Devon change when the load reached, say, 30 GW?

A. As I said above, the Companies' planners have estimated that when the New England peak reaches 30 GW, the average load for the year will be approximately 18 GW. If the same generation dispatch used in the "15 GW Case" were used for the 18 GW average load case, the current on the Beseck-East Devon 345-kV line would increase to approximately 360 MVA (602 amps).

Q. How does the average current for the 30 GW peak year compare to the currents used in the"15 GW Case" and the "27.7 GW Case"?

A. The following table shows this comparison:

New England System Load (GW)	Current (Amps) on 345-kV Beseck-E.Devon Line	Increase in Current Flow from "15 GW Case"
15	425	-
18	602	42 %
27.7	1,500	253 %

Q. What conclusions do you draw from this comparison?

A. The "15 GW Case" is representative of the current that will typically occur in the future on the new Beseck to East Devon lines, while the "27.7 GW Case" is not. Because the "27.7 GW Case" uses a stressed dispatch, which is appropriate for planning purposes but not typical, it results in currents on the lines in the Beseck – East Devon corridor that are far above those that will be typical even beyond the 10 year forecast horizon. After that point, additional generation or transmission lines will result in a new set of conditions that is too speculative to try to model now. In the meantime, while the average system load will grow gradually, the load for most hours of the year will still be in a range of which the 15 GW case is fairly representative. The 15 GW case is a good reference to evaluate what the magnetic fields along the Beseck to East Devon corridor will be when the new line is built and for many years after that, until other system changes are required and implemented.

Q. If the current flow on the lines increases by, say, 50%, will the magnetic fields produced at the edge of the Beseck to East Devon right of way increase proportionately?

A. No, the magnetic field at the edge of the right of way may not be a simple linear function of current flow. If there is only a single circuit on a right of way, the magnetic field from this single circuit will increase proportionately with the current; but in the case of the Beseck to East Devon lines, the magnetic field at the edge of the right-of-way is determined by the magnitude and direction of current flow on multiple circuits. Hence, the effect of increased current flow on some or all of the lines on this right of way must be evaluated by computer modeling to estimate the impact of any change in the line loading assumptions. However, we can say that the fields associated with average or typical currents looking into the future will be much more like those of the 15 GW Case than those produced by the 27.7 GW Case.

Q. Mr. Ashton asked that the Companies calculate the magnetic fields on the existing lines assuming current loadings equal to half of the summer normal rating of the lines (also called their continuous rating). Have you done that?

A. Yes. See the following table:

Magnetic Field at ROW Edge at ½ Thermal Ampacity Rating (Surrogate for 'Peak' Loading)

Cross Section	S/E ROW Edge		N/W ROW Edge	
	Distance (ft)	Magnetic Field (mG)	Distance (ft)	Magnetic Field (mG)
1	0	68.9	250	76.5
2	0	16.3	125	24.6
3	0	25.1	275	9.7
4	0	12.2	320	24.7
5	0	10.7	275	50.8
6-E	0	5.2	200	38.7
6-W	0	6.9	200	52.1
7	0	2.1	200	29.3
7b	0	2.1	200	29.3
8a	0	50.0	165	45.2
8-N	0	50.0	165	45.2
8-Mid	0	51.5	165	45.3
8-S	0	38.3	165	36.8

Direction of current flow based on "typical" flow direction in 15GW load case.

Q. Are these "half capacity" currents more representative of average currents or of peak currents on the existing lines?

A. They are more similar to the peak currents in the 27.7 GW case.

Q. Why are these "half capacity" currents more representative of peak currents on the existing lines?

A. The system was stressed to represent a limited available generation scenario in the 27.7 GW Case. The load on the Beseck to East Devon line in this case was 1500 amperes, about 44% of the line's 3410 ampere normal rating.

Q. Do you recommend that the Siting Council use the half capacity ratings as a basis for evaluating buffer zones?

A. No, for the reasons stated above, the loadings associated with the 15 GW Case are most appropriate for this evaluation.

Q. Does this conclude your testimony?

A. Yes.