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STATE OF CONNECTICUT

BEFORE THE DEPARTMENT OF PUBLIC UTILITY CONTROL

In the Matter of the DPUC	)	
Investigation into Electric Capacity	)	**Docket 99-08-01**
and Distribution	)	

SUPPLEMENTAL TESTIMONY OF

PAUL CHERNICK

ON BEHALF OF

THE OFFICE OF CONSUMER COUNSEL

Resource Insight, Inc.

JANUARY 5, 2000

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I. Introduction

Q: Please state your name, occupation and business address.

A: I am Paul L. Chernick. I am the president of Resource Insight, Inc., 347 Broadway, Cambridge, Massachusetts 02139.

Q: Are you the same Paul Chernick who previously filed testimony in this proceeding?

A: Yes.

Q: What is the purpose of this supplemental testimony?

A: I supplement my initial testimony based on (1) the testimony of utility witnesses on the effects of the 1999 summer heat wave and (2) UI and CL&P responses to discovery on the issue of distribution reliability

Q: Please summarize this supplemental testimony.

A: The outage experience in the 1999 summer heat wave confirms the need for further review of utility T&D system design and operation practices. Future proceedings on T&D reliability should consider at least the following issues:

- whether the T&D system design standards are adequate;
- whether the standards and procedures are consistently applied in both the design of new systems and in the operation of existing systems;
- whether policies and procedures for the replacement of undersized equipment provide a reasonable level of service quality, particularly for residential customers;
- how closely the actual reporting of outage data follows written procedures; and

- how DSM programs can be designed effectively to target specific areas needing T&D upgrades or improved reliability.

Reviewing the Companies' T&D design and maintenance practices is a necessary step in evaluating service quality and in implementing performance standards. Given the number and complexity of the issues, I recommend that the next stage of this investigation take the form of round-table discussions.

Q: What specific areas do you address in this supplemental testimony?

A: I address the following areas:

- The appropriateness of the utilities' treatment of the 1999 summer heat wave as a "storm,"
- The adequacy of the utilities' procedures for sizing, upgrading and maintaining distribution equipment,
- The adequacy of utility efforts to improve the quality of outage data, and
- The validity of the utilities' rejection of distributed utility planning.

Q: Why have UI and CL&P labeled the 1999 summer heat wave a "storm?"

A: UI and CL&P classify the 1999 summer heat wave as a "storm" under the Department's criterion for excludable events:

> ... a major storm will be declared when the number of interruption restoration steps exceeds the 98.5 percentile of all days in the most recent four years. (Attachment to IR OCC-UI-25)

CL&P identifies three separate periods, June 7-8, June 28-29, and July 3-7 as "storms." On UI's system, the outage experience on July 5 and 6 only qualified as a "storm."

Q: What outage events occurred on UI's system in the summer heat wave?

A: There were four cable failures (one on July 5 and three on July 6), 121 transformer overloads, and 19 line fuse overloads. According to UI, the occurrence of three cable failures in one day was not unprecedented, but the high incidence of transformer and fuse overloads was abnormal.

All of the transformer failures and line fuse overloads occurred in residential neighborhoods developed before 1980. The Company attributes these overloads to additions of window air-conditioning units (Ostrum, pp. 1-3, IR OCC-UI-9 and 10).

Q: What distribution problems occurred on the CL&P system?

A: The 1,500 transformers failures and overloads were the primary cause of customer outages. Line fuse overloads were the second most frequent problem. CL&P found that most of the overloads occurred in transformers that were installed 25 to 30 years ago and resulted from customer additions of air conditioning load. However, the Company identified two cases where undersized transformers had been installed in new residential developments (Direct testimony of D. L. Louth, pp. 4-6, IR 1-EL-3).

Q: What is your concern about treating the heat wave as a "storm" to be excluded from performance statistics?

A: In Docket No. 86-12-03 (pp. 3-4), the Department explained that by excluding major storm events, the reliability indices would be more useful "in identifying reliability weaknesses and problems that can be controlled by the Companies." The exclusion of the summer distribution problems does not serve the intended purpose, for two reasons:

First, equipment overloads were responsible for most of the outages last summer. These outages were not the result of such physical causes as

lightning, high winds, wet snow and ice on the lines, or fallen trees. They were load-related, and well within the control and responsibility of the utility.

Second, as CL&P itself demonstrates (B. G. Blakey Direct, p. 2), "the summer of 1999 was extremely hot, but not unprecedented." It may be too costly to design a distribution system to operate under extreme conditions—the heat wave of the century, for example—without significant service interruptions. But the 1999 summer heat wave was not so unusual an event.

It is important that the designation of the heat wave as a "storm" not obscure the utility's responsibility for the service interruptions that occurred because of undersized or inoperable equipment. As the Department stated in Docket No. 86-12-03:

> Customers understand outages due to nature, but outages caused by inadequate system design, poor maintenance or equipment failure are not acceptable (p. III-1)

II. Company T&D Design and Maintenance Procedures

Q: What shortcomings have you identified in the Companies design and maintenance practices that could have contributed to the service interruptions last summer?

A: The information provided by the Companies indicates deficiencies in the following areas:

- Inadequate monitoring of loads on distribution transformers, particularly in residential neighborhoods;
- Failure to replacement of heavily-loaded transformers before failure; and

- Inadequacy of design standards and compliance with those standards, in particular in the initial sizing of distribution equipment in new residential developments.

Q: To what extent do CL&P and UI monitor loads on transformers?

A: CL&P monitors load on distribution substation transformers and transformers serving large C&I customers, and evaluates upgrades in the case of additions of new customers or of major additions to existing loads. But it does not monitor loading on residential distribution transformers (OCC-CLP-31). In fact, CL&P has abandoned the one monitoring device it had, the transformer signal lamp:

> ...Many single-phase, overhead CSP [completely self-protected] transformers were supplied with secondary with signal lamps. The lamp serves as a warning that the transformer is approaching an overload condition. We no longer purchase overhead CSP transformers with lamps, and do not presently change out transformers when the lamp is lit. Utility companies nationwide are also moving away from this practice. (Attachment to OCC-CL&P-32, p. 4, emphasis in the original)

UI claims to collect loading data on all types of transformers, including distribution line transformers, "if UI expects a possible transformer thermal overload". (OCC-UI-22a, 22b). As I discuss below, it is not clear how this policy translates into actual practice in the case of small residential line transformers.

Without load monitoring, the utility cannot systematically identify transformers that are vulnerable to future overloads and therefore, good candidates for upgrading.

Q: Does either utility have a mechanism for replacement of heavily-loaded transformers before failure?

A: CL&P does not upgrade residential transformers until they overload or fail and customers are disconnected. (IR OCC-CL&P-32).

UI's practices are less clear. According to UI's Distribution System Design Criteria, vulnerability to failure is not considered in UI's decision to change out line transformers (Attachment to IR OCC-UI-29, pp. 24-25). On the other hand, UI claims to do the following for each distribution transformer:

- monitor energy sales,
- estimate peak load from the sales data,
- for transformers estimated to be above 80% of nameplate rating, monitor loading during a peak period,
- replace transformers for which load exceeds the nameplate rating.

This sounds like a very conservative policy, since transformers will generally operate for many hours at loads much higher than their nameplate rating.

It is unclear to what extent this practice applies to residential transformers.

Q: Why is it unclear?

A: In most of UI's transformer outages this summer, load had reached between 120% and 150% of nameplate rating. (OCC-UI-33). UI attributes these peaks to additions of air conditioning load, which had occurred over a number of years. It is likely that loading had reached 100% of nameplate rating well before the summer heat wave.

Q: What replacement process does CL&P follow?

A: Issue 28 of CL&P's Over & Under publication provides a description of CL&P's procedures: The transformer's breaker is initially set for normal load cycle, which allows for a peak load of limited duration in excess of the

nameplate rating of the transformer. If the transformer is overloaded, the breaker is tripped and customers are disconnected.[1] CL&P does not replace the transformer at this point. Instead, the response to overloading (absent any secondary fault conditions) is to reset the breaker at the full-capacity ("overload") position to allow for greater overloading of the transformer. Only after the breaker trips at the full-capacity position, disconnecting the customers for a second time, will the transformer be replaced with a larger unit. (Attachment to OCC-CL&P-32, pp. 4-5).

Q: Is the current policy on early transformer replacement the result of a cost-effectiveness analysis?

A: No. Neither utility has studied the cost-effectiveness of replacement or relief of heavily loaded transformers before failure. (IR OCC-CL&P-32f and OCC-UI-23f)

Allowing a transformer to operate at loads higher than design reduces its expected life, as well as decreasing service reliability. On the other hand, if transformers are removed before they fail, they can be used at other locations. Alternatively, the load served by an overloaded transformer can be shared with an additional transformer, prolonging the life of the original unit and improving reliability. The Companies replacement policy should be reexamined to determine whether the cost savings from foregoing early replacement of heavily-loaded transformers or relief justifies the reduction in service quality and the premature aging of transformers.

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[1] A transformer is designed to handle a normal load cycle, which allows for peaks that higher than nameplate rating, as long as they are compensated for by periods where the loads fall below the nameplate rating. An overload is "a sustained load substantially greater than the transformer's nameplate rating." (Attachment to IR OCC-CL&P-32, p. 4).

Q: What problems with design standards and application of those standards became apparent in the summer heat wave?

A: In its review of the outages that occurred last summer, CL&P discovered that some transformers installed in new residential developments had been undersized. The Company recognizes that these outages were the result of both inadequate design standards and inadequate compliance with those standards. (IR DPUC-1-EL-3).

Q: Does CL&P plan to take any action to correct this problem?

A: Yes. CL&P plans to make the following changes:

- Revision of its design standard to specify the sizing of transformers for homes greater than 3500 square feet, and
- Enhanced training for technicians "to insure distribution standards regarding transformer sizing are understood and followed." (IR DPUC-1-EL-3).

Q: Has either Company studied how well its technicians comply with design standards and guidelines?

A: No. Neither company has performed a study of the extent of compliance or believes that such a study is needed. (OCC-CL&P-30, OCC-UI-21).

Q: Is the this confidence that standards and guidelines are properly applied well-founded?

A: No. In UI view, it is enough that "[a]ll working leaders, field coaches and engineers share responsibility for insuring that .... standards and guidelines are complied with." Mere assignment of job responsibility does not ensure that mistakes will not be made.

And CL&P assures us that personnel from its Distribution Material and Construction Standards Section visit each work center to verify compliance

with standards. However, as CL&P's experience last summer clearly indicates, periodic inspections, while useful, are not sufficient to ensure compliance.

The agenda for future proceedings or roundtable discussions should include a review of the equipment sizing standards and the extent of compliance with those standards.

Q: Do the Companies have any plans to alter their load monitoring, sizing and replacement practices to prevent a recurrence of the summer heat wave outage experience?

A: It appears that UI does not plan to make any major changes in its transformer sizing and replacement practices. (Ostrum Direct).

CL&P's plans are less clear. On one hand, CL&P states that it "does not plan to change the process for managing load growth on distribution transformers."[2] (IR OCC-CL&P-42). On the other hand, CL&P has specified two changes it intends to make to improve the initial sizing of transformers in new developments, as discussed above. In addition, CL&P recognizes that it needs to conduct a broad review of its current procedures in light of the abnormal number of transformer outages last summer:

> The high number of distribution transformers which tripped/failed suggest some value in reviewing past transformer load management studies for current applicability (if any), as well as existing practices for initial sizing, and managing load growth. Specifically, System Engineering will be requested to:
>
> - Review past transformer load management studies and recommend a course of action

[2] According to the response to IR OCC-CL&P-42, the "process for managing load growth" includes such actions as initial sizing of transformers, upgrades due to known load growth and/or voltage complaints and addressing protective device operations.

- Review 2 or 3 newer developments from each region that had transformer trippings. Review compliance of sizing with standards and adequacies of standards in light of experience.

- Review methods of managing load growth on transformers (e.g., service upgrades, new homes connected, red light indications) and recommend any changes necessary. (CL&P's July 3-7 Heat Storm report, p. 10, provided as an attachment to IR OCC-CL&P-8)

This inconsistency in its discovery responses suggests that CL&P is unclear itself about how it will proceed in addressing the summer outage experience.

III. Outage Data Collection

Q: Please describe each Company's data collection process

A: The system is similar for the two companies. Essentially, the customer call initiates the outage report, the dispatcher records the call, and the line crew confirms the outage at the trouble location. Additional information from the field and from the database is entered by the dispatcher to complete the record for the outage. (OCC-CL&P-25, OCC-UI-16).

Q: Do the Companies' outage-data systems meet the minimum requirements for accurate data collection?

A: The Companies have developed some useful data and have, to some extent, automated their systems.[3] However, the data collection relies substantially on manual reporting. Manual inputs are more subject to error than automatic recording. In addition, in the case of distribution outage reporting, the process requires input from employees whose primary responsibility is not

[3] For example, UI has detailed data on customer count "on each device such as on transformers, fuses, disconnects, ABS, reclosers, etc.," but these customer counts are not currently shown on the utility's GIS system. ("Storm Floyd Critique Notes," p. 1. Attachment to IR OCC-UI-4)

data collection and who are busiest when the reporting requirements are highest, the system dispatchers and the line crews whose main task is to respond to trouble calls and restore service.

Q: What plans do CL&P and UI have to improve the quality of the data collected on outages?

A: CL&P states that it "works continually to improve the quality of the data it collects on outages." CL&P's plans for future improvements include training of system dispatchers and integration of its supporting information systems and database, which should reduce the reliance on manual input by system dispatchers and reduce data inconsistencies. (OCC-CL&P-26)

UI, on the other hand, believes that there is no reason to improve its outage reporting system:

> ...UI believes that the quality and quantity of the reliability data it collects is second to none in the electric utility industry. (OCC-UI-17)

and:

> Based on discussions with many other utilities, UI believes that the accuracy of reliability data it collects is excellent. (OCC-UI-18)

UI's unrealistic faith in its outage data collection system is contradicted by its own internal report, Storm Floyd Critique Notes (Attachment to OCC-UI-4-2). These notes indicate significant data problems during the storm center operation, including:

- Failure to show accurate customer counts by distribution device on the utility's GIS system (#3 and #4);
- Mistakes in eliciting information from customer calls (#17);
- Delay in entering trouble reports in the computer system (#18); and
- Problems in coordinating computer system operations with storm center operations (#22)

It appears from the experience of UI's own employees that its data-collection system needs improvement.

IV. Distributed Utility Planning

Q: Does either Company design its DSM programs to target specific areas in need of T&D upgrades or improved reliability?

A: No.

Q: Why does CL&P reject targeted DSM?

A: CL&P acknowledges that targeted DSM may be useful, but claims that its past efforts have been largely unsuccessful. According to its response to OCC-CL&P-24, the DSM savings were not sufficient to defer or avoid T&D expenditures, and could not be large enough unless the utility provided excessive customer incentives or made participation mandatory.

CL&P did not provide any detail on its past efforts. Therefore, it is not possible for me to evaluate its claims at the present time. The agenda for further proceedings or roundtable discussions should include an in-depth review of CL&P's experience in this area to determine how targeted DSM can be made more effective through improved selection of T&D projects, proper identification of the target area, and enhanced marketing and customer incentives.

Q: What reasons does UI give for rejecting targeted DSM?

A: Similar to CL&P, UI contends that the savings will be too small and uncertain to affect specific T&D plans. But unlike CL&P, UI indicates a complete unwillingness to design DSM to target specific areas. In addition, UI indicates a preference for last minute planning, upgrading equipment only

when it becomes unreliable, rather than planning based on load growth projections. As UI states in its response to IR OCC-UI-14:

> ...The use of consistent customer incentives across UI's service area minimizes the complexity of program design and customer communications.
>
> UI makes decisions about the scope and timing of T&D additions based on reliability concerns alone. UI would not make such decisions based on the relatively small and somewhat uncertain local impact of targeted conservation or load management.

Q: Does this complete your supplemental testimony?

A: Yes.