PUBLIC UTILITIES REGULATORY AUTHORITY

REVIEW OF THE PUBLIC SERVICE COMPANIES'

RESPONSE TO 2011 STORMS

DOCKET NO. 11-09-09

DIRECT TESTIMONY OF

JOHH W. GOODFELLOW AND MICHAEL W. TOWNSLEY

ON BEHALF OF THE

OFFICE OF CONSUMER COUNSEL

APRIL 17, 2012

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is John W. Goodfellow. I am a consultant affiliated with Townsley Consulting Group, LLC. My business address is 7710 196th Avenue NE, Redmond WA 98053.

My name is Michael Townsley. I am the Principal and sole owner of the Townsley Consulting Group, LLC. My business address is 2 Fox Hill Road, Old Saybrook Connecticut 06475.

Q. PLEASE SUMMARIZE YOUR EDUCATION AND BUSINESS EXPERIENCE

A. **(Goodfellow)** I am Principal Consultant with BioCompliance, Inc., located in Redmond, Washington, and have 35 years of experience in the electric and gas utility industries, having held positions of increasing responsibility for vegetation management, transmission and distribution (T&D) operations, maintenance and engineering at three large investor-owned electric & gas utilities.

I had direct involvement in developing and implementing an Asset Manager/Service Provider outsourcing initiative between Puget Sound Energy and Quanta Services. As Managing Director of the newly created business unit, I was responsible for transitioning and managing a 600-person work force of professional, technical, and crafts workers providing electric and gas utility design, construction, operations, and maintenance services.

More recently, I have been Principle Researcher on several R&D projects focusing on the modes and causes of tree-caused power interruptions. This work has led to the development of a conceptual model useful in understanding and characterizing the risks of tree-initiated electrical faults on overhead electric distribution lines. I am actively involved in developments in the newly emerging field of tree biomechanics, including being responsible for the inception and production of the International Society of Arboriculture's Tree Biomechanics Week (August 2010). More recently, I have been an active participant in proof-of-concept demonstrations of the capabilities of NASA's stereo photogrammetry imaging techniques in capturing full-field 3-D deformations and mechanical behavior of trees under various loading conditions.

I was a long time Trustee of the Research, Education, and Endowment (TREE) Fund, and am a past president of the Utility Arborist Association. I worked directly with the National Arbor Day Foundation in creating that organization's "TreeLine USA" award program, recognizing utilities for excellence in vegetation management. I have been a direct participant on standards and Best Management Practices committees for the utility vegetation management industry.

I received a Bachelor of Science in Environmental Resources Management from SUNY College of Environmental Science & Forestry, and a Bachelor of Science in Forestry from Syracuse University.

My resume is included as Exhibit __ (TCG __3-1).

(**Townsley)** In 2011 I retired from the New York Department of Public Service (DPS) as a Deputy Director. In my career at DPS I worked in the Offices of Industry and Governmental Relations, Energy Efficiency and the Environment, and Electricity and the Environment.

During my work at DPS I provided oversight and guidance to staff investigations such as extended power outages in Westchester County, New York; an assessment of failures and the rebuilding of the Queens, New York, Long Island City (LIC) network following an extensive power outage; and a management audit of Consolidated Edison Company of New York, Inc.'s (Con Edison) electric emergency outage response program. I was also a member of the DPS staff's LIC network outage prudence case settlement negotiations team.

I have over 40 years of utility industry experience working in both the public and private sectors serving in management and consulting roles. Areas of professional experience include: strategic business and operational planning; power system facilities planning and design; retail regulatory processes; deregulated (competitive) and regulated retail energy markets; market planning; market management; financial and cost of service analysis; and research & development portfolio planning and management. I have testified before state public service commissions in Connecticut, Massachusetts, New Hampshire, and New York, and before state siting councils, legislative bodies, and other state agencies.

My educational background includes a Master of Business Administration from Rensselaer Polytechnic Institute and a Bachelor of Science Degree in Electrical Engineering from Purdue University.

My resume is included as Exhibit __ (TCG__3-1)

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?

A. We are testifying on behalf of the Office of Consumer Counsel (OCC), which hired Townsley Consulting Group LLC (TCG) to assist in its review in Docket 11-09-09, "PURA Investigation of Public Service Companies' Response to 2011 Storms."

Q. PLEASE DESCRIBE THE SCOPE OF YOUR REVIEW.

A. OCC retained the Townsley Consulting Group, LLC, to review the actions of Connecticut's public service utilities during Hurricane Irene (Storm Irene) and the October 2011 snowstorm (October Nor'easter) and to make recommendations to improve overall future performance. We have evaluated pertinent materials presented in Docket 11-09-09, and conducted independent analyses, field investigations and interviews to assess Connecticut utilities' vegetation and plant asset management practices as well the utilities' actions during their restoration efforts associated with tropical storm Irene and the October Nor'easter.

Q. PLEASE IDENTIFY THE TOPICS THAT YOU WILL BE COVERING IN THIS TESTIMONY.

A. This testimony will examine the nature of the urban forest in Connecticut, the utilities vegetation management practices, certain proposed enhanced tree trimming practices as an element of future storm-hardening initiatives, as well as the utilities' asset management practices pertaining to pole inspections and pole maintenance. Additionally, the testimony will review actions taken and the protocols employed by the utilities in carrying out their responsibilities in restoring the operational functionality of their utility infrastructure in the aftermath of the storms.

Q. HOW WOULD YOU CHARACTERIZE THE MAJOR DIFFERENCES BETWEEN STORM IRENE AND THE OCTOBER NOR'EASTER?

A. Their impact on electric service differed in a number of ways. Among these included the areas of the state that were affected; Storm Irene's impact was largely in the coastal and eastern portions of the state while the October Nor'easter created extensive outages in the northern, central and western portions of the state. That being said, it should also be noted that 25 towns with wide geographical distribution experienced 81% to 100% outages during both storms.

Both storms presented their own challenges. Irene led to numerous road closings due to both flooding and falling trees, but Connecticut, while suffering some road washouts, was less affected than Vermont, which experienced far more destruction of its transportation infrastructure. The October Nor'easter added to the large amounts of tree damage with the factor that it brought a significant amount of snow falling extremely early in the season (up to 18.6 inches in northwest Connecticut) which, coupled with the downed trees, made it difficult to negotiate the roads and to restore power to many areas until significant road clearing had taken place. To facilitate that effort, the Governor banned non-emergency vehicle travel from some highways. While prepositioning of crews was potentially helpful it may have come too late in the October Nor'easter and the combination of both heavy snow and downed trees added challenges to mobility and possibly led to longer service restoration times.

The temperatures were another factor that differentiated the two storms. Storm Irene, striking in late August with highs averaging in the mid-70's to low 80's and lows from around mid-60's to low-70's, did not present life threatening problems associated with temperatures near or below freezing. Those conditions might lead to dehydration, which could be detrimental to vulnerable populations. The October Nor'easter was more dangerous. The day the storm hit, temperatures were in the low 50's with nighttime temperatures in some locations dipping into the 20's and 30's (see "*Historic 2011 October Northeaster",* State of Connecticut, Department of Emergency Services and Public Protection (DESPP) report by Douglas W. Glowacki issued December 2011, p.2), and they stayed in a generally lower range than normal for several days. This led to the migration of a fairly large number of people to stay with relatives who still had power, to hotels and motels or to warming shelters.

Q. WHY WAS THE DAMAGE FROM STORM IRENE AS SEVERE AS IT WAS WHEN IT WAS NOT EVEN A CATEGORY 1 HURRICANE?

A. In 1999, Professor Dennis Meleti, then-Director of the Natural Hazards Center, with funding from The National Science Foundation, convened 130 area experts to update the first assessment of natural hazards since 1975 (White and Haas) that led to a deeper understanding of the elements that lead to natural disasters. The resulting document states:

"Before a storm attains hurricane status, it passes through the tropical storm stage where winds are between 65 and 119 kilometers per hour (hurricane winds are at least 120 kilometers per hour). Hurricanes that have been downgraded to tropical storms or depressions after moving over land are sometimes caught in a mid-latitude cyclonic storm system. Then severe flooding can occur in non-coastal areas." (See Meleti, Dennis S. et al. "*Disasters by Design: A Reassessment of Natural Hazards in the United States*", Joseph Henry Press. Washington, DC. 1999, p.76.)

Storm Irene may fit this definition as rainfall amounts were, for the most part, actually higher at inland Connecticut locations than along the shore by factors of as much as 2 to 3 times (see report by Douglas W. Glowacki issued October 2011, "*Tropical Storm Irene",* State of Connecticut, Department of Emergency Services and Public Protection, page 6) which would explain much of the flooding that took place in parts of Connecticut not subject to storm surge but particularly applies to locations in more Northern New England. The more specific reasons for the degree of damage in Connecticut are attributed to the following facts:

- Storm Irene made landfall during a spring high tide.
- Connecticut has a very dense wild land urban interface (the proximity of urban areas to forested areas).
- There has been an absence of any major wind events since Hurricane Gloria in 1985.
- The large physical size of Storm Irene significantly contributed to both coastal flooding as a result of a large fetch and riverine flooding resulting from very heavy rainfall.

These factors combined to account for a record number of power outages (see "*Tropical Storm Irene",* State of Connecticut, Department of Emergency Services and Public Protection report by Douglas W. Glowacki issued October 2011, p.1). The reasons listed above provide persuasive insight into why the damage from this tropical storm was so severe. Additionally, there are often actions man has taken in development that can exacerbate the potential of resulting damage. Professor Meleti *et al* noted that the root causes leading to disaster losses are interactions between: the physical environment that includes natural hazards such as storms, the social and demographic characteristics of communities that experience disasters, and the buildings, roads, and other aspects of the built environment. This is evidenced by specific observations (Op. Cit. Meleti. page 3):

1) Society has increased building in hazardous locations and the value of these buildings can later add to the cost to individuals and society. With a growing population, more people are building in earthquake prone and coastal areas that are subject to hurricanes and tropical storms such as Irene. Many times

the building of structures destroys existing ecosystems that would otherwise form buffers to mitigate some disaster damage.

2) Buildings are constructed without disasters in mind. A number of buildings were originally built for seasonal use and then converted to year round use that are not designed to withstand high winds, storm surge or potential sea level rise over the coming decades. Further steps need to be taken to upgrade codes to levels where buildings, including existing ones, incorporate hurricane clips to maintain roof integrity for homes, storm shutters for glass areas and breakaway walls to mitigate surge and flood effects. These forms of storm damage may have secondary effects in that they can also lead to flying debris that can directly and negatively impact components of the electric grid. State building code upgrades with local enforcement may be useful to address these problems.

Q. HOW WAS THE OCTOBER NOR'EASTER DIFFERENT FROM OTHER EARLY OR LATE SNOW EVENTS IN CONNECTICUT'S PAST, AND HOW MIGHT THE EXPERIENCE BE USED TO PREPARE FOR FUTURE EVENTS?

A. Off-season snowstorms, while not common, do occur. Some examples of off-season storms worthy of mention include the following:

- The Mother's Day Storm of 1977 that left as much as 20" of heavy wet snow in Northwest Connecticut, resulting in heavy damage to trees and approximately 25,000 customers without power due to tree limbs bringing down power lines. (see Associated Press. *State Growers Assess Ruins in Wake of Rare Snowstorm*. 5/10/1977and http://localweatherjournal.blogspot.com/2011/05/today-marks-anniversary-of-may-9-1977.htmlhttp://localweatherjournal.blogspot.com/2011/05/today-marks-anniversary-of-may-9-1977.html .)

- The April Fool's Day Storm of 1997 that lasted two days, and left as much as 21" of wet snow in some towns with a peak of 85,000 customers without power (see National Climatic Data Center. www.ncdc.noaa.gov/oa/reports/**april**snow/**april**snow.html).

While there have been storms that delivered larger amounts of snow, they inflicted far less damage to the electric grid than the October Nor'easter. That storm was unique in that it was the result of seven separate, confluent conditions. This had not occurred in 361 years of Connecticut weather records. These confluent conditions are identified below:

1. A high pressure weather system located in northern New England, with cold air advection into southern New England just as the storm arrived, prevented warmer air from being pulled into the storm from warmer water offshore.
2. Temperatures remained within a few degrees of 32 F during the storm, which allowed snow to adhere to objects without melting and falling to the ground.
3. There was long duration of moderate to heavy snow fall, lasting over 12 hours without interruption.
4. Light winds were less than 15 mph during the snow accumulation process;
5. Nearly full foliage remained on most trees.
6. Soils were saturated as a result of Tropical Storm Irene in August and the

remnants of Tropical Storm Lee (which may have delayed the seasonal dropping of leaves), which resulted in many trees being uprooted.

7. There was a heavy overgrowth of trees resulting from the absence of a major hurricane for nearly 60 years. (see "*Historic 2011 October Northeaster",* State of Connecticut, Department of Emergency Services and Public Protection (DESPP) report by Douglas W. Glowacki issued December 2011, p.3.)

It is possible that had one or more of the above conditions <u>not</u> been present, the storm may not have been as devastating.

Q. HOW CLOSE WERE THE OCTOBER NOR'EASTER WEATHER PREDICITIONS TO THE ACTUAL WEATHER CONDITIONS?

A. The table in Exhibit TCG 3-2 provides a snapshot of the forecasts beginning five days in advance of the storm's arrival and some actions (in italics) that were taken as it became more imminent. Recognition of the potential magnitude of the storm appeared to come quite late, leaving less time to prepare for what was experienced.

Q. DO YOU HAVE AN OPINION AS TO THE VEGETATION MANAGEMENT PROGRAMS OF THE TWO ELECTRIC DISTRIBUTION COMPANIES IN CONNECTICUT?

A. Yes. We completed a review of the vegetation management program documentation and made a limited assessment of vegetation maintenance practices in the field. The vegetation management programs and maintenance practices at both CL&P and UI appear to be generally consistent with those found throughout the industry.

Q. DID YOU REVIEW EXISTING TREE-CONDUCTOR CLEARANCES, AND DO YOU HAVE AN OPINION AS TO THE AMOUNT OF CLEARANCE THE TWO ELECTRIC DISTRIBUTION COMPANIES MAINTAIN IN CONNECTICUT?

A. Yes. Tree-conductor clearances established in vegetation maintenance program specifications and related documents (for CL&P, see interrogatory response AG-13 and for UI, see interrogatory response OCC-23-1) and observations made in the field on both the UI and CL&P overhead distribution systems are reasonably well-established. It should be noted that tree-conductor clearances are achieved at the time of maintenance and are lost over time with each proceeding growing season. Once clearances are established the pruned trees respond with an exaggerated re-growth response, followed by continued growth in subsequent growing seasons.

Q. DO YOU HAVE AN OPINION ABOUT THE QUALITY OF LINE CLEARANCE PRUNING WORK CURRENTLY BEING PERFORMED?

A. Line clearance pruning specifications were found to appropriately reflect proper arboricultural practices. Field observations confirm that pruning practices appear to be consistent with proper utility arboriculture standard references and best management practices. The overall quality of the work is acceptable.

Q. DID YOU EVALUATE THE EXTENT TO WHICH THE TWO ELECTRIC DISTRIBUTION COMPANIES ARE COMPLETING THE REQUIRED MAINTENANCE WORK?

A. Yes. The vegetation management programs of both UI and CL&P are intended to carry out approximately equal amounts of preventive maintenance work each year on a fixed-interval cycle. The current preventive maintenance cycle period at CL&P is 5 years (see response to interrogatory AG-13). UI currently follows a compound preventive maintenance cycle period where three-phase segments of a circuit receive preventive maintenance every four years and single-phase laterals are scheduled for vegetation maintenance once in eight years or more frequently if a lateral experiences two or more tree caused outages over a 36-month period (see response to interrogatory AG-13). Both utilities presented documentation that indicates that they are on cycle and meeting production levels sufficient to achieve the current intended cycle period (for CL&P – 3,393 miles/year, and for UI – 460 miles/year., see interrogatory responses to AG-13). Both utilities report similar costs in 2011 for routine preventive vegetation maintenance on their distribution systems (for CL&P - $5,085/mile, and for UI - $5,237/mile, see response to interrogatory AG-13).

Q. DID YOU REVIEW THE VEGETATION MAINTENANCE PRACTICES OF THE TELECOMMUNICATION UTILITIES?

A. Yes, only to the extent necessary to determine that the telecommunications utilities in Connecticut, AT&T- Connecticut and Verizon-New York, perform no preventive vegetation maintenance.

Q. DO THE TELECOMMUNICATION UTILITES BENEFIT FROM THE VEGETATION MAINTENANCE WORK BEING PERFORMED BY UI AND CL&P?

A. Yes. However, it is worth noting that trees pose different risks to overhead telecommunications lines than they do to electric lines. Trees can cause both electrical short circuit faults and direct damage to electric lines. Although there is no risk of tree contacts causing electrical faults on telecommunication lines, the structural failure of trees can cause damage to overhead telecommunication lines. Activities such as hazard tree identification and mitigation that are completed by the electric utilities provide a direct benefit to owners of the telecommunications infrastructure in the same span. The robust nature of large bundled paired telecommunications cables also increases the likelihood of pole failures, rather than just downed electric conductors, when whole trees fail.

Q. DID YOU REVIEW THE VEGETATION-RELATED PROPOSALS BEING CONSIDERED AS A MEANS OF "STORM HARDENING"?

A. Yes. The vegetation-related proposals under discussion are thus far being stated in conceptual terms. They first appeared in presentations by UI (*UI Infrastructure Hardening Considerations, 12/28/2011*) and CL&P (*Distribution Infrastructure Hardening Options and Recommendations, 12/14/2011)* made in response to the Governor's Two-Storm Panel, and subsequently discussed during interviews with staff at both utilities. Stated in general terms, they include increasing tree-conductor clearances, eliminating branches overhanging primary conductors, shortening the preventive maintenance cycle period, and increasing emphasis on reducing risks posed by hazard trees.

Q. DO YOU HAVE AN OPINION REGARDING EACH OF THESE CONCEPTS?

A. Yes, but to answer that question it is important to provide context. The two exceptional storm events of 2011 have already been described. There is a limit to the extent to which risks to the overhead distribution system posed by trees can reasonably or practically be reduced under such adverse conditions. Simply doing more tree work, obtaining more clearance and removing more trees, may be of limited value under major and catastrophic storm conditions similar to or more severe than Storm Irene and the October Nor'easter snowstorm. It may, however, improve performance under more typical adverse weather events.

Q. WHAT IS YOUR OPINION REGARDING THE CONCEPT OF ACHIEVING GREATER TREE CLEARANCE ON THE DISTRIBUTION SYSTEM?

A. CL&P's vegetation management specifications (see response to interrogatory AG-13) establish clearance requirements of 8 feet horizontally (or the previously established tree line) and 10 feet below conductors. These clearances are required for both routine and Enhanced Tree Trimming (ETT). The change being proposed by CL&P is to increase clearance above conductors from 15 feet to in some cases the elimination of all overhanging branches. UI is proposing (see response to interrogatory AG-17) increasing horizontal clearances from 6 to 10 feet and from 5 to 8 feet below conductors. They are also proposing increasing clearances above conductors from 12 to 15 feet.

In our opinion, tree-conductor contact on the distribution system is one step removed from reliability. There are two ways in which trees create interruptions and subsequently cause outages: 1) they provide an electrical short circuit fault pathway and 2) they cause physical damage to wires and poles. Both typically occur as the result of the structural failure of a tree or branch, which then comes into contact with an energized line. When the physical distance between tree and target (the line) is increased, there is some benefit by reducing the likelihood of a line strike. However, clearances on both the CL&P and UI distribution systems are not great enough to eliminate the risk posed by tree or branch failure. This observation is not unique to these two Connecticut utilities. It should also be noted that tree-conductor clearance distances are lost with each growing season following pruning. Another consideration is the fact that pruning cuts, even properly made, are wounds to the tree and have the potential to create areas of decay and ultimately structural weakness. When widening clearance distances, it is important to minimize the need for large-diameter cuts by retaining structurally sound large diameter stems and branches.

In our opinion, there may be a marginal improvement in reliability year- over- year as a result of the proposed changes, but we doubt that any reasonable increase in the amount of clearance achieved would significantly improve the system's performance under major or catastrophic storm conditions similar to or more severe than the two storms of

2011. We believe that the increase in the horizontal clearance being proposed by UI, from 6 to 10 feet, needs to be carefully evaluated and implemented. This will require significant tree removal and heavy pruning of existing trees, well back from the clearances that have been historically maintained. Sound, large-diameter branches and stems between 6 and 10 feet should be considered for retention. In addition, the amount of clearance should be considered in the context of the intended preventive maintenance cycle period.

Q. WHAT IS YOUR OPINION REGARDING THE CONCEPT OF ELIMINATING BRANCHES OVERHANGING DISTRIBUTION LINES?

A. CL&P's "Enhanced Tree Trimming" (ETT) initiative calls for the elimination of all branches overhanging conductors on multi-phase lines (see response to interrogatory AG-18). There often is a call for the elimination of all overhanging branches following major ice and snow storms. There is no question, in these conditions, that small to medium diameter branches adjacent to and above energized conductors in the upper crowns of trees present a significant risk to electric system reliability. Snow loading on branches during the October Nor'easter created overwhelming strain on wood fibers, resulting in the failure of many branches. This point was clearly observable during our field assessment. In many cases the trees were still in full leaf, dramatically increasing the surface area available for snow accumulation. This was particularly true in the case of the oak trees (*Quercus spp*.) found in the urban and utility forests.

These branches are also difficult to access and expensive to maintain during routine preventive maintenance line clearance pruning operations. The traditional approach to reducing risk to reliability has been the attempted elimination of branches that overhang conductors. This practice is often referred to as “ground-to-sky” or “blue sky” clearance work. In actual practice this is rarely practical or achievable, and generally occurs only on the most critical line segments, where an interruption in service would affect a large number of customers.

The structural form of the crowns of trees along a distribution line also needs to be considered. These edge trees typically have asymmetrical crown forms, with branches reaching toward the light in the opening created by the line and roadway. The result is that a high percentage of an edge tree’s foliage occurs in close proximity to the overhead line. Overly aggressive attempts to eliminate all overhanging branches have the potential to result in too great a loss of foliage, reducing the viability of the pruned tree. In other words, if too many leaves (which are the source of food production for the tree) are removed, the tree will decline and possibly die. If taken to excess the aggressive elimination of branches may create future hazard trees.

Moreover, recent work in the field of tree biomechanics is suggesting that small branches may play an important role as mass dampeners of harmonic oscillations under dynamic loading, reducing the risk of stem failures. This supports the practice of branch reduction rather than branch eliminations where appropriate.

In February and March of this year, TCG had the opportunity to spend several days in the field with utility staff, and was able to observe the damage in the areas affected by both storms. The damage to trees and the overhead distribution system was readily apparent. One important observation is that a disproportionate amount of damage in areas affected by the heavy wet snow appears to have occurred to upright branches in the upper crown of trees. These upright branches often are not directly overhanging conductors. They also would not necessarily have been considered a risk so would not have been pruned or removed during scheduled vegetation maintenance.

The actual branch failure mechanism needs to be considered. If one considers the branch to be a pre-stressed cantilever beam, it is apparent that as weight is added to the outer end of the branch, the force (bending moment) straining wood fibers near the main stem increases through leverage. Current work in the field of tree biomechanics is evaluating the efficacy of branch reduction pruning as opposed to removal of the entire branch. Branch reduction pruning is a means of reducing the risk posed to overhanging branches by reducing the likelihood that they will fail. It also reduces risk of conductor contact by reducing branch length and thus the sweep of the arc of those branches that do fail and remain attached.

In our opinion, any attempt to eliminate all overhanging branches should be tempered by the above referenced observations. “Ground-to-sky” clearance requirements may be appropriate for critical multi-phase segments of a distribution circuit. This practice should also consider factors such as branch orientation (upright) and the general structural integrity of the target branches. Reduction pruning has the potential to be a cost-effective alternative to the complete elimination of all overhanging branches. In any case, the cost-efficiency of "ground-to-sky" clearing and branch reduction work should be carefully considered. Any work high in the tree crown, well above the conductors, will be expensive. It is likely a reasonably effective strategy but should be prescribed in a way that focuses and optimizes the benefit.

Q. WHAT IS YOUR OPINION REGARDING THE CONCEPT OF SHORTENING THE PREVENTATIVE MAINTENANCE CYCLE PERIOD?

A. UI has proposed shortening the scheduled preventive maintenance cycle for single phase to four years, from a current interval of eight years with an "on condition" maintenance trigger of two outages over eighteen months (see response to interrogatory to AG-17). CL&P has proposed moving from a five to four year preventive maintenance cycle period (see response to interrogatory AG-17).

The dominant preventive maintenance paradigm in the utility vegetation management industry involves adoption of a fixed interval cycle period. An emerging model retains the concept of a fixed interval for scheduling a condition assessment inspection, and schedules the actual vegetation maintenance work on an "on condition" basis. Under this philosophy, the call for preventive maintenance is not based exclusively on a fixed time interval. The cycle period (time) may be one consideration, but other factors such as system performance (e.g. reliability) and condition assessment inspections are also considered. Another emerging best practice involves inclusion of short interval interim inspections on the most critical elements of a distribution circuit between scheduled periodic preventive vegetation maintenance work on a circuit. The advantage of both these approaches is that preventive maintenance is performed based on need rather than strict adherence to a time interval, having the potential to optimize performance and reduce cost.

Trees do not cause interruptions by growing into contact with conductors energized at common distribution voltages. As previously described, outages are typically caused by the structural failure of trees and/or branches. Shortening the interval between inspections and preventive maintenance means that conditions are reviewed more frequently. Many of the biological processes that compromise the structural integrity of a tree, such as decay, develop over time and may manifest symptoms well before failure of a branch or tree. Other factors such as site clearing and soil disturbance are often readily apparent to a trained observer.

In our opinion, more frequent identification of risk factors and subsequent risk mitigation has the potential to improve system performance. This should hold true both in steady state and under adverse weather conditions. Once again, the benefit during truly catastrophic storms would be less apparent.

Q. WHAT IS YOUR OPINION REGARDING PLACING INCREASED EMPHASIS ON HAZARD TREES?

A. A hazard tree is a structurally unsound tree that has the potential to strike a target such as an overhead conductor when it fails. Both electric distribution companies in Connecticut have identified an opportunity to increase emphasis on hazard tree removal during scheduled vegetation maintenance work.

On well-managed T&D systems, the dominant risk to reliability is from tree failures that occur beyond the corridor or in areas that are not being actively maintained.

Identification and mitigation of tree failure is an important component of a successful vegetation management program. The condition assessment survey described later in this testimony would serve to define the extent of the current level of exposure.

Gross defects are often apparent in hazard trees. The challenge lies in being able to identify structurally unsound trees before they fail. This is often easier said than done. General risk assessment criteria are available and can be refined. Historical information related to actual tree failures that have caused interruptions can be used to develop species- and site-specific risk assessment criteria useful in identifying high-risk trees and sites. Armed with this system-specific information, utility arborists can identify high-risk sites and individual trees that pose the greatest risk of causing interruptions.

While an experienced inspector using visual criteria and historic data can identify many of the risk factors that predispose a tree to failure, not all trees that fail exhibit apparent symptoms of imminent failure. Some trees that otherwise appear to be healthy and sound have been known to fail. Experience suggests that more than half of all tree failures that have resulted in an outage cannot be easily explained. A study by CL&P found that only

17% of tree failures causing an interruption on the transmission system would have been identifiable ahead of time as a hazard tree (interview with Maurice “Zeke” Dumas 2/8/2012). The inverse is also true. Trees that appeared to be structurally compromised or even completely dead snags remain standing in areas that sustained significant damage during the heavy snows of the October Nor’easter. The point is that the ability to accurately identify hazard trees and predict failure is limited.

In our opinion, an effective hazard tree program would improve reliability by identifying and mitigating the risk of failure of trees that are clearly predisposed to failure. This benefit would be accrued both under routine and severe weather conditions. However, the overhead T&D system will continue to face exposure to tree failures during major storms. Many of the trees that failed during both Storm Irene and October Nor’easter would not have been considered hazard trees by any reasonable definition and would not have been considered candidates for removal. Under extreme conditions, the dynamic force of wind and the static loads of ice and snow clearly have the potential to overwhelm structurally sound and healthy trees. We are also of the opinion that the conventional definition of a hazard tree should be expanded to include consideration of individual branches. The concept is to identify and eliminate risk, whether it is due to failure of the entire tree or individual branches rather than simply focusing on simple clearance.

Q. ARE ANY PRO-ACTIVE INITIATIVES BEING PROPOSED BY THE UTILITIES?

A. Yes. The *Report Of The Two-Storm Panel* presented to Governor Malloy in December 2011 has a recommendation (Recommendation 23) that a "State Vegetation Management Task Force" be established to consider the challenges and opportunities to improve conditions in the urban and utility forest. A similar concept has been proposed by UI. UI has also proposed increased emphasis on planting the right tree in the right place (see response to interrogatory AG-17). We agree that a public education initiative regarding planting trees under or near power lines, especially by tree type and location, has some value and suggest that such an initiative be investigated by PURA.

Q. DID YOU IDENTIFY ANY ISSUES RELATED TO CUSTOMER CONTACT DURING LINE CLEARANCE PRUNING THAT MAY AFFECT THE SUCCESS OF VEGATATION MAINENTANCE OPERATIONS?

A. Yes. Both UI and CL&P employ a relativity passive approach of seeking permission when interacting with customers on matters concerning the need for vegetation maintenance work on the distribution system. The apparent consensus practice is that, with the exception of emergencies and storm damage, permission for tree trimming is sought from the adjoining property tree owner and from municipal tree wardens. This is in contrast to a more proactive posture found throughout much of the utility industry, which includes notification of customers of pending work. Permission is more commonly reserved for removal of landscape trees in areas in and around residences. The difference between permission and notification may seem subtle but has proven successful. Regulatory requirements in Connecticut limit the opportunity to adopt the more proactive approach in dealing with the public on matters related to vegetation maintenance.

Q. DID YOU MAKE A REVIEW OF THE REGULATIONS THAT AFFECT LINE CLEARANCE TREE PRUNING OR REMOVAL WORK IN CONNECTICUT, AND, IF SO, DO YOU HAVE ANY OBSERVATIONS?

A. Yes, to a limited extent. Existing laws pertaining to utility vegetation management activities require the electric utilities to obtain the permission (and in some cases permits) from several parties, including tree owners, adjacent property owners, departments of transportation/public works, and municipal tree wardens. Effectively, with the exception of emergencies and storm damage, these requirements complicate and restrict the ability to perform this necessary work.

It is our opinion that these laws should be carefully reviewed. The levels of approval seem excessive. The power system is expansive and crosses many property lines and jurisdictional borders. The will of one party has the potential to place an entire circuit at risk. A tree-caused interruption due to vegetation maintenance restrictions will result in an outage that may impact customers far beyond the restricted location. It would also be wise to establish consensus among tree wardens and the two utilities on reasonable requirements for utility vegetation management operations. The goal should be collaboration to achieve an appropriate balance between concern for public safety, reliability of electric service, and health of the urban forest.

Q. BOTH ELECTRIC UTILITIES IN CONNECTICUT OUTSOURCE VEGETATION MAINTENANCE SERVICES TO CONTRACTORS. DO YOU HAVE ANY CONCERN WITH THIS PRACTICE?

A. The use of line clearance contractors is the dominant practice in the utility vegetation management industry. We found no reason to be concerned by this practice at either CL&P or UI.

Q. DID YOU IDENTIFY ANYTHING IN YOUR REVIEW OF THE VEGETATION MANAGEMENT PROGRAMS OF EITHER ELECTRIC UTILITY THAT YOU FOUND UNUSUAL?

A. Yes. The near exclusive use of uniformed police officers to perform traffic control services for line clearance tree crews.

Q. AS YOU HAVE NOTED, BOTH ELECTRIC UTILITIES HAVE IDENTIFIED TRAFFIC CONTROL AS A SIGNIFICANT COST TO THEIR VEGETATION MANAGEMENT PROGRAM. WHAT IS YOUR OPINION ON THIS MATTER?

A. The practice (requirement) of using uniformed police officers for traffic control represents a very significant cost to the states' two electric utilities. This is not a common practice in the utility vegetation management industry. Data provided by CL&P indicates that 8.5% of the total distribution vegetation management budget is spent on traffic control ($1,935K of $22,770K in 2011, see response to interrogatory AG-15). Data provided by UI indicates that 24.5% of the distribution vegetation management budget in 2011 was spent on uniformed police details flagging for tree crews ($910K/$3,702K, see response to interrogatory AG-15).

Q. HOW DOES THE COST OF TRAFFIC CONTROL RELATE TO THE COST OF ACTUALLY PERFORMING THE WORK?

A. Both utilities use a "standard" tree crew composed of two qualified line clearance workers, a bucket truck, and chipper. The cost of this kind of crew typically costs +/- $95/hr. The average billing rate for a uniformed police officer averages +/-$65/hour, (see response to interrogatory of both CL&P and UI to OCC-193), and the cost of a police car when required is +/-$25/hour (TCG interview with UI staff on 3/8/2012). In many cases the total cost for traffic control provided by police officers can run as high as $95-$120/hour. The result is that a uniformed police officer providing traffic control often costs as much or more than the actual line clearance tree crew. UI reports that in 2011 the cost of using police officers accounts for 33.5% of the cost for every mile of vegetation maintenance work completed ($1,757/$5,237 per mile; see response to interrogatory OCC-193). CL&P related that police details typically account for 10-15% of the cost of vegetation maintenance work (TCG interview with David Goodson on 2/7/2012).

Q. IS A REQUIREMENT TO USE UNIFORMED POLICE OFFICERS FOR TRAFFIC CONTROL A COMMON PRACTICE?

A. No. It is found in Connecticut and Massachusetts, but generally not elsewhere. It should be noted that this practice applies to line crews as well, so any storm hardening work requiring changes to the energy delivery infrastructure would also be burdened by these costs.

It should also be noted that the costs being imposed seems to be increasing. Towns have begun to add on an invoice processing/handling fee. Some are using a flat fee of $10-$15/invoice. Others assess a percentage (9-10%) to invoice value (interview with UI on 3/8/2012).

Q. WHAT ARE THE ALTERNATIVES TO THE PRACTICE OF REQUIRING THE USE OF UNIFORMED POLICE OFFICERS FOR TRAFFIC CONTROL?

A. The industry's standard practice is to make use of qualified traffic control service providers, with an occasional use of qualified tree crew personnel to handle incidental flagging.

Q. WHAT KIND OF DAMAGE DID TREES CAUSE TO THE OVERHEAD TRANSMISSION AND DISTRIBUTION SYSTEM AS A RESULT OF THE TWO MAJOR STORMS IN 2011?

A. The structural failure of trees caused damage to supporting structures such as poles and cross arms and to electric conductors.

Q. IN YOUR OPINION, WAS THE CONDITION OF THE IN-SERVICE WOOD POLES A FACTOR IN THE EXTENT OF THE DAMAGE EXPERIENCED IN THE TWO MAJOR STORMS?

A. The data indicates that it was. Of the poles that failed during the storms, poles over 40 years of age were over-represented. For UI, approximately 24% of its pole population consists of poles 40 years of age and older (see response to interrogatory AG-22); however, in both storms approximately 56% of the UI poles that failed were 40 years of age or older (see response to interrogatory OCC-357). The situation for AT&T was similar. Approximately 41% of its poles are 40 years of age or older; however, in both storms approximately 62% of the AT&T poles that failed were 40 years of age or older. Overall AT&T experienced over 1500 pole failures in both storms (see interrogatory responses OCC 52 and OCC 53). Significantly, CL&P was unable to provide specific information on the ages of failed poles, which inhibits the monitoring of this situation in its service territory (see response to interrogatory OCC-357). UI and AT&T failure rates for older poles in classified storms needs to be monitored going forward to see if the experience in Storm Irene and the October Nor'easter with older pole failure rates was unusual or part of a developing trend. It should be noted that both AT&T and CL&P have large percentages of their pole populations that are 40 years of age or older (see response to interrogatory AG-22). In the two storms Verizon had 16 pole failures (see response to interrogatory OCC-357) or 4.7% of the poles they jointly own (see response to interrogatory AG-20). Verizon could not report on the number of poles they jointly own for which they have custodial responsibility without conducting a special study (see response to interrogatory OCC-7).

Q. DO YOU HAVE AN OPINION REGARDING THE LEVEL OF MAINTENANCE THE EXISTING POLES ARE RECEIVING?

A. The purpose of a preventive maintenance program for wood poles is to extend their useful service life by minimizing infestation by wood decay organisms. The decay organisms require four things to flourish - suitable temperature, adequate moisture, available source of oxygen, and, "food" (the wood pole). Ambient air and soil temperatures are conducive to fungal growth for much of the year in Connecticut. Moisture levels are generally considered optimal from six inches above soil level downward. Adequate oxygen is generally available to a depth of eighteen inches below grade, below which oxygen is the limiting factor. This is why the critical zone for inspection is generally considered to be the approximately 2 feet of pole at and below the soil surface. This is also where bending moments being exerted on the pole are greatest. Wood preservatives are toxic to the decay organisms, depriving them of a source of food. But these chemicals break down over time, so the purpose of the maintenance treatment is to renew the preservative concentration to a level that will eliminate decay organisms.

Both electric utilities outsource pole inspection and treatment to reputable contractors, who follow implied utility industry best management practices for both inspection and treatment processes. Pole inspection data provided by both CL&P and UI indicated that very few poles fail inspection (2.5% at CL&P and 2% at UI, see response by both companies - see response to interrogatory AG-26). This suggests that the inspection and treatment program is effective in extending the life of the installed pole plant.

AT&T reports that in-house personnel inspect their poles, and that no remedial treatments with wood preservatives are performed (Transcript: 3/19/2012, Bucchieri at 229 and 238). The reported failure rates (i.e., poles that do not pass inspection) from AT&T's self-performed inspection program is suspiciously low (1.5%, see response to interrogatory AG-26), especially considering that they do no preventive pole maintenance. This is a "run-to-failure" corrective maintenance strategy. The poles owned by AT&T receive no preventive maintenance. According to AT&T, they are periodically inspected and corrective action, in the form of pole replacement, is undertaken when they fail inspection or when they fail outright.

Verizon does not have a formalized pole cycle inspection program like AT&T and the electric utilities, but rather Verizon employees inspect poles just prior to climbing them (Transcript 3/20/2012, Bozik at p. 326). However, like AT&T, Verizon does not perform remedial treatments on poles to extend their life. Rather, Verizon poles that fail the spot inspections are removed (AG-19 Supplemental Response).

The pole maintenance cycle period found in the utility industry typically ranges between 10 and 15 years, depending on expected decay rates. CL&P inspects and treats poles on a 15-year cycle. (CL&P transcript: March 20, 2012, Bowes at p. 418)

UI's pole inspection and treatment program is currently on a six-year cycle (see response to interrogatory AG-23). This program had historically been on a longer maintenance cycle period. The current 6 year cycle is coming to conclusion, and UI has indicated that it is considering changes to the cycle period and/or scope of inspection.

AT&T reports its intent to achieve a 10-year cycle period (see response to interrogatory AG-23). The number of poles inspected each year apparently varies greatly, as approximately one- half the population of poles was inspected in the previous two years.

The investment in the current asset base is significant. Pole maintenance has the potential to extend the service life of poles. The joint pole ownership model suggests that a common standard of care be applied to the jointly- held poles. The non-custodial owner has a legitimate interest in the wood poles maintenance practices of the custodial owner. This interest is both defined in terms of a pole's function and structural integrity, as well as in financial terms.

Q. IS THE AGE OF THE CURRENT POPULATION OF WOOD POLES A REASON FOR CONCERN?

A. Age alone is not a good indicator of the condition of a wood pole if the level of wood preservative in the pole is being renewed and maintained by *in situ* treatment. At some point in a pole's life it becomes necessary to include a detailed inspection of the upper portion of the pole, as weathering and decay of the pole top typically becomes the limiting factor in terms of service life. If, on the other hand, wood poles are not being re-treated, then age is a reasonable indicator of condition.

Q. BOTH OF THE STORMS CAUSED CONSIDERABLE DAMAGE TO OVERHEAD LOW VOLTAGE SERVICE LINES. DO YOU HAVE ANY OBSERVATIONS RELATED TO THE RISKS TREES POSE TO SERVICE LINES?

A. Yes. Neither electric utility performs routine line clearance pruning on individual low voltage service lines. This is consistent with industry practices. In some cases the practice is to prune service lines if branch contact is causing deflection of the wires from their normal sag. While it is true that trees caused a significant amount of damage to individual services during both storms, the damage was not caused by branches that would reasonably be pruned on a preventive basis. Overhead services generally are found in older areas with mature landscapes and large shade trees.

In our opinion, tree-related risks to services are best mitigated by enhanced restoration practices rather than through clearance pruning performed on a preventive maintenance basis. Said another way, it is likely much more cost effective to focus on reducing the impact of a tree knocking down a service than preventing it in the first place. The cost of trying to eliminate tree conflicts on services far outweighs the cost of repair, and service outage durations have the potential to be significantly reduced.

Q. TREES CAUSED SIGNIFICANT DAMAGE TO INDIVIDUAL ELECTRIC SERVICES TO HOMES. DID YOU CONSIDER THIS MATTER?

A. Yes. To shorten the overall outage time for customers, the electric utilities employed a practice of augmenting line crew resources during major storms with qualified electricians. We believe this is a good idea, with certain reservations regarding safety described below. UI reports (in TCG interview with UI staff on 3/7/2012) that this has been a standard procedure for many years. Electric utilities appropriately practice a form of triage in allocating resources to jobs that pick up the most customers first. While repair of individual services does not typically involve much in terms of crew or material resources, they are pushed down the repair queue and repaired late in the restoration effort. In many cases, the damage may extend beyond the utility's point of delivery, which results in further delays when homeowners are informed that services cannot be reconnected until repairs are made on their side of the delivery point. Electricians are equipped to make service reconnections at the point of delivery and this work can be performed concurrently with line crews making repairs to the high voltage system.

Q. ARE THERE ANY SAFETY CONCERNS TO BE ADDRESSED RELATIVE TO THIS PRACTICE?

A. Yes. While the voltage levels of individual service are typically those found in the home, they can still be dangerous. It is important that work be performed by qualified personnel. It is also important to clearly define the general scope of work. This would typically involve work on the last span of wire to the weather head or house knob, but not include work at the pole where high voltages may be present. Only qualified and properly licensed electricians should do this work.

Q. ARE THERE ANY REGULATORY ISSUES THAT NEED TO BE CONSIDERED?

A. The point of service delivery needs to be clearly understood by both homeowners and repair service providers. Electricians engaged by the electric utilities to perform this service should not also be completing repairs on the customer's side of the point of service delivery. Typically the work should stop at the weather head or house knob. Otherwise, they would be performing work that is the responsibility of the homeowner. This potential issue can be addressed by a careful review of the service tariffs and making any required changes.

Q. BOTH UI AND CL&P ARE CONSIDERING INCREASING THE USE OF "TREE WIRE". DO YOU HAVE AN OPINION REGARDING THE USE OF "TREE WIRE"?

A. Yes. Replacing bare primary conductors with one of the coated wire systems can reduce some of the risk of tree-caused outages in some circumstances, but it can also increase the repair time if the higher conductor strength causes pole or cross arm failure and can cause some safety concerns when the wires do come down. The term "tree wire" often is used interchangeably to describe three different conductor systems. The least common is the use of a fully insulated aerial cable. An aerial spacer cable system is more common. In the aerial spacer application, bundles of heavily coated conductors are held in place with spacers suspended by a steel messenger. The most basic application is simply to use conductors that have a plastic coating of various thicknesses. Neither the coating on the spacer cable nor on the basic coated wire is rated insulation. As such, it is not impervious to continuous contact with trees.

UI reports that “tree wire” is used on 89% of their overhead distribution system (3/20/2012 transcript, Cole at page 402). This is a high percentage of its distribution system. In contrast, CL&P reports some use of “tree wire”, but more commonly its circuits have bare primary conductors. Both companies report some use of aerial spacer cable systems.

Tree wire reduces the risk of a tree or branch providing a short circuit fault pathway resulting in an outage. This would reduce the risk of relatively small branches and pieces of trees falling into contact with the line but not creating enough impact to cause mechanical damage. Large tree impacts will still cause physical damage to the supporting structures, so the wire may end up on the ground just as bare wire does. In fact, when small diameter bare wire is replaced with larger diameter “tree wire” systems, the risk of pole failure can rise. This is due to two factors. First, these larger diameter wires will experience heavier loads under icing conditions. Second, the more robust nature of these systems also typically means that poles and cross arms are damaged when struck by trees, whereas small diameter wire may simply break, leaving poles and arms intact.

Another concern is the tendency of “tree wire” to remain energized while lying on the ground. The problem occurs because the coating system is thick enough to reduce fault current levels, meaning it remains energized. In the majority of cases, bare conductors in contact with earth will result in a high current fault that is detected and interrupted by the over-current protection system. UI related (in TCG staff interview with staff on

3/8/2012) that in approximately half of all tree-related trouble calls to which they respond the conductor(s) remain energized.

Neither utility indicated that it had attempted a study of the efficacy of coated wire following the two major storms of 2011 (in TCG interviews with CL&P on 2/7/12 and with UI on 3/7/12).

In our opinion, the use of coated wire systems can be effective in reducing the risk trees pose to an overhead distribution system and therefore customer outages. However, some of the benefit may be lost in major storms in situations where the failure of whole trees and large branches strike lines with enough force to bring conductors to the ground. The risk of downed conductors remaining energized is a safety concern that should be factored into a decision to use coated wire systems. The use of tree wire by UI overall seems to be reducing outages levels for customers.

Q. ARE THERE ANY ISSUES OF CONCERN IN ACCELERATING THE RATE AT WHICH POLES ARE REPLACED?

A. CL&P has suggested replacement of 25% of the oldest/weakest poles on their system over a ten-year period (*Distribution System Hardening Options and Recommendations,* 12/14/2011, pg 11, 104,800 of 426,000 poles). UI has been less specific in this area. It should be noted that only 24% of UI's poles are over 40 years old (20,132of 84,481, see interrogatory response AG-22) versus 46% for CL&P (195,972of 425,972, see response to interrogatory AG-22).

This initiative is complicated by the current joint ownership model for poles in Connecticut. AT&T is custodial owner for approximately half the poles on the CL&P and UI systems. It is unclear how AT&T would respond if accelerated pole replacements were required to support electrical system storm hardening initiatives. The question is whether AT&T would willingly increase spending significantly in support of these efforts to accelerate pole replacement. If AT&T does not step up and match the pole replacements/investments identified by the electric utilities, then success of any such hardening proposal relying on aggressive pole replacement would be highly uncertain.

Q. DO YOU HAVE AN OPINION REGARDING OTHER MEANS OF REDUCING THE OVERHEAD DISTRIBUTION SYSTEMS' EXPOSURE TO TREES?

A. Yes. There are a limited number of sites and portions of circuits where no amount of tree work, short of widening a distribution right-of-way to such a width that no tree was tall enough to strike conductors, would provide the desired level of reliability. In these cases it is appropriate to consider alterations to existing infrastructure. This may include line relocation and overhead to underground conversions. The cost of these options can be substantial, and consequently, their use should be limited. Our opinion is that it is appropriate to consider these options as possible solutions to specific challenges.

Q. TO WHAT EXTENT DID THE PRE-EXISTING CONDITION OF TREES CONTRIBUTE TO THE MAGNITUDE OF THE DAMAGE EXPERIENCED IN STORM IRENE AND THE OCTOBER NOR'EASTER?

A. The overall condition of the urban/utility forests of Connecticut is an important consideration in understanding the extent of damage sustained in both major storm events. There is reason to expect that there may be some systemic issues that contributed to the extent of tree damage experienced in both storms.

Q. HOW COULD THE CONDITION OF CONNECTICUT'S TREES BE ASSESSED?

A. A condition assessment survey based on statistically valid sampling methodology could be conducted. The population of trees of interest is a subset of all trees in the state. The critical population, in terms of the societal impact of a major storm, would be those trees in proximity to public infrastructure, such as roadways and overhead utility lines. These trees are part of the urban forests of Connecticut. The resulting information from such a survey would provide a clearer understanding of the underlying issues faced by urban foresters and vegetation managers. It would not be necessary to conduct a complete inventory of all trees in the urban forest, nor of special classes of trees such as hazard trees. A survey can be designed to yield a 90% confidence interval. This level of accuracy would effectively frame the problem and point to solutions, and would be far more cost-efficient than an inventory.

Q. PLEASE DESCRIBE HOW THE CONDITIONS OF THE URBAN AND UTILITY FORESTS OF CONNECTICUT COULD BE DEFINED.

A. A variety of criteria would be used to create a comprehensive assessment of conditions and characteristics in the urban/utility forest. The purpose of a condition assessment survey would be to help define and characterize the nature of the risks trees pose to the overhead power system, public roads, and the general public. The survey could also establish the value of the trees in Connecticut's urban and utility forests using existing tools available through the US Department of Agriculture, Forest Service.

Q. IS THERE SUPPORT FOR A CONDITION ASSESSMENT SURVEY OF CONNECTICUT'S TREES?

A. Yes. There appears to be a consensus that such a survey should be conducted. The Governor's *Report of The Two Storm Panel* recommends a state-wide tree risk assessment survey (Recommendation 20). As part of this investigation, John Goodfellow, TCG consultant, met with Dr. Jeffery Ward, PhD, Chief Scientist at the Connecticut Agricultural Experiment Station, and Christopher Donnelly, State Urban Forester, at Dr. Ward's office on February 6, 2012. Both indicated support for such an investigation. UI has also proposed that a survey of trees near its overhead lines be conducted (see response to interrogatory AG-17).

Q. HAVE SIMILAR CONDITION ASSESSMENT SURVEYS BEEN COMPLETED IN OTHER AREAS?

A. Yes. Similar studies have been completed in surrounding states. A condition assessment of the utility forests of Westchester County, NY was completed in 2008; it identified issues that may also be present in Connecticut. That project established a suitable survey protocol and served to address issues raised by the New York State Public Service

Commission. A similar survey is currently being completed in Massachusetts and Rhode Island for National Grid USA.

Q. WHAT SIGNIFICANT ISSUES WERE IDENTIFIED THAT MAY ALSO BE PRESENT IN CONNECTICUT?

A. It is likely that the issues faced in Connecticut's urban and utility forests are similar to those found in adjacent areas of the region. These include a lack of diversity in species composition and age. There is probably an over-abundance of some species, such as Norway maple (*Acer platanoides*) which are known to be relatively short-lived. There may also be large groups of trees of similar age.   This even-aged characteristic may be more pronounced within some species. The implication of this scenario is that a disproportionately large number of trees are advancing through their natural lifecycle as a group. As they pass maturity and begin to decline, the risk of structural failure and potential damage to overhead utility systems and risk to public safety will continue to increase. A preliminary assessment of Connecticut's urban forests (completed by Dr. Ward for the Governors' *Two Storm Panel*) points to risk factors similar to those found in Westchester County, New York.

Q. DO YOU HAVE A SENSE OF THE SIZE OF THE POPULATION OF TREES IN CLOSE PROXIMITY TO OVERHEAD POWER LINES AND ALONG PUBLIC THUROUGHFARES?

A. Yes. UI has reported that there are approximately 325,000 trees in close proximity to the overhead distribution system (in TCG interview on 3/8/2012). In our experience the stocking density for utilities in the New England region typically approaches 180 trees per mile of overhead line. Applying this metric to the more than 16,961 miles (see response to interrogatory) of overhead primary voltage distribution line maintained by CL&P suggests a total population on that system of approximately 3 million trees, for a combined population approaching 3.3 million trees in proximity to overhead lines. Dr. Ward has projected (*Connecticut's Street Trees: A Preliminary Analysis*, 11/29/2012) that as many as 40% of an estimated population of 1.1 million street trees in Connecticut are in close proximity to overhead lines. Experience would suggest less than <5% of either population would be high risk hazard trees.

Q. IN YOUR REVIEW OF THE UTILITIES' RESPONSE TO STORM IRENE AND THE OCTOBER NOR'EASTER, DID YOU LOOK INTO THEIR MANAGEMENT OF THE STORM RESPONSE?

A. Yes. We have conducted interviews of UI and CL&P personnel who were handling the storm restoration processes and visual inspected their primary Emergency Operation Centers (EOCs).

Q. WHAT DID YOU LEARN FROM YOUR INTERVIEWS WITH UI REGARDING ITS STORM RESTORATION MANAGEMEMT PROCESSES?

A. In our interviews with UI on March 7 and 8, 2012, we learned that UI had been working on modifications to its incident command processes in the months preceding Storm Irene. As the storm approached, UI made a decision to implement the updated incident command (IC) structure. At the time, UI had not conducted widespread training on the new structure; however, it did have a core staff group that had been working on the IC plan revisions which allowed it to undertake the implementation.

Q. HOW DOES UI'S NEW IC STRUCTURE COMPARE WITH INDUSTRY BEST PRACTICES?

A. The industry best practice for IC is the protocols that have been developed by the Federal Emergency Management Agency (FEMA) with the U.S. Department of Homeland Security (USHS). These protocols are embodied in the National Incident Management System (NIMS), which "provides a systematic, proactive approach to guide departments and agencies at all levels of government, nongovernmental organizations, and the private sector to work seamlessly to prevent, protect against, respond to, recover from, and mitigate the effects of incidents, regardless of cause, size, location, or complexity, in order to reduce the loss of life and property and harm to the environment"(NIMS publication dated December 2008, page1). In support of the NIMS protocols training programs have been developed which provide for various levels of certification commensurate with individual roles in the NIMS IC structure. The NIMS framework allows both governmental and non-governmental organizations (NGOs) to work within common and expandable framework by utilizing common terms and processes to manage emergencies. Several municipalities in Connecticut have engaged in NIMS training as a requirement to obtain USHS funding for various projects.

Q. DOES THE IC STRUCTURE IMPLEMENTED BY UI COMPLY WITH THE NIMS PROTOCALS AND PROCEESS?

A. Yes, it parallels the NIMS IC structure. However, it does not strictly follow the NIMS protocols. These differences include definitions in IC position titles which could be confusing to governmental agencies and other NGOs should an emergency require greater integration of organizations to address a large scale emergency response event.

Q. DID YOU REVIEW OTHER ASPECTS OF UI'S EMERGENCY RESPONSE, AND IF SO, WHAT DID YOU LEARN?

A. Yes. One important facet of UI's emergency response is the process of assessing the damage immediately after a storm event. The damage assessment process is a critical element of the overall emergency response as it requires trained observers to inspect the damage areas and record their observations in sufficient detail so that the physical restoration work can be planned and the labor and material requirements quantified on a unit of work basis. Before crews can commence the restoration process on a large scale, the results of the damage assessment process must be interpreted and entered into an outage management system (OMS). If there are delays, inefficiencies or inaccuracies in the damage assessment process, it can delay the process of mobilizing the proper number of labor resources and the movement of sufficient materials into staging areas to support the repair of the damaged infrastructure replacement materials. Before in-house, contract and mutual assistance line crews can be assigned to specific work locations, information from the damage assessment process needs to be reformulated in work packages that tell line crews what work is to be done and what materials will be needed to complete repairs. UI sends trained engineers and technicians into the field to survey the damage based on circuit restoration priorities. The damage assessors make notes of their observations on maps of the distribution system and return to a central location where they are debriefed and the results of those debriefings are then manually entered into to an OMS, converted to units of work (or trouble tickets) and assigned to line crews. Much of the process currently requires manual entry of information to support the process. UI is investigating some options to improve the efficiency of the process.

Q. DID YOU INSPECT UI'S EOC?

A. Yes, we did. For Storm Irene and the October Nor'easter, UI's main EOC is located in large conference rooms at an operating center location. Their EOC is not a location that is 100 percent dedicated to emergency management activities, but serves as regular conference and meeting room during non-emergencies. Located around the perimeter of the room are work stations with computer terminals to support the various storm restoration activities. UI will soon be moving some of its operations to a new facility where we were told they have some upgraded EOC capabilities. In the new location UI reported that emergency restoration activities would be managed from work locations that would also double as conference rooms during normal business days.

Q. WHAT DID YOU LEARN IN YOUR INTERVIEWS WITH CL&P REGARDING ITS STORM RESTORATION PROCESSES?

A. We interviewed CL&P on February 8 and 9 at its offices in Berlin, Connecticut about issues pertaining to its management of storm restoration efforts. We reviewed its IC structure which consists of a System, Area, Division and District hierarchy. This structure at the System level would include managing emergency events across multiple Northeast Utilities (NU) operating subsidiaries. At the Area level, management of an emergency event would focus on a single NU operating subsidiary such as CL&P. The

Division and District IC levels would cover geographical areas within CL&P that would be largely consistent with the geographical organizational structure in place to support day - to - day utility operations. Additionally, we found that the restoration of CL&P's transmission system assets was not managed directly under the CL&P Area IC command structure but was managed from a location within a nearby facility.

Q. HOW DOES CL&P's NEW IC STRUCTURE COMPARE WITH INDUSTRY BEST PRACTICES?

A. As with UI, CL&P's IC structure has similarities to the NIMS IC protocols; however, it does not exactly follow it. Furthermore, CL&P's IC structure maintains its normal day to day Division/District hierarchical structure, which is perhaps not as efficient or modular as the NIMS IC protocols call for to efficiently manage emergency incidents. In the NIMS protocols an Incident Commander role is reserved for the individual who has the greatest authority and responsibility for managing the overall emergency event. In CL&P's IC structure, the title of Incident Commander is assigned to individuals who are managing and directing resources at a district level, not at a statewide level. In interviews with some Town EOC Directors, it was apparent to some towns that had received NIMS training, that CL&P's (district) Incident Commanders lacked the authority usually associated with the title to redirect or reallocate resources. There is also some potential for inefficiencies in CL&P's IC structure resulting from the placement of the responsibility for the restoration of transmission facilities outside of the Area Commanders direct authority. This structure has the potential for conflicts over restoration priorities because under CL&P's current IC structure, it was not apparent that in storm Irene or the October Nor'easter, that a single Incident Commander for statewide CL&P operations was identified.

Q. DID YOU REVIEW OTHER ASPECTS OF CL&P's EMERGENCY RESPONSE, AND, IF SO, WHAT DID YOU LEARN?

A. Yes. As with UI, we reviewed CL&P's approach to damage assessment. We found that as with UI, CL&P's approach to damage assessment was largely a manual process when it came to translating the observations of the damage assessors into information in the Outage Management System (OMS).

CL&P's restoration information is collected by damage assessors and is put into the OMS as a narrative. Separate manual tabulations must be maintained to track the number of poles, transformers, etc., that will be needed. CL&P damage assessors sometimes call in reports from the field, which must be then typed manually into the OMS. Otherwise, the damage assessors add the information to the OMS system when they return to their base station. CL&P indicated they are exploring the use of contract damage assessors with more automated information processing capabilities.

Q. DID YOU INSPECT CL&P's EOC?

A. Yes. CL&P has a dedicated EOC facility which includes impressive graphic displays of critical storm restoration information, including the locations of its line trucks and crews. CL&P is continuing to enhance its information processing capabilities at its EOC. We did not visually inspect the CL&P's Division and District storm rooms and make observations regarding those facilities.

Q. HAVE YOU REVIEWED AT&T EMERGENCY STORM CAPABILITIES IN CONNECTICUT?

A. Yes. We have conducted some review of AT&T's storm response capabilities in Connecticut, though we were not able to interview their personnel or visually inspect their EOC.

Q. WHAT DID LEARN FROM YOUR REVIEW?

A. AT&T manages their storm restoration efforts in Connecticut from a Local Response Center (LRC) in Meriden Connecticut. However, AT&T's storm restoration crews, for the most part, are dispatched on national basis rather than on a state specific basis. The individual who is responsible for managing or monitoring their storm restoration efforts in Connecticut (Mr. Daniel L. Wiley) also has responsibilities for Southern Ohio. Mr. Wiley was in Connecticut prior to the landfall of Storm Irene, however, for the October Nor'easter Mr. Wiley managed Connecticut activities in a "Virtual Mode" from Ohio (Transcript 3/20/2012, Wiley at page 155). AT&T has national and regional emergency plans, however they do not appear to have a Connecticut specific plan. AT&T did have liaisons posted in the EOC's of both UI and CL&P to facilitate and coordinate pole replacement where they had the joint pole ownership custodial responsibilities.

Q. DURING YOUR REVIEW HAVE YOU MADE ANY ADDITIONAL OBSERVATIONS REGARDING THE DISTIBUTION SYSTEM MANAGEMENT PRACTICES OF THE MAJOR ELECTRIC UTILITIES?

A. Yes. From the interviews conducted with UI and CL&P and from reviewing the information submitted in the docket, there appear to be some apparent differences in the manner in which UI and CL&P manage their distribution assets.

Q. WOULD YOU PLEASE EXPLAIN SOME OF THOSE DIFFERENCES?

A. Yes. In Exhibit__TCG_3-3, the table compares information provided in this docket through discovery, as well as information developed by TCG, on various aspects of distribution asset management. When one looks at a number of different dimensions, a difference in management practices emerges. For example, since 2001 and through 2010, UI has increased its spending for distribution system operations and maintenance (O&M) spending by 54%, which is above the rate of inflation over the period. CL&P increased its spending by only 6% which means than when inflation is taken into consideration, CL&P is not spending as much in 2010 as it was in 2001 by roughly 20% or more to operate and keep up the distribution system (Exhibit__TCG__2-2). CL&P had the second lowest increase in spending of utilities in the region reviewed; the only lower utility increase in distribution maintenance observed was NSTAR at minus 2%.

If you look at wood pole inspection cycles, UI has been very aggressive and it has surveyed and inspected all of its wooden poles in the past 6 years (see response to interrogatory AG-23), whereas CL&P is currently on a 14 year pole inspection cycle

(3/20/2012 transcript at page 418). UI has also been more aggressive in pole replacement, and, as a result, only 24% of its poles are 40 years old or more. However, according to an estimate made by CL&P in 2009, their pole population includes 46% of poles 40 years old or older (see response to interrogatory AG-22). UI seems to have developed a pole management data base capability which includes the age of its poles and is capable of tracking other information about poles, which is useful. For example, UI can report the age of the poles replaced in both tropical storm Irene and the October Nor'easter. CL&P cannot (see response to interrogatory OCC-357). UI can report on the number of pole locations where it is waiting for AT&T to transfer attachments, or where a new pole has been set and an old pole needs to be removed (so called double bare poles) while CL&P could not (see response to interrogatories OCC-279 and AG-108). These situations can pose hazards to residents and are a source of complaints.

Since 2008 UI has increased its total number of lineman by about 3 during the same period, CL&P has reduced the number of lineman by 54 and has reduced other line worker classifications as well (see Exhibit__TCG__2-4 and Exhibit__TCG__2-5).

Additionally UI has replaced most of its bare primary distribution lines with coated tree wire such that 89% of its primary line is coated conductor (tree wire) (3/20/2012 transcript at page 402). Based on observations and CL&P interviews on February 8 & 9, 2012 it appears that over half of CL&P's primary lines are bare conductors with no coating and portions of that infrastructure were put in service when design standards for distribution lines was less stringent than today.

Q. DO THESE DIFFERENCES IN OBSERVED APPROACH TO DISTRIBUTION ASSET MANAGEMENT BETWEEN UI AND CL&P ACCOUNT FOR DIFFERENCES IN OUTCOMES FROM CUSTOMERS IN TERMS OF STORM RELATED OUTAGES?

A. Yes, there may be some indicators starting to appear that suggest these differences in management approach are beginning to show differences in outcomes for customers. In PURA's 2011 "*Annual Report to the General Assembly On Electric Distribution Company System Reliability*" dated June 8, 2011 there are different observations made about the reliability experienced by customers for CL&P and UI. On page 7 there is a graphic which indicates that the combined percentages of total (non-storm) outages from trees/limbs plus animals/bird contact was 36.8% of all CL&P outages. On page 11 the comparable percentage for UI was 22.4%, much lower than CL&P's.

Since storm Irene was a storm that affected large portions of both UI's and CL&P's service territories with horizontal wind forces, we believe it is informative to compare their pole failure rates in storm Irene. While the overall percentages of pole failures was relatively small for both, UI's pole failures were less that 0.1 of a percent (or 84 poles) of its total pole population. CL&Ps pole failures amounted to 0.2 of a percent (or 854 poles) or twice as great as UI's. In the October Nor'easter CL&P replaced 1064 poles and UI had to replace only 17 poles, though the Nor'easter hit the state very much harder in the middle and northern areas than in UI's service territory.

A particularly vexing graphic that appeared in the Hartford Courant on November 27, 2011 (see Exhibit__TCG__3-4) illustrates the towns in Connecticut that experienced 81% of their customers out of service during Storm Irene and the October Nor'easter. Storm Irene hit both the UI and CL&P coastal areas hard, and October Nor'easter hit CL&P's towns in the mid- to upper- part of the state much harder than the towns in UI's service territory. As discussed earlier in this testimony, Storm Irene was a horizontal wind type of storm which approached Connecticut from the south. When you closely examine the graphic, none of the UI towns experienced customer outage levels of 81% or more. However, about eight CL&P towns immediately adjacent to UI's service territory experienced 81% or more of their customers' losing power. An examination of the situation and visual observations in both the CL&P towns adjacent to UI's service territory and towns in UI's service territory adjacent to CL&P's service territory, provides no obvious explanation for this difference in outcome. However, it may well be that UI's more proactive approach to pole and primary wire replacement is beginning to make discernible differences in the resilience of its distribution system to storm related outages.

Q. COULD YOU PLEASE SUMMARIZE YOUR RECOMMEMDATIONS?

A. Yes. Our recommendations are summarized below:

1) We recommend that telecommunication operators, especially those with custodial pole ownership responsibilities, should contribute to the cost of reducing the risk of tree failure. Otherwise, electric ratepayers are providing a subsidy to the

telecommunications operators. It is clear that the benefit telecommunication providers receive as a result of the vegetation maintenance activities of both UI and CL&P is substantial. These activities reduce the risk of tree failures, which in turn reduces the potential for damage to supporting structures, such as poles and telecommunications equipment itself. Some costs, such as storm restoration work and clearing for new lines, are shared. That is not true in the case of preventive maintenance.

2) With respect to vegetation management, we recommend that realistic expectations and a clear set of performance objectives first be established. These can then be used to assess the cost effectiveness of options being considered. There is no question that much of what is being considered in the way of vegetation maintenance by UI and CL&P will result in improvement to reliability. However, to the extent that this proceeding (11-09-09) is focusing on the two major storms of 2011, the question of what can practically be achieved in terms of reducing storm damage to the electric system remains open. There is a limit to what can reasonably be achieved on an overhead distribution system. Simply doing more "tree work" is not necessarily effective under major and catastrophic storm conditions.

3) We recommend that UI provide a substantive basis for its proposal for significant increases in clearances to the side of and below conductors. Existing tree-conductor clearances on the UI system appear to be well- established by routine pruning over multiple maintenance cycles. Clearance is one step removed from reliability. The additional clearances being proposed will have a significant impact on trees, and if

applied literally, would result in the removal of large- diameter stems and branches that may not pose an elevated risk to reliability.

4) We recommend that UI's proposed change (to increase clearances to the side of and below conductors) be reviewed by PURA to ensure that such a plan can be cost justified in terms of improved outage reductions in major storm events. Moreover, PURA should require that an implementation plan be developed so that the resulting increase in clearance does not adversely affect trees. Without such an implementation plan, UI's proposed changes may potentially lead to increased risk of tree and branch failure.

5) We recommend that the cost of performing increased vegetation clearance below conductors be quantified, and the performance of circuits and line segments that receive this treatment be monitored and evaluated. The proposal to eliminate all branches overhanging critical lines initially appears to be an appealing concept. However, it may be impractical and unnecessarily expensive. It may also be overly heavy-handed in terms of the potential impact on trees. It is likely to improve reliability under routine conditions, but the impact of this practice under severe storm conditions is less clear.

6) We recommend that branch reduction pruning be considered as an alternative to the removal of entire branches where appropriate. This should be considered where necessary to maintain the health of the tree, which would prevent the inadvertent creation of further hazard branches or trees.

7) UI and CL&P have both proposed establishing four-year preventive vegetation maintenance cycle periods. We recommend supporting their respective proposals in this area. We also recommend that their approach to scheduling vegetation maintenance work be modified to allow some flexibility. To be clear, the benefit of a shorter cycle period is more frequent condition assessment. The actual performance of necessary vegetation maintenance tasks in the field should be allowed to vary based on the assessed need of circuits rather that a rigid circuit cycle trimming schedule. Condition assessment should involve field reconnaissance as well as the monitoring of suitable performance indicators.

8) We recommend an increased emphasis on hazard tree identification and mitigation work, and that UI and CL&P make a concerted effort to develop these capabilities. Both utilities have made this proposal, and we support this concept. Effective identification of hazard trees involves both art and science, and the attention of a well-trained and qualified assessor. We further recommend that the definition of a hazard tree be expanded to include consideration of individual branches.

9) We recommend that a review be made of the performance of circuits that had previously received “ETT” treatment to determine the performance of this approach relative to a peer group which received routine vegetation maintenance. CL&P has advocated a significant increase in its existing “ETT” program. The study should

consider performance during the two major storms of 2011 as well as other less severe events.

10) We support the formation of the "State Vegetation Management Task Force" and recommend active participation by UI and CL&P. Tree-related problems brought into focus by Storm Irene and the October Nor'easter, extends beyond the responsibilities of the electric utilities.

11) We recommend that a public education intiative regarding planting trees under or near power lines, especially by tree type and location, has some value and suggest that such an approach be investigated by PURA.

12) The existing laws and regulations pertaining to utility vegetation management activities require the electric utilities to obtain the permission (and in some cases permits) from several parties including tree owners, adjacent property owners, departments of transportation/public works, and municipal tree wardens, which is an overly burdensome process. We recommend that a review of existing regulations be conducted with the intent of streamlining the approval, and to achieve greater continuity across jurisdictions. We also specifically recommend that existing regulations be amended to allow electric utilities to notify the public of pending routine vegetation maintenance work, rather than asking permission.

13) We recommend that the current traffic control requirement imposed by many local jurisdictions, that uniformed police officers be hired to provide traffic control

services, be revised. This is unnecessarily costly. Qualified traffic control service providers can fill this need more cost- effectively. It should also be noted that the use of uniformed police officers will place a significant cost burden on any initiative to invest in system hardening, as it affects line crews, too.

14) We recommend that the cost in excess of using contract traffic control (flagging) services be borne by those towns and/or the customers in those towns that impose traffic control requirements for uniformed police officers. This would be fair to all other ratepayers and perhaps limit the further expansion of this practice which is becoming a very large percent of the UI and CL&P tree trimming budgets.

15) We recommend that a thorough inspection and preventive maintenance be required of all poles supporting electric infrastructure, regardless of pole ownership. The custodial pole owner is responsible for maintaining the structural integrity of the pole, ensuring that it stands upright and performs its intended function. However, non-custodial owners have an interest in assuring that their common investment is adequately maintained.

16) We recommended that the practice of using qualified electricians to repair downed services during major event restoration work be reviewed to ensure that there is no unintended conflict with electric service tariffs. The repair work that is supported in this manner should be limited to that on the utility's side of the point of delivery. Any repairs that are the customer's responsibility should not be made by these same qualified electricians while they are engaged in supporting the electric utility.

17) We recommend that a study be conducted to consider the use of coated conductors, which we believe will improve reliability performance overall. These systems have been in place for many years. The performance of circuits with coated wire should be compared to a bare wire peer group. The study should consider performance during the two major storms of 2011 as well as less severe events.

18) We recommend that consideration be given to the potential risk to the public of downed coated lines remaining energized and that specific communications be developed to warn first responders and the general public regarding potential hazards that can be associated with coated primary wire.

19) We recommend that before either electric utility implements a major accelerated pole replacement program, the matter of corresponding pole replacement of non-custodial poles be addressed.

20) Since existing conditions in Connecticut's urban and utility forest likely contributed to the level of damage sustained during the two major storm events of 2012, were recommend that a condition assessment survey be conducted. The purpose of the survey is to develop a basic understanding of the underlying issues faced by urban foresters and vegetation managers.

21) We recommend that robust data collection protocols be established to better collect and track data regarding storm outages and the damage inflicted on the distribution infrastructure. We also recommend that utilities develop formal independent forensic testing programs to test failed transmission and distribution equipment to

ascertain whether failed equipment is retaining its ability to meets its original design performance specifications and to make reports of such tests available to PURA.

22) We recommend that CL&P's efforts to develop an improved pole management database should be accelerated if possible.

23) There are apparent differences in the approach being used by UI and CL&P to manage their distribution assets. There is some preliminary information indicating that UI's more proactive posture on pole and primary wire replacement could be reducing customer outages. The NU/NSTAR merger settlement that PURA approved in Docket No. 12-01-07 requires CL&P to submit a plan to improve the resilience of its distribution plant. We recommend that PURA provide some direction in this proceeding to CL&P in developing the required plan. Specifically we recommend that a separate cost- benefit analysis be required for each of the major plan elements and recommendation. We also recommend that CL&P be required to include in the plan the details of how the plan could be financed with minimal rate impacts for CL&P customers. The financing plan should illustrate in detail how the provisions of NU/ NSTAR merger settlement agreement recently approved by PURA could be applied to reduce the cost to ratepayers of upgrading its distribution system infrastructure. We further recommend that the financing plan should include estimates for reductions in CL&P's overall cost of service emanating from various merger synergies which could be applied to the distribution plant upgrade.

24) UI and CL&P need to bring their IC organizational structures for storm restoration into greater alignment with the NIMS protocols and authority levels. This could be very important should Connecticut experience a widespread emergency event such as a category III hurricane where greater coordination and integration with federal, state and local governments as well as with other NGO's could be required. The NIMS IC protocols were designed with the management of those types of widespread damage events in mind.

25) We further recommend that all utilities in Connecticut have Connecticut specific emergency response plans that are filed at least bi-annually with PURA for acceptance, modification or approval, and that all utilities meet with the towns in which they operate at least annually to review their emergency plans, including participation with the towns' EOCs in emergency management drills and training at least on a regional basis.

26) UI and CL&P should be encouraged to develop damage assessment capabilities that can more efficiently automate the flow of information from damage assessors into their OMS systems. UI and CL&P should be required to develop protocols and the underlying information processing systems to allow towns to efficiently report roadway blockages immediately after storm passages and indentify the nature of the those blockages regarding the presences of downed utility infrastructure requiring trained assistance for safe removal.

27) If not current practice, PURA should consider providing basic NIMS training to its staff and deploying them in strictly monitoring roles in the utilities EOCs. This is done in other states and has several advantages. First, staff can provide regular independent reports on storm restoration progress and on other issues relevant to the restoration effort to the PURA Chairman. Second, staff can often collect information and make observations that would be useful in a post event analysis that might otherwise be lost in the intensity of the restoration effort. Third, it provides an opportunity to increase staffs' understanding of important aspects of the storm restoration and the many and competing considerations that can influence the outcome.

Q. DOES THAT CONCLUDE YOUR TESTIMONY?

A. Yes, it does.