

**STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL**

<p>The Connecticut Light & Power Company Application for a Certificate of Environmental Compatibility and Public Need for the Stamford Reliability Cable Project, which consists of construction, maintenance, and operation of a new 115-kV underground transmission circuit extending approximately 1.5 miles between Glenbrook and South End Substations, Stamford, Connecticut and related substation improvements.</p>	<p style="text-align:center">DOCKET NO. 435</p> <p style="text-align:center">June 12, 2013</p>
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**SUPPLEMENTAL DIRECT TESTIMONY OF
RAYMOND GAGNON AND PETER NOVAK
ON BEHALF OF THE CONNECTICUT LIGHT AND POWER COMPANY
CONCERNING ENGINEERING, DESIGN AND CONSTRUCTION
OF THE STAMFORD RELIABILITY CABLE PROJECT**

Q. What is the purpose of this supplemental testimony?

A. The purpose of this supplemental testimony is to provide background information on the selection of an underground circuit in lieu of an overhead circuit to improve the reliability of the electric system in Southwest Connecticut.

Q. Since the last hearing, has CL&P re-analyzed potential overhead alternatives to the underground cable proposed in its Application?

A. Yes, we have.

Q. In particular, have you re-analyzed the possibility of adapting the Glenbrook to South End segment of the existing 1977 Line, which shares the Metro-North Railroad (“MNRR”) ROW, to support a second 115-kV overhead circuit?

A. Yes.

Q. Is installing a second circuit on the existing support structures of the 1977

Line a viable alternative to the Project?

A. No, it is not.

Q. Why not?

A. Installing a second circuit on the existing 1977 Line structures is not a viable alternative because the substantial majority of the structures have insufficient load bearing capabilities to support the second circuit. Therefore, all but one of the structures would need to be replaced in order to support two circuits.

Q. When the project solution was initially developed, was consideration given to the installation of a future line (the “1151 Line”) on the existing 1977 Line structures?

A. Yes, it was. However, that concept was dismissed at an early stage and therefore not developed to the point where it would have been presented in the Application as a viable transmission alternative.

Q. What was the basis for the early dismissal of this concept?

A. It was based principally on constructibility considerations.

Q. What were the constructibility problems that were considered at this initial stage?

A. Many of the existing 1977 Line structures were considered not capable of supporting an additional circuit, and there were recognized constraints and challenges associated with MNRR requirements, as shown by CL&P’s experience with the construction of the Pequonnock-Ely Avenue line along the railroad ROW in 1992, i.e. scheduling, track outages, coordination of MNRR personnel, changes in work space accessibility.

Q. During the project's initial design, why did CL&P conclude that the 1977 Line structures would not support an additional circuit?

A. This inadequacy of the structures is shown in CL&P's historical records, which we had been aware of for many years.

Q. Please describe what the records show.

A. CL&P intended that the 1977 Line structures be designed to accommodate two circuits. The 1977 Line structures were designed by Gibbs & Hill, Inc. for CL&P in the mid 1960s and constructed in the late 1960s. In 1977, CL&P engaged Meyer Machine Company (now known as Meyer Steel Structures, a division of Thomas & Betts Corporation) ("Meyer") to independently analyze a portion of the 1977 Line to evaluate the ability of the tubular steel structures to accommodate a second circuit. Meyer's report to CL&P stated that 14 of the 18 structures that were examined on the 1977 Line, including four of the seven structures analyzed between the Glenbrook and South End Substations, did not meet the 1960 National Electrical Safety Code ("NESC") requirements (those in effect when the structures were constructed) for adding a second circuit. A summary of Meyer's analysis is attached as Attachment 1. Based on a review of CL&P's records, it appears that the loading design used by Gibbs & Hill for the structures is a different loading criteria than that defined by the 1960 NESC, resulting in insufficient load bearing capability to support a second circuit.

Q. How did the Meyer work product influence the design of the current project?

A. CL&P assumed that the remaining tubular steel structures comprising the 1977 Line, including those under discussion here, were similarly designed and thus similarly inadequate for a second circuit, so that a second overhead circuit between South End and

Glenbrook Substations could not be added without replacing the existing structures along the railroad ROW.

Q. Has CL&P recently performed a detailed analysis to confirm or disprove this assumption?

A. Yes, we have.

Q. Please describe CL&P analysis.

A. CL&P analyzed all but one of the structures between the Glenbrook and South End Substations for compliance with the 1960 NESC. The findings were consistent with the Meyer analysis done in 1977. CL&P found that 100% (20 of 20) of the tubular steel structures and 33% (1 of 3) of the lattice structures had an element(s) failing when a second circuit was added. For 14 (61%) of these 23 structures, at least one of the following elements failed: base plate, anchor bolt embedment length or pole section. Structures with these types of element failures cannot be reinforced and, at a minimum, replacement would be required to accommodate a second circuit. Furthermore, because more than 50% of the structures failed, good utility practice calls for an evaluation of all the structures under the current NESC (2012). Under the 2012 NESC, CL&P found 21 (91%) of the same 23 structures (100% of the tubular steel structures) failed to meet the requirements for a second circuit. Therefore, all 23 structures would have to be replaced if a second circuit were to be added.

Q. Please describe the construction challenges to rebuild the 1977 Line structures near an active railroad.

A. Work on railroad ROWs must satisfy the criteria established by the Federal Railroad Administration. Such criteria specify worker safety requirements (e.g., training, flagging), permitting, and the performance of activities within the confines of the railroad

schedule and operations. Moreover, extensive coordination efforts between CL&P, MNRR and ConnDOT would be required. As a practical matter, MNRR and ConnDOT can dictate the conditions under which the line can be constructed. The constraints that CL&P would encounter, most of which have significant cost and construction schedule implications, include:

- a) Because a track must be taken out of service for construction activities to take place, MNRR would limit CL&P to a construction window of only 2.75 hours per day between 2:00 AM and 4:45 AM, which allows a very narrow time period for mobilization, performance of work and demobilization. However, the construction crews would need to be paid for a full day of work each day (likely for a minimum of 10 hours).
- b) During such night-time hours, the work site, which abuts the rear of approximately 32 residential properties, would be brightly illuminated for the safety of construction crews.
- c) Even with the track out of service, the space available for the construction effort is constrained, so that the amount of work that can be safely accomplished in 2.75 hours is much less than can be accomplished in an equivalent period of time on a typical, unconstrained ROW.
- d) Because of limited space, the contractor would be building the new overhead line in essentially the same location as the existing line that was being dismantled. This type of construction is expected to proceed more slowly than a replacement line that can be built in a ROW alongside the line that is being replaced.
- e) Even though the track nearest the line under construction would be taken out of service, there may be trains on other tracks for MNRR testing or maintenance

purposes. Certain types of work must be suspended when MNRR decides to operate a train on any of the other tracks and could not be resumed until it has passed.

- f) MNRR may cancel the scheduled track outages on short notice due to their own overriding priorities.
- g) The equipment, construction procedures and protection measures employed by CL&P's contractor would be subject to approval by MNRR, and the approval process is time-consuming and can cause construction delays.
- h) In addition to paying for the construction personnel to build the line, CL&P must pay for MNRR safety personnel such as signalmen or watchmen. Nevertheless, the work would be subject to the limited availability of MNRR personnel (i.e. groundmen, flagmen, etc.) to implement track outages and the personnel (i.e. conductor, breakman, engineer, pilot) needed to remove the track from service prior to track outages.

Q. Do you recall any recent experiences with MNRR similar to what would be required here?

A. Yes, the Pequonnock-Ely Avenue project in the early 1990s was very challenging; many of the limitations and requirements explained above were imposed by MNRR. In addition, MNRR only allowed structure work on Friday and Saturday between 10:00 PM and 5:00 AM resulting in an approximately two year construction period. Without warning, during the Thanksgiving and Christmas holiday season, MNRR recalled the rail being used for the work, which necessitated use of off rail access. As a result, the mobilization/demobilization costs were higher than originally anticipated.

Q. Please describe any site-specific construction challenges that CL&P would encounter in rebuilding the 1977 Line structures near their current location.

A. The 1977 Line structures are located within the railroad corridor and in close proximity to local streets and homes. Site-specific construction challenges include:

- a) Twenty-four drill rig platforms would be required primarily along South State Street and the railroad corridor. For the platforms in South State Street, two lanes would need to be closed. For the platforms in the railroad corridor, the drill rigs must be elevated to the same ground level as the finished foundation.
- b) A high stone wall supports the railroad on South State Street near Atlantic Street, requiring a very high drill rig platform to be erected.
- c) Access to structures would be difficult from the rear yards of homes along Culloden Road. All of these properties have very small lots.

Q. Can you help the Council to visualize the railroad corridor to better understand the complexities in working within MNRR's railroad corridor and the adjacent streets and backyards of the homes along Culloden Road?

A. CL&P viewed the railroad corridor via Google-Earth. Screenshots, with annotations as to location and site features, are attached as Attachment 2 to this Supplemental Testimony, along with photographs with similar annotations.

Q. In addition to construction of new structures for CL&P's facilities (1977 and 1151 Lines), would any other work within the MNRR ROW be required?

A. Yes. Currently, MNRR railroad supply circuits are located on 10 of CL&P's 1977 Line structures. Prior to any construction activities related to the 1977 Line structures, CL&P must undertake measures to accommodate these circuits. For example, CL&P may be

required to construct temporary poles for the MNRR circuits and coordinate with MNRR the relocation of those circuits from the 1977 Line structures to the temporary poles. Once the new structures would be in place, CL&P would coordinate with MNRR to move the MNRR circuits onto the new structures and remove the temporary poles. MNRR circuit outages would be required for any such accommodation and could lead to construction schedule delays.

Q. Are there any other issues that are specific to construction and operation of facilities near an active railroad?

A. As evidenced by the tragic accident in West Haven on May 28, 2013 involving an on-duty railroad foreman, an active railroad poses greater danger than a typical construction site. In addition, railroad derailments and train crashes, such as the incident that occurred in Bridgeport on May 17, 2013, can result in outages of adjacent electric lines and other complications.

Q. Did CL&P consult with MNRR?

A. Yes.

Q. What was the outcome of your consultations with MNRR?

A. In addition to the construction window and other construction challenges described above, MNRR provided estimates for the required number of personnel and current rates. MNRR also indicated that CL&P would be responsible for all costs associated with the temporary removal and relocation of MNRR supply circuits and that the work would be done only by MNRR personnel. MNRR noted that a six-hour window for wire work, if approved by MNRR would likely require taking scheduled trains out of service and providing bus transportation for train passengers, all at CL&P's expense. [Note that CL&P may require approximately 12 six-hour outages for this work]. Finally, for CL&P to use a crane to install the

new approximately 100 foot tall structures, MNRR would require additional MNRR personnel to take the adjacent track out of service as well as cut power to all other tracks in the corridor.

Q. Why is the MNRR construction window so limited?

A. MNRR would be required to take the north outside track of the New Canaan line out of service. The MNRR construction window includes time to clear that track block after the last train at 1:44 AM, to take the track out of service and cut the power at the beginning and to restore the track and power to service prior to the next scheduled train.

Q. Did CL&P consult with ConnDOT about working on railroad property to replace the 1977 Line structures with new structures that would carry the 1977 and 1151 Lines?

A. Yes.

Q. What was ConnDOT's position?

A. ConnDOT's Office of Rails does not support the installation of utilities within this highly congested railroad corridor. ConnDOT stated that its ability to achieve long range plans for increasing ridership and reliability of its rail system hinges on systematic infrastructure, catenary, communication and signal system improvements in this area. ConnDOT further noted that locating the components for system upgrades, new catenary structures and the addition of new track within an already highly congested corridor, would increase construction costs and would add time to its projects.

Q. Did you consult with ConnDOT as to whether it would allow use of its catenary structures for the 1151 Line?

A. Yes. Although ConnDOT has allowed the use of catenary structures in some circumstances in the past, ConnDOT indicated that it would prefer not to do so in the future

because existing catenary structures are aging and require maintenance to meet the ever increasing railroad demands. ConnDOT also stated that newly installed catenary structures are not being designed for the purpose of carrying utility transmission lines.

Q. Are there any other constructibility factors that would influence a decision to build the new 1977/1511 Line structures?

A. Yes. As noted by Mr. Novak during the evidentiary hearing on March 28, 2013, ConnDOT informed CL&P that ConnDOT is planning to expand the wing wall for Atlantic Street and move the wall along South State Street out 15 feet (essentially eliminating one of the South State Street lanes), and that all of the ConnDOT's current projects in this area are being designed to accept a future additional rail in the MNRR corridor.

Q. What would be the practical consequences to CL&P of an additional rail in that area?

A. An additional rail in that area would force relocation of approximately 17 of CL&P's 24 structures that support the 1977 Line, essentially requiring the entire line to be relocated elsewhere. Under the terms of CL&P's 1967 easement with the Trustees of the New York, New Haven and Hartford Railroad Company, any relocation of the transmission line required by the railroad for the purpose of installing additional tracks must be done at CL&P's sole expense.

Q. Were that to happen, what would CL&P do with the 1977 Line?

A. The 1977 Line would have to be constructed underground; there is no available existing ROW or space for additional ROW in the vicinity of the 1977 Line. The 1977 Line could not be placed overhead in North State Street because there is insufficient space for

structure footings or along I-95 because it is elevated throughout this area. Also, ConnDOT would only allow a transmission line to be built along a restricted access road as a last resort.

Q. And if the 1977 Line were reconstructed with the 1151 Line before the MNRR ordered the relocation, what effect would that have on CL&P?

A. CL&P would need to identify an underground cable route or routes that would allow for both the 1977 Line and the 1151 Line.

Q. Does constructing the 1151 Line as an underground circuit have any advantages compared to constructing new 1977 Line structures to support the 1977 Line and the 1151 Line?

A. Yes. There is a continuity of service advantage and avoidance of risk of a ConnDOT/MNRR-requested relocation of the 1151 Line by constructing it as an underground circuit.

Q. Please describe the continuity of service advantage.

A. An underground circuit would reduce potential risks to customers losing service during construction. An outage of the 1977 Line during construction of the new structures followed by a single contingency event (i.e. one involving the 1440 and 1450 Lines that are located on double circuit towers), could cause a blackout of customers served by the Cos Cob, Waterside, Tomac and South End Substations.

Q. If such a blackout were to occur, approximately how many customers could be affected?

A. Approximately 47,500 customers, representing nearly all customers in the Stamford-Greenwich Sub-area, could be affected by a blackout of this nature.

Q. Has CL&P experienced an event on double circuit towers that caused an outage?

A. Yes. In early August of 2012, the double circuit towers supporting the 1740 and 1750 Lines (located southwesterly of the 1440 and 1450 Lines) were forced out of service when a tree initially fell onto the 1750 Line and several hours later, the 1740 Line tripped. The outage of the 1750 Line lasted for 20 hours; the outage of the 1740 Line lasted for four hours. Approximately 37,000 customers were affected by these outages.

Q. Please explain the reduced risk for a ConnDOT/MNRR requested relocation.

A. As noted in Mr. Novak's testimony at the March 28, 2013 hearing, the terms of CL&P's easement with the then Trustees of the railroad property require CL&P to relocate the 1977 Line if ConnDOT directs it to do so, at CL&P's sole cost. Therefore, at any time, CL&P could be required to remove the structures and the 1977 Line. If the 1151 Line were built on the new 1977 Line structures, then the current risk of such relocation would apply equally to the 1151 Line. There is no risk of such relocation associated with building the 1151 Line as an underground circuit. Replacing the 1977 Line structures with new structures and adding another line would compound relocation efforts and costs.

Q. Are there any other factors that the Siting Council should take into account when evaluating the benefits of an underground circuit for the 1151 Line?

A. Yes. CL&P has a higher degree of confidence in the nature and extent of underground construction in the streets of Stamford. The construction of new overhead structures alongside an active railroad presents greater variables that could greatly influence the cost of the project as well as the schedule to complete the project.

For example, as explained above, the construction window is severely limited and could be suspended at any time for any number of days if MNRR required outages for emergency or maintenance purposes.

Q. Did you develop an estimate of the cost to construct an alternative transmission solution that would involve rebuilding the existing 1977 Line on new structures?

A. Yes.

Q. What type of cost estimate did you prepare for the approach identified above?

A. The estimate was a “conceptual grade estimate” type, which has an accuracy range of -25% to +50%, escalated to 2014 dollars, which is when we expect the construction to occur. We did our best to reflect the unusual cost drivers that this construction will entail, as described above.

Q. Please describe the process for your cost estimate.

A. Recognizing the unusual cost drivers for work within an active railroad corridor, CL&P obtained an estimate of anticipated costs associated with the construction of 24 new 1977 Line structures from a third party electrical contractor. This third party contractor is one of the largest electrical contracting companies in North America, employing over 2,000 professionals with expertise in design, installation, repair and maintenance of transmission and distribution networks. Its core expertise is the installation of foundations, lattice steel, tubular steel, wood pole structures, conductor and fiber optic ground wire and cables. It owns more than 5,000 pieces of specialized transmission line construction equipment (the largest fleet in the nation) and has equipment that is easily transported to remote sites for foundation installation, tower

erection and wire stringing. In addition, it has been recognized for its record of safety excellence.

After field reviews, including one with a third party clearing and road work sub-contractor, the contractor provided CL&P a total cost estimate of \$36.8 million for labor and equipment. This estimate, included structure work, foundations, wire work (with the installation of new conductor only for 1151 Line) and civil work. In addition to compliance with the MNRRC constraints (including the narrow construction window), this cost estimate includes assumptions of a Monday through Saturday work week and continuous six hour work windows of construction duration to string overhead conductor and groundwire.

In accordance with utility estimate development practices, CL&P then added to the contractor’s estimate costs for engineering, siting, permitting, materials, escalation, allowances for funds used during construction and contingency.

Q. What construction period was assumed in the cost estimate?

A. The cost estimate assumed a 42 week construction period as follows:

Activity	Schedule (in weeks)
Clear ROW between MNRRC corridor and Culloden Road	4
Install 24 drill rig platforms (three crews at two weeks per platform)	16
Drill and pour 24 foundations (six drill rigs working simultaneously at three weeks per foundation)	12
Structure work (unclip old conductor, remove old/install new structure, reclip old 1977 Line conductor)	6
Clip in new conductor for new 1151 Line (eight weeks if include new conductor for 1977 Line)	4

Q. What were the results of your cost estimating?

A. The estimated cost of adding a second circuit to the 1977 Line structures between the South End and Glenbrook Substations, assuming that all structures would be replaced, would

be approximately \$69.9 million. All costs are in 2014 dollars and do not include substation upgrades. A breakdown of such costs is included in Attachment 3.

Q. Compared to the underground circuit cost estimate, what overall conclusions can be drawn about the expected cost estimate to rebuild the 1977 Line overhead circuit?

A. The underground circuit cost estimate reflects a greater number of factors within CL&P's control. In contrast, the 1977 Line rebuilding expected costs will be heavily dependent on factors outside of CL&P's control, including MNRR construction schedule restrictions (established construction window plus any unanticipated work stoppages) and personnel and administrative costs, CONVEX-approved outages and any City of Stamford requirements, arising from the installation and operation of the drill rigs along South State Street.

Q. Does this conclude your testimony?

A. Yes.

Attachments

1. Summary of Meyer Analysis
2. Google-Earth Screenshots and Photographs
3. 1977/1151 Overhead Line Estimated Cost Breakdown