6 Conclusions

A survey has been performed on utility hazard tree management. Thirty-two utilities responded, geographically representing the US from north to south and from east to west. The survey captured information regarding existing practices and recommended practices in the areas of tree trimming, tree outages, hazard tree identification, hazard tree removal, and hazard tree best practices.

Many of the utilities responding to the survey seem to be satisfied with their hazard tree program. Many claim that they are keeping up with the natural rate of tree mortality, assert that additional effort in hazard tree management will not reduce storm damage, and posit that they cannot think of anything additional or different that they could do to better manage hazard trees. Although these utilities may feel that they are addressing hazard trees in an appropriate and effective manner, most would be hard-pressed to *prove* that this is the case. Based on this and the overall survey results, the author has assembled a list of eighteen best practices that will help to ensure that hazard trees are being managed through a process that is cost effective, consistent, transparent, and data-driven.

These best practices should be taken in context. First, many utilities will already have many of these elements, or their equivalent, in place. Second, each utility is in a unique situation with regards to hazard trees. Certain best practices, though appropriate for most utilities, may not be appropriate for all. In any case, all utilities are encouraged to examine the proposed best practices. Some can be implemented at little-to-no cost, and others may allow hazard trees to be more effectively managed at a lower cost.

Recommendations are not intended to be a "one size fits all" approach. For example, a utility with very little tree exposure may not need to have any formal hazard tree program at all. Similarly, utilities where tree fall-ins result in a small percentage of customer interruption minutes (e.g., less than 5%) may not need to change their approach as long as they can demonstrate cost effectiveness.

Best practices are organized into three stages. The best practices in the first stage are inexpensive and relatively simple to implement. In addition to being potential quick wins, they also set the foundation for more ambitious actions. The best practices in the second stage are designed to be implemented in the medium term and generally require more utility effort, investment, and potentially change. Generally, the experience and data obtained from the first stage will be helpful when implementing the second stage.

The best practices in the third stage should be considered after a utility has a very good handle on its hazard program including the costs and benefits of a more aggressive approach. These recommendations are recommended if utilities wish to significantly reduce the number of tree failures during major storms. Since most tree failures during major storms are apparently healthy trees (i.e., not hazard trees), some of the recommendations in the Third Stage go beyond hazard trees, are potentially expensive, and are sensitive to property owners. Therefore, utilities must carefully consider whether the benefits associated with these Third Stage recommendations justify the costs and other implications.

First Stage

1. Culture change
2. Separate hazard tree budget
3. Hazard tree data
4. Post-storm data collection
5. Inspection procedures
6. Maximize customer approvals

Second Stage

7. Manage backlog
8. Maintain pruning cycle
9. Hazard tree database
10. Assess the utility forest
11. Prioritize by species
12. Plan for epidemics

Third Stage

13. Engage regulators
14. Address legal, regulatory, and political issues
15. Targeted annual inspections
16. Targeted danger tree removal
17. Targeted ground-to-sky pruning
18. Customer outreach

The recommendations in the first two stages will result in a well-managed and data-driven hazard tree program. A utility may already be doing a good job with respect to hazard trees, but the recommendations in the first two stages will allow the effectiveness of the hazard tree program to be demonstrated based on budgets, processes, and data. For most utilities, the recommendations in the first two stages will allow for an increase in the cost-effectiveness of hazard tree management, and modest reductions in daily and storm tree in-falls. Most of these recommendations can be implemented either with little cost or with short-term costs that result in long-term savings (e.g., maintaining an optimal trim cycle).

In the survey, many utilities claim that only ten percent or less of in-fall trees could have been identified as hazard trees prior to failure. If this is the case, more aggressive hazard tree removal will only provide incremental storm benefits. Consider a major wind storm where eighty percent of damage is due to in-fall trees, with eight percent of damage due to identifiable hazard trees. Assume that a utility implements an aggressive hazard tree program that is able to identify and remove seventy five percent of all identifiable hazard trees *on the entire system*. This implies a six percent reduction in overall storm damage, reducing a fourteen day storm to a thirteen day storm. This may not seem like much, but each day of storm restoration is very expensive and the cost of such a hazard tree program may be justifiable based on reduced storm costs. The economics will vary for each utility, but are worthwhile to examine.

The economics of hazard trees should include societal benefits. Each dead and diseased tree in a populated area will eventually fail and have to be removed. Even if the tree does not do any damage, the cost difference between reactive removal after failure and proactive removal is minimal, since the cost is dominated by the amount of biomass involved. Therefore, the additional societal cost for utilities proactively

identifying and removing hazard trees, not considering damage, is equal to the cost of identification and program management. Assuming that the cost of hazard tree identification and program management is fifteen percent of overall costs, society is better off if the reliability benefits and reduced storm damage benefits exceed about fifteen percent of the overall program costs (not including the benefits of reduced customer property damage). This analysis does not necessarily extend to forested areas where fallen trees are not removed. Regulators must ultimately decide how much utility hazard tree management effort is appropriate for inclusion in rates, but there is already strong precedent for utilities to pay for the removal of trees on customer property and to recover these costs through rates.

Significant reductions in storm damage can be achieved by reducing the utility forest and by reducing the amount of branches that overhang conductors. The societal economics for hazard trees do not apply in these cases, requiring the benefits to exceed the full costs for justification. However, storm benefits could be substantial. Consider again a major wind storm where eighty percent of damage is due to in-fall trees. If a utility reduces the utility forest on a critical circuit by fifty percent, storm damage on this circuit will be reduced by forty percent.

Based on survey results, some utilities have a highly developed hazard tree management program, many have a good program with opportunities for improvement, and some have programs that are not effectively managing hazard trees. In addition, there are many differences across utilities in terms of service territory, vegetation density, vegetation type, storm characteristics, and other factors that necessarily impact their approach to hazard tree management. These recommendations are not intended to be a "one size fits all" approach, and each utility must therefore thoughtfully determine its own best approach to hazard tree management.

Appendix A – Benchmark Survey

Directions

- Please send to rbrown@quanta-technology.com by May 13, 2009. Sooner is appreciated!
- Answer each question to the best of your ability. Educated guesses are welcome. If you cannot make an educated guess, please respond "don't know" or leave blank.
- Commentary, context, experiences, thoughts, and other contributions are always welcome. I will compile all of this collective knowledge in the benchmark report.
- For this survey, "hazard tree" is defined as a tree that (1) has the ability to fall into overhead conductors, and (2) has some visible risk factor such as being dead, diseased, structurally weak, or excessively leaning.
- If your company has multiple utilities with different practices (e.g., Exelon has ComEd and PECO), feel free to fill out a separate survey for each utility.
- The focus of this survey is hazard trees near the distribution system.
- **Check boxes:** to check, double click on the box, select "checked," and press "OK."

General

1. Name of responder: [answer]
2. Utility: [answer]
3. Number of electric customers: [answer]
4. Circuit miles of overhead primary distribution: [answer]
5. About what percentage of your system is:
   a. Heavily treed: [answer]
   b. Moderately treed: [answer]
   c. Lightly treed: [answer]
6. What types of major storms do you have?
   a. Hurricanes: ☐
   b. Linear winds: ☐
   c. Tornadoes: ☐
   d. Ice storms: ☐
   e. Wild fires: ☐
   f. Other (explain): ☐ [answer]

Tree Trimming

7. Briefly describe your distribution tree trimming cycle (e.g., 4-year cycle): [answer]
8. About what percentage of your distribution trimming is outsourced? [answer]
9. Are you, for the most part, keeping up with your tree trimming cycle goals? [answer]
10. Is there a separate budget for hazard tree removal? [answer]
11. Are you, for the most part, keeping up with your goals for hazard tree removal? [answer]
12. Is it more difficult for you to address hazard trees when you are behind on your trimming cycle? Explain. [answer]
13. On about what percentage of your distribution system do you trim "ground-to-sky," not allowing branches to exist directly above conductors? Thoughts and experiences on ground-to-sky trimming are welcome. [answer]

Tree Outages

14. Excluding major storms, approximately what percentage of outage events are due to:
    a. Entire trees, outside of the right-of-way, falling into conductors: [answer]
    b. Other tree-related causes: [answer]
15. During major storms, approximately what percentage of outage events are due to:
    a. Entire trees, outside of the right-of-way, falling into conductors: [answer]
    b. Other tree-related causes: [answer]
16. Approximately what percentage of trees that fall into conductors has visible warning signs that could have been detected prior to the tree falling over? [answer]

Identification

17. Is the identification of hazard trees outside of the trim zone explicitly addressed in your vegetation management procedures? [answer]
18. Do your private property easements allow for the removal of hazard trees within the right-of-way?
19. Do your private property easements allow for the removal the removal of hazard trees adjacent to the right-of-way?
20. Do your public property easements allow for the removal of hazard trees within the right-of-way?
21. At your utility, would you characterize the focus of identifying off-right-of-way hazard tree as:
    a. Focus is weak: ☐
    b. Focus is moderate: ☐
    c. Focus is strong: ☐
22. About what percentage of identified hazard trees are discovered through the following:
    a. Normal trimming cycle: [answer]
    b. Dedicated circuit inspections: [answer]
    c. Noticed by crews doing other things: [answer]
    d. Customers: [answer]
    e. Other (please explain): [answer]
23. Do you have a database of hazard tree information (i.e., location of removed trees, known hazards, customer refusals, etc.)? [answer]

Removal

24. Do you remove hazard trees located on customer property at your own cost? [answer]
25. Are there any complications with hazard tree removal related to third-party-owned or jointly-owned facilities? [answer]
26. Do you have the ability to remove hazard trees located on customer property without the prior consent of the customer, such as condemning dead hazard trees? Please explain. [answer]
27. Please describe how hazard tree removal requests are performed. [answer]
28. About what percentage of hazard tree-removal requests are granted by customers? [answer]
29. If a customer does not respond to a hazard tree removal request, can you remove the tree? Explain. [answer]
30. If a customer initially refuses to have a hazard tree removed, are any follow-on persuasion activities performed? How effective have these been? [answer]
31. If a customer refuses to have a hazard tree removed, and the tree later damages the utility system, do you ever hold the customer financially liable for the resulting damage? Explain. [answer]
32. About how much time, on average, elapses from the identification of a hazard tree until it is removed? [answer]
33. After cutting down a hazard tree on a customer's property, do you remove the resulting wood? [answer]
34. When removing a hazard tree on a customer's property, do you ever replace the tree? Explain. [answer]

35. Do you have a program to identify and replace undesirable tree species? How aggressive is this program? [answer]

Best Practices

36. A certain percentage of trees die naturally every year. Do you feel that your utility, on an annual basis, removes enough dead and diseased trees to keep up with this natural process? [answer]
37. Would an increase in the aggressiveness of hazard tree removal reduce major storm damage:
    a. A little bit: ☐
    b. A moderate amount: ☐
    c. A lot: ☐
38. What else besides hazard tree removal (vegetation related) would be effective at reducing major storm damage? [answer]
39. Please describe any attempts to more effectively address hazard trees that did not work very well. [answer]
40. Please describe any attempts to more effectively address hazard trees that did work very well. [answer]
41. What would it take for your company to more effectively manage hazard trees? [answer]
42. What would you recommend as a best practice for managing hazard trees? [answer]
43. Any other thoughts or comments on the subject of hazard trees? [answer]

Appendix B – Survey Responses

General

1. Name of responder:
2. Utility:
3. Number of electric customers:
4. Circuit miles of overhead primary distribution:
5. About what percentage of your system is: heavily treed, moderately treed, and lightly treed:
6. What types of major storms do you have: hurricanes, linear winds, tornadoes, ice storms, wild fires, other (explain)?

Table B-1. Summary of Responses to Questions 1-6

Utility	Customers	Ckt Miles of OH Dist.	% System Tree Density			Types of Major Storms				
			H	M	L	H	LW	T	IS	WF
AEP Texas Central	810,890	24,868	22	26	52	x	x	x		x
AEP Texas North	199,000	12,950	15	28	57		x	x	x	
Baltimore Gas & Electric	1,220,000	9,345	---	---	---	x			x	
Black Hills Power	202,100	5,100	25	60	15		x	x	x	x
CenterPoint	2,080,000	21,050	25	57	18	x	x	x	x	
CHELCO	42,000	2,816	50	50	0	x	x	x		x
Cleco Power	272,877	11,000	50	40	10	x		x	x	
CPS Energy	692,000	8,000	50	30	20	x	x	x		
Dayton Power & Light	514,000	10,500	25	50	25		x	x	x	
Duke Carolinas	2,500,000	54,000	30	50	20	x	x	x	x	
Duke Midwest	1,600,000	16,000	7	58	35	x	x	x	x	
Entergy Texas	395,000	10,985	50	35	15	x	x	x	x	
Enwin (Canada)	84,644	451	20	40	40		x	x	x	
Florida Power & Light	4,500,000	35,000	50	30	20	x			x	
Hawaii Electric	294,371	899	25	50	25	x				
Idaho Power	480,000	19,387	---	---	---		x		x	
Kansas City Power & Light	800,000	25,000	28	60	12		x	x	x	
Nova Scotia Power (Canada)	467,317	15,982	40	30	20	x		x		
Oklahoma Gas & Electric	770,000	26,300	45	25	30		x	x	x	x
Oncor	3,100,000	56,200	74	19	7	x	x	x	x	x
PacifiCorp	1,700,000	45,000	35	30	25		x	x	x	x
PECO Energy	1,600,000	12,000	65	20	15	x	x	x	x	
PG&E	5,200,000	113,500	60	25	15		x	x	x	x
PPL	1,380,887	27,965	25	30	45	x	x	x	x	
Puget Sound Energy	1,000,000	10,800	60	35	5		x			
Progress Energy Florida	1,600,000	18,100	30	50	20	x	x	x		x
Southern California Edison	4,851,312	98,500	10	20	70		x		x	x
SW Public Service Co.	400,000	16,000	33	33	34		x	x	x	x
Tampa Electric	670,000	6,400	25	50	25	x	x	x		x
Texas New Mexico Power	228,000	1,926	40	50	10	x	x	x	x	
Toronto Hydro (Canada)	682,560	2,665	60	30	10		x		x	
Xcel Energy	3,326,436	51,700	39	42	19		x	x	x	x
Average	**1,364,481**	**24,075**	**37**	**38**	**24**	**56**	**84**	**78**	**75**	**38**
Low	**42,000**	**451**	**7**	**19**	**0**			**(% of utilities)**		
High	**5,200,000**	**113,500**	**74**	**60**	**70**					

1. H=High; M = Medium; L = Low
2. H = Hurricanes; LW = Linear Winds; T = Tornadoes; IS = Ice Storms; WF = Wild Fires
3. Additional responses included: Floods (x2), Thunderstorms (x2), Micro Climates, Supercells, and Heat Waves

Tree Trimming

7. Briefly describe your distribution tree trimming cycle (e.g., 4-year cycle):
   - 4-year cycle (x3)
   - 5-year cycle (x4)
   - Cycle length varies by region and in some cases by circuit, due to the variety of growing conditions, species and outage causing factors. In general, cycles range between 3 and 5 years, with a few circuits on two-year cycles of maintenance.
   - Our distribution circuit tree trimming program emphasizes performing maintenance on circuits with extensive tree- and wind-caused System Average Interruption Duration Index (SAIDI) outage minutes or Top 10 % circuits with consideration given to the amount of time since the circuit was last trimmed. Although the selection process is driven by circuit reliability and performance, average cycle targets are set for different voltage classes of circuits. The target averages for the three voltage classes are as follows: (a) 35kV – Three-year cycle average; (b) 12kV "Normal" (i.e. 12kV circuits with standard 10' ground and 20' aerial easements) – Five-year cycle average; (c) 12kV "Narrow" (i.e. 12kV circuits in inner-urban areas with restricted easements and 10' ground easements with no associated aerial easements) – Three-year cycle average.
   - 3 yr. avg. for feeders and 6 yr. avg. for laterals.
   - 3-yr cycle
   - 4 year urban, 6 year rural.
   - 12-15 month cycle.
   - 1 year cycle – we patrol and trim every mile every year.
   - 12 Month cycle with a mid cycle patrol-trimmed every 12 Months and checked every 6 Months.
   - 4.5 yrs (3 yrs – feeder;5 yrs – laterals).
   - 4-yr goal
   - Reliability Based Vegetation Management Program. This methodology uses reliability performance of each feeder from tree related outages to determine the optimal trimming cycle for each feeder.
   - 3-yr cycle
   - Combination of 4-yr and 5-yr cycles.
   - We use a 4-year cycle for urban circuits (greater than 35 customers per circuit mile) and a 6-year cycle for rural circuits (less than 35 customers per mile).
   - Multi year cycle on each feeder
   - Transitioning to a 5 year cycle
   - 11-yr cycle
   - 4 to 6.5 years
   - 3-5 years
   - The distribution system is maintained on an average cycle of 5.3 years. The cycle in urban areas is between 3 and 4 years, while the cycle in rural areas is approximately 6 years.
   - Currently, cycle is driven by poor performing circuit records; target was a 4 year cycle, but concentrating on worst circuits has impacted overall cycle period dramatically
   - Hazard trees – annual cycle
   - Instead of a cycle-based approach, that requires vegetation to be trimmed based on a time continuum without regard to actual performance/reliability, we have adopted a performance-based approach based on SAIFI, SAIDI, and CAIDI targets as indicators for trimming need (x2)
   - 4-yr and 3-yr, depending upon the state

8. About what percentage of your distribution trimming is outsourced?
   - 100% (x27)
   - 95% (x2)
   - 85% (x2)

- 5% (x1)

9. Are you, for the most part, keeping up with your tree trimming cycle goals?
   - Yes (x14)
   - Most areas are between 85% and 100% on-cycle
   - Yes. Our goals for trimming trees on the distribution system are driven primarily by reliability performance. We are achieving these goals. (x2)
   - Yes, for the most part (x2)
   - No (x4)
   - Working to get to a 4-year cycle
   - We have to trim about 5,500 circuit miles per year to maintain our trimming cycle, which we are consistently trimming less.
   - Not currently on a prescribed cycle
   - Yes, mostly but has been deteriorating somewhat in some places
   - 85-100% on-cycle
   - Hazard trees – yes
   - Yes. We believe we are doing a reasonable job of keeping up; however, the annual rain fall drastically changes the growth rate of trees, so it is impossible to eliminate tree issues.
   - Our overall tree trim cycles have been, for the most part, improving over the past few years, improving our cycle times continues to be a major goal and objective

10. Is there a separate budget for hazard tree removal?
    - No (x16)
    - Yes (x11)
    - Yes, recently implemented (x2)
    - No. However, we are considering a separate budget for "epidemic" diseased trees (e.g., Mountain Pine Beetle) as the problem grows.
    - Not specifically, we have allocated fund for all removals which included hazard trees.
    - Some operating companies yes, others no.
    - Yes. However, the budget is $0 for 2009. Some hazard trees are still being cut, but they are being targeted within another budget line item called "Hot Spots". The line item for Hot Spots has not been inflated to incorporate hazard tree funding.

11. Are you, for the most part, keeping up with your goals for hazard tree removal?
    - No (x3)
    - Yes (x19)
    - Yes, except for special conditions such as epidemic tree diseases.
    - Yes, hazard trees are addressed on an "as-identified" basis.
    - Yes, would like to do more.
    - A recent study was performed that indicates a need for increased hazard tree removal if we are to improve reliability.
    - No set goals (x3).
    - Yes, to the extent that we are able to target visibly hazardous trees. Identifying the visually healthy and straight trees that fail due to high winds and/or saturated soil conditions has proven to be more difficult.
    - We have not determined the need to establish a goal for Hazard tree removal; this is incorporated into our overall plans for distribution cycle trimming.

12. Is it more difficult for you to address hazard trees when you are behind on your trimming cycle? Explain.
    - No (x5)
    - No, we use separate crews for the danger trees.
    - No, we maintain the same guidelines.

- No. We treat hazard trees as a priority.
- It would be but this has not been an issue for us.
- No. Hazard trees are removed from the distribution system wherever identified. However, hazard trees are primarily identified and removed during normal circuit trimming maintenance activities.
- Mile targets are a priority, removals follow.
- Yes, as we try to work the two programs together to reduce set up and travel costs.
- Yes
- We do not get behind on our trimming cycle; it remains a top priority. Hazard trees are included in our annual patrol.
- We identify during routine patrol and clear within 30 Days.
- Yes, typically in tough economic times this is a budget line item that is mitigated.
- We do not have a separate patrol for identifying hazard trees.
- We are typically on schedule so this is not an issue.
- Yes. There would be a higher volume of hazard trees if we were behind on our trimming cycle. The hazard trees left are closer to the lines, increasing the risk of an outage.
- Yes - schedule work costs would then be increased, causing funding for hazard mitigation to be less; regardless of schedule progress, current mid-cycle patrols are performed to minimize volume of hazardous conditions.
- Yes, it becomes more difficult to address hazard trees, as we need to be more selective, when we are behind on the trimming cycle.
- Without the right-of-way being managed, hazard trees are often hidden amongst the forest.
- We do not make an effort to identify hazard trees.
- Yes, because without prescribed cycles we aren't visually inspecting all of our circuits on a routine basis.
- Sometimes, but we usually do the hazard tree program anyway. Same crews do both hazard tree and cycle maintenance.
- There is no hazard tree removal program
- No, we maintain the same guidelines
- No. Cycle-maintenance trimming is a separate program from hazard tree identification/removal. We monitor vegetation-related reliability on a daily basis, inspecting all outages for greater than 50 customers interrupted. In addition, we use input from the field and reliability data to track where hazard tree outages are occurring, and conducts "danger tree patrols" as needed each year to target these areas. In general, deciduous trees are most visible in the spring and fall, while stressed conifers are visible year-round.
- Yes; resources are focused on hitting the poor performing circuits and trouble areas rather than performing truly preventative maintenance work.
- Addressing hazard trees and our reliability based line clearance maintenance program have independent schedules.
- Yes, it is more difficult to address hazard trees when behind on the trimming cycle because resources are transitioned to the trimming program to ensure mileage goals are met.
- Ten years ago when we were it was difficult. When we're keeping up, we regularly inspect our lines, and have good handle on hazard trees.
- Hazard trees on our distribution facilities are not a major operational issue for us, as such this question does not apply.

13. On about what percentage of your distribution system do you trim "ground-to-sky," not allowing branches to exist directly above conductors? Thoughts and experiences on ground-to-sky trimming are welcome.
    - Varies due to special projects, etc.
    - Target 100% of multiphase portions of circuits. Single phase portion of circuits we maintain trees based on their likelihood of causing an outage or posing a public safety risk. Moving from a ground-to-sky approach to this targeted approach has led to lower costs on our first and second cycles. It also improved reliability as we were able to get more of our system on-cycle. However, we anticipate costs to level out or increase incrementally in subsequent cycles because trees that were not a threat in past cycles will need to be maintained.

- About 10%. We manage all of our 34.5 kV subtransmission lines and some habitual poor performing distribution feeders on a blue sky basis.
- Subject to the rights provided to the Company in easement documents, we essentially practices 100% ground-to-sky trimming for all distribution primary conductors. Our guidelines require contractors to clear laterally from the conductors a minimum distance based on the voltage (35kV – 10+ feet; 12kV – 7+feet), then clear vertically to twice the height of the pole or as high as a lift truck or mechanized equipment can reach. Any higher limbs are shortened in length so that they will not extend above or beyond the conductor closest to the tree. Subsequently, if these limbs break or fall, they will hinge and miss the wires.
- Less than 10% Thoughts and experiences on ground-to-sky trimming are welcome.
- None (x3)
- 5%
- Less than 1 % of our distribution system is pruned ground to sky. However, 100% of the transmission system is pruned in this manner.
- 3% in Mountain areas prone to heavy snow/ice loading.
- 10% .We only remove defective overhang when it is found or circuits feed a large number of critical customers. Ground to sky in my opinion allows for more light penetration to the floor, which allows more growth from the ground. In addition, by allowing more light penetration the phototropic properties of trees would dominate and allow limbs to grow into the space once occupied by full shade. The approach of targeted removal of overhang is a more conducive practice for us. We look for defects in limbs and tree, i.e. attachments, declining limbs, etc.
- Done on ALL 3-phase feeders (no exceptions)
- With additional funds that we will have from our system hardening budget we will be able to afford to get the additional clearance and start trimming "ground-to-sky"
- We try for 100%.
- Approx 30% (3-phase segments only)
- Currently, there is no ground-to-sky trimming as a rule and it is only performed on some PSE jobs. Several circuits are selected for ground-to-sky trimming for test and analysis purposes. Ground-to-sky trimming was done often from the early to late 1990's. Benefits of improved circuit reliability were seen from this type of tree trimming. However, VM program philosophies and budget capacities changed over time, favoring less aggressive trimming on more frequent cycles.
- We are in our 5th year of implementing a sustainability program where the goal is to re-establish the right-of-way from the ground in effort to switch to IVM on distribution. IVM has been traditionally only implemented on transmission. Percentage of "ground – sky" work = 40%.
- Not currently doing this but recommended that we should. Some Political issues with the rate payer against trimming or removing trees on their property.
- trim below our conductors to the sky. Therefore we don't adhere to a strict ground to sky policy.
- 90% ground to sky. Contract allows contractors to trim as high as the bucket can reach on front property. Back property is ground to sky, since it is climbed. And only some line miles have trees above line. This specification is subject to disagreement internal to the company. However, no business case has been convincing yet to convert to ground to sky on all line miles, including front property.
- 100%, we cut 10 feet minimum either side of the primary line ground to sky and follow up with a stump treat spray program.
- 50%. Ground-to-sky trimming is more beneficial on 3 phase lines. Ground-to sky trimming is more costly method of trimming.
- Target 100% of multiphase portions of circuits (multiphase is roughly 40% of system). Single phase portion of circuits we maintain trees based on their likelihood of causing an outage or posing a public safety risk. Moving from a ground-to-sky approach to this targeted approach has led to lower costs on our first and second cycles. It also improved reliability as we were able to get more of our system on-cycle. However, we anticipate costs to level out or increase incrementally in subsequent cycles because trees that were not a threat in past cycles will need to be maintained.
- An estimated 25% of all line miles have been trimmed "ground-to-sky." We believe this is a beneficial program in certain areas and times i.e. along the main trunk of the feeder, and will certainly help during ice

storms. However, if a tree is "sky-trimmed" extensively there is a risk of later mortality. In addition, high winds tend to throw limbs into the conductors from outside the ROW, rather than dropping straight down.
- On all primary voltage lines, except handful of property owner refusals.
- For hazard trees that are pruned from the conductors 100% are "ground to sky"
- We do not practice "ground to sky" trimming in any easement or right-of-way. Our target is to remove tree overhang from all primary voltage conductors. On any given circuit, we leave overhang on portions that consist of only secondary voltage conductors.
- All primary
- We do not trim ground to sky
- 10%
- The use of "ground-to-sky" clearing is predicated upon the area we are working as well as our past practices. Such clearing becomes a decision based upon the ability to perform such clearing, customer base, location, politics, etc., as well as the financial implications of doing so. Our specification for overhang requires 15 feet of clearance above our distribution facilities, no overhang is allowed on Transmission facilities.

Tree Outages

14. Excluding major storms, approximately what percentage of outage events are due to:
    a. Entire trees, outside of the right-of-way, falling into conductors: Unknown (x5), <1 (x8), 1, 1.7, 2, 3, 3, 5, 5.5, 7, 10, 10, 19, 35, 46, 53, 60, 75, 75, 75, 80
    b. Other tree-related causes: No answer (x5), 1, 1, 3, 5, 6, 6, 7, 7, , 8, 10, 15, 15, 16, 16, 16, 20, 20, 20, 22.5, 25, 25, 25, 25, 25, 26, 30, 47, 65, 90
15. During major storms, approximately what percentage of outage events are due to:
    a. Entire trees, outside of the right-of-way, falling into conductors: Unknown/no answer (x8), <1. (x4), 1, 2, 2.7, 5, 5, 5, 7, 10, 19, 23, 40, 45, 51, 65, 70, 75, 75, 80, 80, 85
    b. Other tree-related causes: Unknown/no answer (x8), 1, 2, 6, 9, 10, 10, 15, 15, 15, 15, 16, 16, 20, 20, 24, 25, 25, 40, 55, 60, 60, 70, 80, 90
16. Approximately what percentage of trees that fall into conductors has visible warning signs that could have been detected prior to the tree falling over? Unknown/no answer (x13), <1 (x1), 1, 3, 5, 7, 7, 10, 10, 10, 10, 10, 10, 10, 20, 23, 25, 30, 36, 50

Identification

17. Is the identification of hazard trees outside of the trim zone explicitly addressed in your vegetation management procedures?
    - Yes (x19)
    - No (x8)
    - Separate Procedure
    - Yes, contractors are instructed to identify all hazard trees during the course of work activities.
    - Yes. We remove dead trees within 45 ft of the center line on both cycle maintenance and the annual danger tree survey and removal. The annual dead tree survey and removal is completed on three phase lines only. A problem is that we have a lot of trees falling that do not appear to be dead. Also, often we will miss some dead trees during the survey.
    - Somewhat
    - Yes. It should be noted that we do not define a hazard tree as "dead., diseased, structurally weak, or excessively leaning trees". To us, a hazard tree is a tree considered a potential threat to the safety and reliability of our facilities growing within, or immediately adjacent to, the normally maintained right-of-way.

18. Do your private property easements allow for the removal of hazard trees within the right-of-way?
    - Yes (x16)

- No (x2)
- No easements
- No, although when we deem the tree requires work, we cite our Customer Service Agreement.
- Our distribution R/W's are of indeterminate width and typically encumber an entire property for trimming or removal of trees.
- A portion of our easements include rights to remove hazard trees within the right-of-way.
- We have specific rights in ROW regardless of private or public property.
- Yes, but easements are rare in the distribution system.
- No (x4)
- If an easement exists, then we can remove volunteer trees that are less than 4" dbh
- Firstly, we started acquiring easements after privatization in 1992. Before that we constructed all of our lines on rights of way associated with the government roads. The answer is yes in most cases. Requires discussion and negotiation in some municipalities.
- No, although when we deem the tree requires work, we cite our Customer Service Agreement.
- Highly variable, we are all over the place on this one. This is based upon our history as well as the type of easement, as well as the inclusion or exclusion of Danger tree or Hazard tree rights in the easement document.

19. Do your private property easements allow for the removal the removal of hazard trees adjacent to the right-of-way?
    - No (x14)
    - Yes (x2)
    - No, although when we deem the tree requires work, we cite our Customer Service Agreement.
    - Our distribution R/W's are of indeterminate width and typically encumber an entire property for trimming or removal of trees.
    - A portion of our easements include rights to remove hazard trees adjacent to the right-of-way.
    - We have limited rights outside of ROW.
    - Yes (in most cases)
    - No - unless expressly provided for in the easement; again, easements within distribution are rare.
    - Most.
    - No easements
    - With property owner's approval
    - government road rights of way, the answer is No. On right-of-way acquired since 1992, the answer is yes. The amount of right-of-way constructed since privatization is negligible when considering the total amount of line constructed.
    - Generally yes. We have varying easement language but for the most part have a "within and without" clause which gives us the right to trim threatening vegetation outside of our easement.
    - No, although when we deem the tree requires work, we cite our Customer Service Agreement.
    - Yes, where we have secured easements we typically have the right to "remove or modify from time to time trees, limbs, and/or vegetation outside the said right-of-way which the Grantee considers a hazard to any of its electric power or communications facilities or is a hazard to the rendering of adequate and dependable service to the Grantor or any of the Grantee's customers, by use of a variety of methods used in the vegetation management industry." The Company's practice, however, is to attempt to gain customer consent to remove hazard trees regardless of the provisions in the easements.
    - No; however State Tariff allows removal.
    - Sometimes.
    - Highly variable, we are all over the place on this one. This is based upon our history as well as the type of easement

20. Do your public property easements allow for the removal of hazard trees within the right-of-way?
    - Yes (x11)

- No (x10)
- We have specific rights in ROW regardless of private or public property.
- Yes, if less than 4" dbh
- Most of the time (x2)
- Sometimes (x2)
- If prior approval is received
- Unknown
- Not always specific language
- Highly variable, however we do have leverage for trees within the ROW due to County and City ordinance
- No answer (x1)

21. At your utility, would you characterize the focus of identifying off-right-of-way hazard tree as:
    a. Focus is weak: xxxxxxxxxx
    b. Focus is moderate: xxxxxxxx
    c. Focus is strong: xxxxxxxxxxxxx

22. About what percentage of identified hazard trees are discovered through the following:
    a. Normal trimming cycle: 0, 0, 10, 20, 25, 25, 25, 30, 35, 35, 45, 47, 48, 50, 50, 60, 60, 65, 70, 75, 75, 80, 80, 85, 85, 85, 90, 90, 90, 97
    b. Dedicated circuit inspections: 0, 0, 0, 0, 0, 0, 0, 1, 2, 5, 5, 5, 5, 5, 10, 15, 18, 20, 25, 25, 25, 30, 44, 45, 47, 50, 50, 70, 70, 70
    c. Noticed by crews doing other things: 0, 0, 0, 0, 0, 1, 1, 1, 2, 5, 5, 5, 5, 5, 5, 7, 10, 10, 10, 10, 20, 20, 20, 23, 25, 30, 30, 35, 90
    d. Customers: 0, 0, 0, 1, 1, 1, 1, 3, 5, 5, 5, 5, 5, 5, 5, 5, 5, 8, 10, 10, 10, 10, 10, 10, 15, 15, 20, 25, 30, 30
    e. Other (please explain): Outage follow up (5%), Outage follow up (80%)
    f. No answer: xx

23. Do you have a database of hazard tree information (i.e., location of removed trees, known hazards, customer refusals, etc.)?
    - Yes (x5)
    - No (x15)
    - Spreadsheets
    - No. However, we keep hard copies of that information with our maintenance maps so we can attempt to address them on our next cycle.
    - No, we have some paper records.
    - For customer refusals only.
    - We have a vegetation database that we use to log all circuit information and a customer database to log all complaints/refusals.
    - Yes, information can be identified by feeder.
    - Yes, but it was just recently created (January 2009).
    - Not currently, however, our Forestry Planners have just been issued GPS to begin an identification program.
    - This information is maintained but not in a single-source database.
    - No; but planned for GIS software system being installed this year.
    - We maintain a evolving list of properties with delayed pruning issues

Removal

24. Do you remove hazard trees located on customer property at your own cost?

- Yes (x22)
- Yes, if it endangers our facilities.
- Yes-Sometimes just top below lines.
- No
- We remove immediate hazard at own cost, customer is responsible beyond that
- Most of the time.
- No, too expensive.
- Infrequently.
- This is variable, and is determined by need; we may remove at our cost or just top the tree at our cost and leave removal to the customer.

25. Are there any complications with hazard tree removal related to third-party-owned or jointly-owned facilities?
    - No (x16)
    - Yes (x4)
    - Yes. Our contractors are required to obtain property owner permission prior to removing trees.
    - Yes; complications are usually related to recovering shared costs.
    - Yes, communications companies do very little tree work to protect their facilities.
    - We notify customers prior to removal & have their authorization.
    - Not really, we will share the cost if the tree is on municipal land and it is shared between the utilities and the municipality in some cases the transportation dept.
    - Sometimes
    - No answer (x2)
    - Yes. Identifying the land owner can complicate the issue.
    - No; except that they accept no responsibility to share in the cost or liability (phone/cable TV/etc).
    - Generally no.
    - Obtaining a signed permit can be more difficult when the property third-party-owned.
    - From time to time, we encounter a customer who refuses to allow us to remove a hazard tree in an area where we have no easement – roadside pole placements, for example.

26. Do you have the ability to remove hazard trees located on customer property without the prior consent of the customer, such as condemning dead hazard trees? Please explain.
    - No (x14)
    - Yes (x2)
    - Yes, if eminent danger.
    - Yes, although severity of hazard dictates whether the tree is addressed without consensus.
    - We have the ability but perform pre-notification in advance of the work.
    - No. We seek the customer's permission and work through a, "refusal," process to resolve disagreements.
    - During emergency or reliability concern.
    - Yes. If it is a safety and reliability hazard we will remove and resolve issues later.
    - No—we must have property owner's permission to remove any tree greater than 4" dbh
    - Customer consent not required however we do provide notification to customer that tree will be removed.
    - No, customers are required to sign removal forms
    - We could have the right to remove hazard trees on customer property without their consent, but we always notify the customer and get their consent first.
    - Yes, however our normal policy is to notify before the work is completed
    - We contact the customer prior to any removal
    - Yes. The Company's practice, however, is to attempt to gain customer consent to remove hazard trees regardless of the provisions in the easements.
    - Generally, No on improved properties.
    - In Washington and Oregon, yes by statue. If other states no. We will remove a hazard tree regardless of our authority to do so if, in our judgment, it presents an imminent threat.

- This is really a decision making process dependent upon the severity of the Hazard Tree situation, basically we handles these on a case by case basis. These are operational decisions, the level of condemnation as a legal tool has not been utilized to date.

27. Please describe how hazard tree removal requests are performed.
    - Coordinator patrols a circuit, identifies trees to be removed, gets permission and assigns contractor crew.
    - We leave a door card with a description of the required work and a contact number for questions. We may seek a signature from the customer acknowledging the work prior to removal.
    - Contractor notification person contacts the property owner to arrange for the work.
    - If a customer contacts us to report a hazardous tree, a Customer Service Order is generated and forwarded to an assigned tree contractor. The contractor will dispatch an inspector within five business days to visit the location to assess the request and notify the customer of assessment results. The contractor then obtains any necessary property owner permission and schedules the work for completion within 21 days of the original request. If urgent action is necessary, the contractor will remove the tree as soon as possible. If our field personnel identify and request a tree removal, a work order will be issued to a contractor to schedule and perform the work. If urgent action is required, a tree crew is redeployed from its current work site to address the hazard.
    - Typically on ROW rural areas don't require a formal request process. For private property issues customer contact and subsequent approval is required.
    - Evaluated by Certified Arborist and risk/cost assessed.
    - Company Arborist evaluates request and then secures written permission, if beneficial for the Company. Company contractor schedules removal with the customer.
    - Our contract pre-inspection company employees identify trees that require abatement work and seek customer permission for the work.
    - Customer contact-permission to complete-share costs.
    - Customer will contact us, field inspectors will site visit and speak with customer to obtain a consent waiver, crews will perform work.
    - Any time a potential hazard tree is identifies, by whatever means, a qualified arborist will investigate & determine the potential hazard & the tree is prioritized.
    - Customers call into our call center and request a tree be trimmed or made safe.
    - Identify hazard tree, provide written notification to customer, remove tree.
    - Hazard is assessed by arborist and removed immediately if an imminent threat, or scheduled as assessed.
    - ID hazard, notify customer, homeowner signed documentation prior to any and all tree work.
    - All removal requests are performed on a case by case study. First the request is directed to vegetation management. The site is then investigated to determine if it warrants a removal.
    - Basically we don't receive any. Where we have set up a program with a municipality, we will compile a database of trees and priorities for removal. The database would identify all the 3rd party cost-share partners.
    - We do not perform hazard tree removals.
    - Immediate, imminent threats are addressed quickly. Non-imminent threats are communicated to the property owner and arrangements made for future removal.
    - Facilitator contacts customer
    - It is verified or identified by the Supervisor over that department. Then contact is made to the customer.
    - Requests are generated either through customer calls or utility personnel. Each ticket is investigated by a forester to determine if it is hazard tree. Vegetation Management Department prioritizes requests as low, medium, or high. A tree prioritized as high is addressed immediately.
    - leave a door card with a description of the required work and a contact number for questions. We may seek a signature from the customer acknowledging the work prior to removal.
    - When a hazard tree is identified, a field personnel or contract tree crew general foremen identify the property owner and make contact. When contact is established, negotiations are conducted regarding the amount of post-removal cleanup necessary to satisfy the customer. After an agreement is reached and permission is granted, the tree is removed.

- Request evaluated by in-house or contract 'inspector'; if initiated by property owner, we work with property owner to eliminate as much of the hazard as we feel responsible for (try to leave anything not impacting our system for the property owner to handle, but will do all if this is the only way to negotiate what we need); direct our contracted tree crew to perform the work as negotiated. If the request is initiated in-house, go through same process to notify and explain to property owner and negotiate a result acceptable to both parties.
- Door hanger / Letter contact.
- As trees are identified, a contract employee or a company employee will contact the property owners to resolve tree hazard.
- As hazard trees are identified, property owners are contacted to resolve the problem.
- A vegetation management representative contacts the customer, and explains that a hazard tree has been identified on the customer's property. The utility representative explains the potential impact to electric facilities and the policy to leave all wood. He then obtains a signed removal permit allowing the utility and its contractor to remove the tree and leave the wood on site.
- Our certified arborist will approach the property owner and explain the circumstances, and arrange to have the tree removed. If they refuse, we'll send them a letter notifying them of our impending action (assuming we have time. If not, we'll send out a crew and remove the tree.
- If this is an immediate threat we handle it right away, if it is not, we handle this as we do all other requests for tree work.
- n/a (x1)

28. About what percentage of hazard tree-removal requests are granted by customers?
    - 100% (x4)
    - 99.9% (x2)
    - 99% (x2)
    - 98%
    - 95% (x3)
    - 90% (x8)
    - >90%
    - 90-95%
    - 90%
    - 80%
    - 85% (x2)
    - 75% (x2)
    - 25%
    - Don't know (x2)
    - n/a (x2)

29. If a customer does not respond to a hazard tree removal request, can you remove the tree? Explain.
    - Yes if eminent danger
    - Yes, although severity of hazard dictates whether the tree is addressed without consensus.
    - Yes - where we have rights.
    - Removal of a hazard tree without customer consent would require us to take legal action against the property owner unless such right is provided for in the easement documents.
    - Yes for public, no for private.
    - No, but if it is immediate threat we can if we post notice for 2 weeks.
    - No (x5)
    - Usually after negotiating or following our, "refusal," process we are able to abate the tree.
    - If reliability or fire hazard we force remove with or without consent.
    - Yes. It may involve legal action.
    - Yes, our utility by state law has the right to remove any tree we feel is a threat to our facilities.

- Yes, we have the right through the Municipal Licensing Standards Act.
- If it is inside the right-of-way, the tree will be removed regardless. If it is on customer property and access is denied after explanation, it may become a legal issue.
- No- signed documentation needed prior to removal.
- No, most times we do not have the right to remove it. If a right-of-way agreement provides such rights, we will notify the property owner of our rights and work with them to resolve the situation.
- Not sure we have ever encountered this problem. If on our right-of-way; yes. If not, this would be a matter for our legal dept.
- Not if the tree is on private property
- If it is an imminent threat we will. If not, we may choose to simply make the tree safe and leave final removal to the property owner
- Depends on the locations as to how we might proceed.
- Yes, although severity of hazard would dictate whether tree is addressed without consensus
- Yes, if there is an easement in place that allows ETI to remove the hazard tree. If there is no such easement in place, the Company does not have the right to remove the hazard tree.
- No; but portions of tree that may cause immediate threat may be pruned.
- Yes, if the tree is in the easement. We usually leave a notice explaining tree work will be done on given date. We show up on date with crew and law enforcement officers and complete tree work; however, this can lead to litigation.
- Yes, we usually leave a notice explaining tree work will be done on a given data. We show up on date with crew and law enforcement officers and complete tree work. Legal gets involved if necessary.
- No. If a customer does not respond and we are unable to obtain a signed permit for the removal, then we cannot remove the tree.
- Yes
- Yes, but this is really a decision making process dependent upon the severity of the Hazard Tree situation, basically we handles these on a case by case basis.
- n/a (x1)

30. If a customer initially refuses to have a hazard tree removed, are any follow-on persuasion activities performed? How effective have these been?
    - Occasionally take down additional trees at customer request.
    - Yes. Our company vegetation management supervisors will make a contact and attempt to persuade the customer. Sometimes we will offer to replace the tree with a short-growing species and/or grind stumps in order to get a desirable removal.
    - Almost never occurs but we do have a protocol that is set-up for this purpose.
    - Our actions depend on the situation and the immediacy of the hazard. If the contractor cannot secure removal, the pertinent utility representative will be notified. We may offer to haul the brush or debris or negotiate some other work activity to help facilitate the removal.
    - Very high acceptance rate for removal of hazard trees on private property.
    - Depends on the degree of risk for outage/safety.
    - Yes. Notify the customer in writing that they will be responsible for damages.
    - Yes. Very effective. In the event that the customer does not agree, our contractors continue to engage the customer sometimes utilizing incentives. If the customer continues to decline the work, we will initiate a, "refusal," process where the customer is notified in writing of the utility's duty (in our state, hazard tree removal is required by law) to abate a hazard tree while explaining the customer's role in complying with that duty.
    - If refused-we force remove.
    - Yes. Fairly effective once we explain why we would like to remove the tree.
    - No answer (x3)
    - A vegetation management coordinator or the forester will talk with the customer and explain the hazards to life and property because of that tree. If the customer still refuses, then we have them sign a form acknowl-

edging that the hazards were explained to them and the document is filed in the vegetation management customer database.

- If the customer refuses the City will remove the tree and apply the charge to the customers municipal property taxes.
- We make every attempt to have the customers' support removing the tree. If not, we us law enforcement and/or legal means. Usually the persuasion activities are effective, however.
- Yes- follow-up letter; 95% effective.
- Yes, we discuss the potential of the hazard tree creating an outage for the customer and the benefits of having the tree removed. By communicating and educating the customer to the real hazards of these situations, we are generally successful in persuading the customer to allow us to remove the tree.
- We have a program entitled "right tree in the right place" and we offer replacement trees or shrubs to compensate for the loss of the tree.
- We can advise the customer that they will be held liable for any damage caused by the tree should it fall into the lines. We are also able to contact the City arborist who has more authority to require removal of the tree.
- Yes. 50% of the initial refusals reconsider.
- Yes, a Forester will arrange to meet with customer and attempt to educate customer and seek permission to allow for removal. About 90% of the time both parties are able to resolve the issue.
- Yes. Our company vegetation management supervisors will make a contact and attempt to persuade the customer.
- Generally, the Company is successful in gaining consent to remove hazard trees
- Sometimes
- Yes; negotiated replacement trees and/or other pruning or tree removal options have been utilized with great success. Currently trying to set up a voucher system with local nurseries to allow us to just hand local nursery 'gift card' voucher to the property owner as incentive.
- Contact by VM representative, generally good results.
- Yes. We usually leave a notice explaining tree work will be done on given date.
- Yes, we get the trees taken care of.
- If the customer refuses to have a hazard tree removed, the vegetation management representative explains the impact of a hazard tree falling on the electric facilities. If the customer still refuses, then the location and hazard tree information is documented and tracked in the database. Usually the customer does not change their mind in allowing us to remove the hazard tree.
- We have an involved process where we follow a technician with their general foreman or supervisor., If they don't get anywhere, a company forester will visit. We reinforce the same message each time. It is usually effective. However, we do not hesitate to act without authorization if need be.
- Yes, we strive for resolution in on form or another.

31. If a customer refuses to have a hazard tree removed, and the tree later damages the utility system, do you ever hold the customer financially liable for the resulting damage? Explain.
    - No (x14)
    - Don't know.
    - We have not had the opportunity to cross this bridge.
    - No. Currently examining these options.
    - Yes (x2)
    - Yes-It would have been documented.
    - Sometimes. If a refusal form is signed by the customer and they are advised of their liability we have in the past billed the customer for restoration costs.
    - We do not allow it to get to that point, however, if it did get to that point, yes, the customer would be liable for damage to our system.
    - Not to my knowledge.
    - This is attempted by our regional customer service offices. Not sure how successful they have been; probably not very successful.

- We advise the customer that we will however we do not have a mechanism to track the fact that this discussion was held and unless the incident occurs shortly after the notice to the customer, we would absorb the costs of replacing the line.
- We do advise customers in our final danger tree letter that we will hold them financially responsible for damage to our facilities but it doesn't occur very often.
- No, For a number of reasons, including the difficulty in proving the facts necessary to succeed in a legal suit against a customer.
- Attempt to, and this threat is used as part of the 'negotiation', but most situations do not get assessed back to the property owner that I am aware of.
- We have not had to yet, but we have billed a tree contractor for damages when they missed a tree that later caused a problem.
- To date we have not had such an event, it would be interesting to challenge this, however, I would expect we would purchase the tree or rights to it before we went down the path of liability.
- N/A
- No answer (x1)

32. About how much time, on average, elapses from the identification of a hazard tree until it is removed?
    - 1 week, unless immediate action is necessary.
    - 1-3 days (x2)
    - 30 days (x3)
    - 6-8 weeks
    - Less than 3 weeks
    - No answer (x1)
    - Imminent threats on done within days, others typically take a few weeks.
    - Two weeks.
    - Depending of hazard-no longer than 30 days.
    - 10 business days (x2)
    - Less than 15 days
    - 0-6 weeks
    - About 1 week (x2)
    - Immediately if imminent threat.
    - No more than 30 days.
    - 8-10 weeks
    - Depends on discussion with the customer but generally, if it is going to be removed then the work happens within about a week of the identification.
    - 30-60 days
    - 1-6 months, depending on the process.
    - 1 week to 10 days
    - If the hazard tree is prioritized as a high it is addressed within 24 hours. If it is a low or medium the tree will addressed within 14 days
    - Less than 3 weeks
    - Dependent upon many variables (line criticality, public safety, political nature, etc), but average is one week
    - 4 weeks.
    - It depends on the severity. If the tree is coming over, it's a matter of hours. Otherwise, I'd say 10 days.
    - Highly variable, from immediately to 2-3 weeks dependent upon the severity of the situation.

33. After cutting down a hazard tree on a customer's property, do you remove the resulting wood?
    - No (x9)
    - Yes, in most cases, unless permission to leave it.

- No, although there have been exceptions.
- Not typically but we have done so as part of a special reliability project that involved a significant amount of wood.
- Normally, the debris is left for the property owner to dispose of.
- We will ask the customer.
- Yes; about 30% of the time the large wood is removed (4" or greater in diameter). About 80% of the time the small wood is either hauled away or chipped and scattered on the property. However, our preference is to allow the customer to manage the debris that remains from their tree.
- Not normally but in some negotiated circumstances.
- Most of the time no. but debris removal can be used as part of the negotiation.
- No, unless it is in an urban setting & we may consider chipping the limbs, but we do not remove the log wood.
- If customer requests—otherwise wood is left on site.
- our vegetation program, the tree is removed. Branches will be chipped and removed from yards and all wood larger than 4" diameter will be left for the customer on the property. Dead wood is non-chippable and will also be left on the property. If it is cut by a trouble or lineman, (i.e. storm-caused event) everything is left.
- Company policy is to leave the wood however realistically actually handled on case by case basis.
- It is negotiated or often, yes, it is removed.
- We remove the wood if the removal is planned. If it is as a result of a storm then we cut the tree clear of the line and leave the tree for the customer to clean up.
- Depends on the location and situation.
- Subject to negotiations with the customer.
- Is part of the negotiated agreement with the property owner; normally chip up brush and stack the cord wood. Try to leave as much as possible.
- Generally no.
- Not normally; however, in a few cases, this has been done to avoid litigation.
- We typically do not dispose of the wood. If a contractor is used to remove the tree, he may use a chipper for the brush and smaller limbs and haul them off.
- It is case specific, but typically no. We do chip brush in many cases. In some Cities we are required to haul all debris, so in those cases we do haul wood away.
- Nearly always.
- This is variable, and many times is negotiated with the customer.

34. When removing a hazard tree on a customer's property, do you ever replace the tree? Explain.
    - No (x15)
    - Yes (x2)
    - Yes. Sometimes we will offer to replace the tree with a short-growing species in order to get a desirable removal.
    - Not typically.
    - Yes. We may offer small replacement trees to facilitate removal in isolated incidents.
    - If they request we have certificates for nursery purchases.
    - Yes. At our Arborist's discretion.
    - Not directly. Instead, we provide a pre-paid VISA card for the customer to use as they like. Educational materials are provided with the card to assist the customer in selecting a proper tree to plant near the power lines. So while not directly replacing the tree, some customers may choose to do so with the card.
    - Sometimes but rarely.
    - Rarely. Again replacement can be used as part of the negotiation.
    - Customers are offered tree vouchers through our Tree Replacement Program.
    - Yes. We have a program entitled "right tree in the right place" and we offer replacement trees or shrubs to compensate for the loss of the tree.

- While we have replaced trees in the past, this is not a generally used practice.
- Yes; normal negotiated replacements are given to the property owner to plant, but we have actually planted some, all dependent upon negotiated terms to get required clearances.
- Case specific, but usually no.
- No, because the customer owns the tree and the utility is assisting the customer with the removal of the hazard tree and related liability, and reducing the cost incurred by the customer.
- No, however, it is a tool we may at some time need to utilize.

35. Do you have a program to identify and replace undesirable tree species? How aggressive is this program?
    - No (x17)
    - Yes, but it is not aggressive.
    - No. We replace undesirable tree species upon customer request.
    - No answer (x1)
    - Yes. The program is extensive with letters to customers, a communication campaign involving multiple forms of media, public presentations, as well as participation in Arbor Day and Earth Day events and the like.
    - Yes-right tree/right place program. Usually only on palm trees.
    - No. We have a Gift Certificate program that is used strictly as a negotiation tool & not a 1:1 replacement. We also participate in a community tree planting program.
    - We do have extra funds available now to remove fast-growing volunteer trees that are 8" dbh or less but we still have to have property owner permission on any tree between 4-8" dbh.
    - Yes, based upon growth potential, cost, and system reliability. This is part of our tree replacement program.
    - Yes. The whole program is centered on nurturing the growth of compatible vegetation. We do plant in some instances, however, lean heavily on Mother Nature to provide compatible shrubs naturally. We used to plant speckled alder on the rights of way adjacent roads however, this program was stopped in favor of more aggressive vegetation management.
    - Yes, moderate.
    - Yes, an informal program discussed continually with contractors. We aggressively pursue removal of several troublesome species ('cycle-busters').
    - Yes. We aggressively target fast growing species. We try to work with city governments on tree ordinances, and we have even developed educational material that is made available publicly in an effort to inform customers and city code enforcement officials.
    - Yes. We aggressively target fast growing trees.
    - Yes. Ten years ago, it was very aggressive. Many of the trees that are left are large, and not cost effective to remove in our judgment.
    - No, however we do target a number of these in our day to day operations.

Best Practices

36. A certain percentage of trees die naturally every year. Do you feel that your utility, on an annual basis, removes enough dead and diseased trees to keep up with this natural process?
    - No (x9)
    - Not sure, program is 1 year old.
    - Yes (x12)
    - Probably not.
    - Yes. Under normal conditions exclusive of hurricanes and tornadoes, we generally keeps up with this natural process. Dead trees are routinely reported by customers as well as identified by the contractors and our personnel during ongoing operations.
    - In general yes, although the answer depends upon many factors that are mostly local in nature..
    - No reply (x1)

- Yes - Exception is our bark beetle infestation where the state has funded the removal of large quantities.
- We stay current on our 3-year cycle, barring an infestation of some type, yes we keep up with the natural process.
- Unknown (x2)
- Yes, for normal years; however, coming out of a several year drought, we may be seeing this change. Are already seeing a larger number of stressed trees uprooting and shedding major scaffold limbs due to drought/disease issues.
- Yes, but only if they are in the easement and if the tree represents a hazard to our facilities.

37. Would an increase in the aggressiveness of hazard tree removal reduce major storm damage:
    a. A little bit: 16
    b. A moderate amount: 7
    c. A lot: 8
    d. Unknown 1

38. What else besides hazard tree removal (vegetation related) would be effective at reducing major storm damage?
- Widening Right-of-way
- Don't know / no response (x4)
- Overhang removal; targeting weak-wooded and other problematic species for overhang trimming and/or complete removal, e.g. black locusts (removals), silver maples (blue-sky or hinge point overhang removals – very dependent upon construction type, e.g. spacer cable/tree wire/field spun vs. 3-phase open wire, single phase pole-top-pin etc.
- It would be beneficial to eliminate all tall-growing trees from beneath the power lines.
- More lateral (neighborhood) line clearing.
- Aside from increasing the removal of hazard trees, the strategies are to improve storm restoration times, not reduce the cause.
- Set minimum clearance and maintenance requirements for owners of trees.
- Increased clearances at the time of pruning; franchise rights and state laws that provide for tree abatement at the utility's discretion & without the owner's permission; greater enforcement of certain provisions of fire prevention laws that require landowners to reduce vegetative fuels on their properties.
- Palm tree skinning program and hard wood overhang removal.
- Ability to complete a total annual work plan, herbicide application, mowing, customer education.
- The utility must clear the right-of-way based on species & growth rate. If there is a brittle wood tree or a fast growing tree then more clearance may be necessary.
- Staying on a 4-yr trim cycle
- Undergrounding, break-away service drop connectors, reinforced service mast, storm guys, aggressive storm hardening on the trees, branch stiffening and reducing wind load through the trees.
- Mid-cycle inspections.
- Removing additional overhang on laterals (single phase lines); burying lines; modified construction.
- Being more proactive in our maintenance program.
- Being notified by adjacent landowners of land use change. Many landowners have decided to clear cut their land for the economic return and when this is completed, there remains a strip of trees adjacent to the power line that inevitably fall the next time the wind blows.
- Routine cycle trim maintenance
- Nothing
- Reducing the cycle time while keeping the current ground to sky specification. Our models show this would be worth the cost, but would require spending current O&M increase to pay for a future O&M reduction. This is a really hard sell. Most reliability improvements for us are paid using Capital investment to pay for future O&M reduction. This is not possible with cycle pruning, which is mostly O&M. We can capitalize danger trees, but the real problem is identifying the actual hazard trees, as we discussed earlier. An important point is that the cycle specifications are a key to reducing storm costs. The type of utility pruning where the floor is not maintained and you only trim above and below and to the side a small distance will

not help storm costs. We have measured the difference in cycles at the preferred specification vs. actual storm costs and found our model predicts damage pretty close to actual results. But, once again, getting to a preferable cycle costs up front O&M which is hard for management to commit.

- A better trim specification. We trim a minimal distance from the conductors in all directions. The floor is not cleared and overhang is allowed. Side pruning is limited to 10 ft.
- Educating the public and builders about planting the right trees in the right place.
- We believe the only way to reduce major storm damage in any recognizable way would be a dramatic (greater than 30 feet to either side of the conductor) increase in the maintained ROW along primary conductors. This, however, may be both cost and customer prohibitive.
- Reduced cycle period / increased routine pruning; increased amount of targeted tree removal/replacement; greater 'hardening' of line equipment to withstand momentary contacts during storm events.
- Cooperation of governmental entities, state, city and county, in addressing vegetation issues. City and county officials hamper our efforts, or do not help with adverse customer reaction to tree trimming and attempt to pass ordinances that hamper our efforts.
- Cooperation of governmental entities, state, city and county, in addressing vegetation issues. City and county officials hamper our efforts, or do not help with adverse customer reactions to tree trimming and attempts to pass ordinances to hamper our efforts. A mechanism other than the current rate making process to allow for concurrent recovery of vegetation management related expenses.
- Removing additional overhang on weak wooded tree species. Ground to sky clearance on 34kV voltage primary. Preventative maintenance on isolated open wire secondary lines.
- We have found that a systematic vegetation management cycle does wonders.
- Sufficient and consistent Line Clearing funding can improve both storm and non-storm performance. This can also improve overall restoration times after any type of storm event.

39. Please describe any attempts to more effectively address hazard trees that <u>did not</u> work very well.
    - None/no answer (x26)
    - Lump sum bidding. Contractors' desire to make a profit put extra pressure on our supervisors to catch skipped hazard trees.
    - We are just embarking of a hazard tree removal program now. We have called it storm hardening in the past, however, our regulator has not permitted extra spending for such work.
    - Removing dead trees only.
    - We determined that a stand-along hazard tree identification and removal program (separate from the routine trimming cycle) was more effective.
    - Lack of property owner notice and 'buy-in' prior to initiating work has proven to be a deal-breaker for many political subdivisions we must all work with.
    - Having multiple screeners checking backlogged hazard trees did not work very well. It is better to designate 2 screeners who screen/identify and permit systematically the removal of hazard trees.

40. Please describe any attempts to more effectively address hazard trees that <u>did</u> work very well.
    - None/no answer (x16)
    - Use of retirees to assist in coordination and inspections.
    - Investigating and analyzing tree caused outages, then summarizing the findings and educating field forces on identification, controlling contractor employee turnover, and face-to-face customer contact to get agreement on tree removal. Holding the contractor responsible for tree outages caused by missed or skipped hazard trees over the entire trimming cycle.
    - We believes our current program of hazard tree identification and removal during the course of planned circuit maintenance activities work very well.
    - Piloting a reclaiming of ROW line clearing practices in some limited areas.
    - Personal face to face contact with property owner.

- Developing a Hazard Tree Rating System; implementing a system-wide vegetation management reliability program; continuous training and education of our contracting pre-inspection arborists. Implementing a Hazard Tree Quality Control program that examines abatement decision making.
- One on one education of the customer about hazard trees and the potential they have.
- More patrols by servicemen/linemen & full removal when the trees are identifies. Having a 2-man crew dedicated to removing hazard trees.
- Trouble & Linemen calling in hazards.
- Increase mid-cycle patrols to include laterals (singe phase).
- In a designated "natural" area, we obtained permission to clear cut everything below the lines and any dead trees within a fall arc of the lines. We chipped the wood and created a walking trail beside the lines. The City seemed to like this idea and we had no complaints from residents and users of the "natural" area. Tree contacts have significantly been reduced and reliability increased in an area that was performing poorly during storms.
- Investigating and analyzing tree caused outages, then summarizing the findings and educating field forces on identification, controlling contractor employee turnover, and face-to-face customer contact to get agreement on tree removal. Holding the contractor responsible for tree outages caused by missed or skipped hazard trees over the entire trimming cycle.
- We are still looking.
- Tracking and analyzing outages has led to identification of areas that require more extensive hazard tree identification and removal. For example, insect infestation or disease may cause more hazard trees to disrupt service in a localized area than would otherwise occur. Outage data can indicate the location of those areas.
- Proactive notice and negotiated agreements prior to work starting.
- Screen for hazard trees post leaf-out. Prioritization system is effective.

41. What would it take for your company to more effectively manage hazard trees?
    - No answer (x3)
    - Budget increases to allow for more tree replacements.
    - We would need better data to support an increase in funding.
    - We believes its current program is effective.
    - Resources (manpower).
    - Increased funding and additional resources.
    - Budget for hazard tree removals and take firm legal action against property owners.
    - 1) Better tree failure data that shows failure trends by species that include: how the tree fails (wholly, partially, or both), its rate of failure as a function of population, and the time of year the species is likely to fail. An analysis of weather's influences over these failure patterns would also be valuable. 2) Better support for tree removal from public agencies and fire protection authorities would also be helpful. 3) Establishing statutory Utility liability for damages caused by hazard trees that is based upon a negligence standard rather than a strict liability standard.
    - Reliability program-we are mostly compliance only.
    - A dedicated budget to support identification, communication with customers and resources to do the work.
    - If it became a problem than we would address it during our normal trim cycles.
    - Increased inspections & budget $'s.
    - Mid-cycle inspections.
    - Funding; tree replacement program (Right Tree Right Place); include tree removal as part of new easement agreements.
    - Good data collection tools and analytical support, along with consistent funding for hazard tree management.
    - An identification program and a price setting mechanism. In addition, a separate crew that can climb a tree and fell it into the woods. No need for a bucket truck or disposal when the forest is the adjacent land type.
    - Some form of specialized inspector to identify hazard trees (very expensive).
    - Cycle trimming

- good business case. A necessity for this business case would be the ability to identify actual hazard trees accurately. Such knowledge is necessary, but not sufficient. We would also have to show we get more value than the cost, which would mainly be in reducing major storm costs, which can range from $10 to $100 million per year.
- Better education for the public and better facilitation of requests to have trees removed with the public. Also, our utility would have to find a way to get beyond the "business as usual" pruning methodology currently in use and create a hazard tree program.
- Dedicate a portion of budget dollars to address hazardous trees located on transmission and distribution lines
- Budget increases to allow for tree replacements.
- We believe we are effectively managing the VISIBLY hazardous trees, and only ROW expansion would address the "look-OK-but-fail-anyway" trees.
- Stronger stance of regulatory agencies to back-up clearance and hazard reduction initiatives; increased budget
- We are managing hazard tree issues adequately.
- We believe that we do a reasonably good job at vegetation management; however, a mechanism to allow for the concurrent recovery of vegetation related expenses would stimulate a more aggressive program.
- A mechanism to allow for the concurrent recovery of vegetation related expenses.
- Increase funding and designated resources.
- $5 million
- Overall this is not a major issue for us.

42. What would you recommend as a best practice for managing hazard trees?
    - No answer (x7)
    - Holding the contractor responsible for tree outages caused by missed or skipped hazard trees over the entire trimming cycle.
    - Use a stratified approach based on the importance of the facilities, e.g. we use a complete tree walk-around process 40' on either side of the pole line for subtransmission lines and distribution feeder main; otherwise detect hazard trees on remaining facilities as viewed when walking along the pole line.
    - We recommends a three-pronged approach. This includes hazard tree identification and removal by contractors as part of an ongoing proactive circuit trim maintenance program; vigilant reporting and removal of hazard trees identified by utility personnel during the course of operations; and prompt inspections with the appropriate actions taken following notification from customers of potential hazards.
    - A consistent means of patrolling.
    - Know species risk, target specific areas known to be at risk.
    - 1) Gather species-specific tree failure data & utilize that data to drive tree-abatement decision making. 2) Establish a patrol standard that includes hazard trees. 3) Establish a reasoned method to analyze the risk (impacts) associated with tree failure and utilize that analysis in tree abatement decision making. 4) Require ANSI standards in tree abatement practices. 5) Put a high emphasis on customer satisfaction. 6) Develop a parallel reliability-focused program. 7) Establish a quality control mechanism that objectively analyzes tree abatement decision making and require open dialogue about the QC findings.
    - Reliability inspection and maintenance program.
    - Wide spread education of the customers, removal – replacement, governmental ordinances that do not hinder the removal of hazard trees by utilities.
    - Search & destroy method is the only effective way to do it.
    - If you had the budget to do so, send a work planner out every six months to inspect main feeder lines for hazard trees in areas that would have a high customer impact if an outage occurred.
    - Increased inspections & prompt removals.
    - Remaining on cycle and doing mid-cycle inspections.
    - Mid-cycle patrols and outage investigations.
    - Several years of consistent funding.

- Train pole inspectors to identify hazard trees during regular inspections or use tree trimmers to identify during area trimming.
- Aggressive removal policy as part of routine circuit maintenance to prevent trees from becoming hazardous in the future
- Remove as many as possible
- An annual danger tree crew to find and address hazardous trees
- Holding the contractor responsible for tree outages caused by missed or skipped hazard trees over the entire trimming cycle.
- Include this as part of the routine patrols made; recognition of targeted problem species in your area that need to be given special management attention.
- Periodic visual inspections.
- The majority of the tree problem in south and west Texas relate to otherwise healthy trees that have the size and ability to excessively bend (palm trees) under high winds, are large healthy trees that become uprooted and fall in high. winds (especially if the soil is saturated), or trees that parts break off in high winds and the parts land in the power lines.
- Prioritization Guidelines (18 point system) based on voltage, defects, failure potential and species.
- Annual inspections with a designated tree crew in a particular area.
- Developing a quick and efficient method for dealing with these when they occur.

43. Any other thoughts or comments on the subject of hazard trees?
    - No / No answer (x18)
    - Thank you [author: you are welcome!]
    - Good Survey [author: thank you!]
    - Not as yet – perhaps next year. Thank you for the opportunity to participate [author: you are welcome!]
    - With a catastrophic storm event with sustained high winds (95+ miles per hour), many trees fail that do not meet the hazard tree definition for this survey. Without these obvious, defined characteristics, most homeowners would be unreceptive and reluctant to allow the utility to arbitrarily remove trees based on "…we could have a hurricane and if the conditions are absolutely right, it may fall on the power lines." Removal costs on this basis to accomplish the work would be enormous.
    - If you had the budget to do so, send a work planner out every six months to inspect main feeder lines for hazard trees in areas that would have a high customer impact if an outage occurred.
    - Right now on our system, squirrels and lightning cause more outages than hazards trees do.
    - Cost/Benefit not good enough for us at this time and politically challenged.
    - The evidence shows that most tree outages come from falling/failing trees rather that limb outages. But we spend more money trimming than we do on tree removal. A few of us are considering why utilities actually maintain RW. Our model shows that reliability based solely on customer interruptions is not why RW is maintained. That is, the value of customer reliability to the utility, either per CI or per CMI, is not worth the money we spend. But there is still a reason why utilities maintain RW, and it is likely in the preservation of the asset itself. Vegetation will totally destroy the asset if we did not prune. So many utilities prune just enough to keep the asset, but not enough to prevent customer interruptions. Utility management intuitively understands this "asset retention" policy, even if they cannot or will not state it openly. Preventing customer interruptions is therefore secondary to the real reason utilities maintain RW. This hypothesis is not particularly popular however, although I think it may be true. So don't put it down as what my utility thinks. What does this have to do with hazard tree removal? Hazard tree removal is not really necessary for preservation of the asset. But it does appear necessary if you want to reduce customer interruptions, and it may also play a significant role in reducing future O&M costs in reduction of storm costs.
    - We make a conscious effort to identify and address hazardous trees.
    - The practices of our operating company take into account experiences and knowledge from our parent company's other operating companies.
    - Although trees off-easement do cause problems on occasion, in our region the biggest problem is still regrowth from trees within the easement.

- Most of our off ROW tree issues are with green trees that no one can identify or predict will fall into conductors due to soil conditions, amount of moisture, root health, location of trees and their height or dead trees from drought and insect infestations.
- The removal of dead and declining trees, including dead overhangs, is one of the best ways to reduce vegetation related outages and improve reliability on the distribution system. There needs to be separate budgeted dollars, designated resource allocation, and explicit criteria of the hazard removal program for it to be effective.
- We view hazard trees as a component of our overall vegetation mgt program. Hazard tree removal is more of an issue on Transmission facilities that it is with our Distribution facilities due to the FERC 003-1 TVMP requirement. Since we are moving toward a 3 year trim cycle on our distribution facilities the importance of Hazard tree removal will be reduced due to our increased level of systematic maintenance.

PUC DOCKET NO. _____

APPLICATION OF CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC FOR DETERMINATION OF HURRICANE RESTORATION COSTS	§ § § §	**PUBLIC UTILITY COMMISSION OF TEXAS**

DIRECT TESTIMONY

OF

KENNY MERCADO

FOR

CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC

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EXECUTIVE SUMMARY

My name is Kenny Mercado, and I am employed by CenterPoint Energy Houston Electric ("CEHE" or "Company"), an operating subsidiary of CenterPoint Energy, Inc. ("CNP"). I currently serve as Senior Vice President of AMS Deployment, a position I have held since January 2009. Prior to my current assignment, I previously held the position of Senior Vice President of Electric Operations. I served in that prior position during the time relevant to the Company's experience with Hurricane Ike.

My testimony will detail the impact of Hurricane Ike, and CEHE's preparation and response to the storm. My testimony will also introduce the other CEHE witnesses and the issues that they will address in greater detail. Then, my testimony will go into more depth on policy considerations and the Emergency Operations Plan ("EOP") and process. My testimony will also address other areas of interest including: customer service efforts; aspects of communications with customers, the Public Utility Commission of Texas ("PUCT" or "Commission"), government officials, and other utilities; and insurance and other financial assistance.

CEHE is seeking a determination that $677.8 million of costs associated with the restoration efforts of Hurricane Ike are reasonable and necessary costs and are eligible for recovery. The method of recovery will be the subject of separate proceedings. Detailed information regarding the reasonableness and necessity of these costs are discussed in the testimony of the other Company witnesses presented in this proceeding.

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME, BUSINESS AND POSITION.

A. My name is Kenny Mercado, and my business address is 1111 Louisiana Street, Houston Texas, 77002. I am employed by CenterPoint Energy Houston Electric ("CEHE" or "Company"), which is an operating subsidiary of CenterPoint Energy, Inc. ("CNP"). I currently serve as Senior Vice President of AMS Deployment, a position I have held since January 2009. Prior to my current assignment, I was employed as Senior Vice President of Electric Operations. I served in that prior position during much of the time relevant to the Company's experience with the preparation, onslaught, and aftermath associated with Hurricane Ike, an encounter the significance of which will be explained in this testimony. I have a bachelor's degree in Electrical Engineering and a master's degree in Engineering Management from the University of Houston and I expect to earn an Executive Master's Degree in business management from Texas A&M University in May 2009. I served for ten years in a number of positions in the Company's Electric Engineering Department. I was named Service Area Manager for the Magnolia Park Service Center in 1999, Manager of Purchasing & Logistics in 2001, and Service Area Manager for the Bellaire Service Center in 2004. I was promoted to Vice President of Distribution Operations in 2006. In 2008, I was named Senior Vice President of Electric Operations.

Q. WHAT BUSINESS UNITS COMPRISE ELECTRIC OPERATIONS?

A. Electric Operations is comprised of three divisions: Distribution Operations, Distribution Engineering & Services, and Transmission/Substation Operations.

Q. WHAT ARE THE RESPONSIBILITIES OF THESE DIVISIONS?

A. Distribution Operations is responsible for all of the line mechanics and service consultants that are based at the Company's twelve service centers. This unit is also responsible for major underground operations. Distribution Engineering & Services is responsible for distribution dispatching, distribution engineering, meter reading, field service representative ("FSR") operations, distribution project management, tree trimming, safety, environmental and technical training. Transmission/Substation Operations is responsible for transmission system control and dispatching, substation and transmission operations, engineering, and planning.

Q. WHAT WERE YOUR RESPONSIBILITIES AS SENIOR VICE PRESIDENT OF ELECTRIC OPERATIONS?

A. I oversaw the three divisions. I also oversaw coordination of CEHE's Emergency Operations Plan ("EOP") and process.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THIS COMMISSION?

A. Yes. I have filed testimony on behalf of the Company with the Public Utility Commission of Texas ("PUCT" or "Commission") in Docket No. 35639, *Application of CenterPoint Energy Houston, LLC for Approval of Deployment Plan and Request for Surcharge for an Advanced Metering System.*

Q. PLEASE SUMMARIZE CEHE'S REQUEST.

A. CEHE is seeking a determination that $677.8 million of costs associated with the restoration efforts of Hurricane Ike are reasonable and necessary costs and are eligible for recovery. The method of recovery of these costs will be the subject of separate proceedings. Detailed information regarding the reasonableness and necessity of these costs is presented in the testimony of the other Company witnesses presented in this proceeding.

Q. PLEASE PRESENT THE REMAINING WITNESSES AND THE SUBJECT MATTER OF THEIR TESTIMONY.

A. Below is Figure 1, listing the topics covered under each witness's testimony in the case.

Figure 1

List of Company Witnesses and Subject Matter of Testimony

Name	Title	Subject Matter of Testimony
Kenny Mercado	Senior Vice President of Electric Operations (until February 2009) / Senior Vice President of AMS Deployment (as of February 2009)	Overview & Policy Issues Emergency Operations Plan and Process Customer Service Issues Communications Issues Insurance Recovery Other Financial Assistance
Terry Finley	Vice President of Distribution Engineering and Services	Distribution System Restoration Costs
John Houston	Vice President of Transmission and Substation Operations	Transmission and Substation System Restoration Costs
Walter Fitzgerald	Senior Vice President and Controller	Accounting for Restoration Costs Regulatory Asset Ratemaking Treatment of Restoration Costs Carrying Costs
Paul Gastineau	Director Rates and Regulatory Research	Cost Recovery and Class Allocation
Mark Fagan	Partner, PricewaterhouseCoopers	External Cost Attestation
Howard Solganick	Associate Principal Consultant, KEMA	External Assessment of Restoration Efforts

Q. DO YOU SPONSOR ANY FIGURES OR EXHIBITS IN THIS FILING?

A. Yes. A list of figures is available in the Table of Figures and a list of exhibits is available in the Table of Exhibits. Both tables follow the Table of Contents in this testimony.

II. OVERVIEW OF FILING & POLICY ISSUES

Q. WHAT IS THE PURPOSE OF THIS FILING?

A. CEHE makes this filing with the Commission to seek a determination that Hurricane Ike related restoration costs are reasonable and necessary costs and are eligible for recovery. CEHE will outline the steps taken to prepare for the hurricane and to deal with the aftermath and will then discuss the restoration costs that are associated with these steps.

Q. WHAT ACTION DOES CEHE REQUEST FROM THE PUCT AT THIS TIME?

A. CEHE is requesting that the Commission make a determination that CEHE's hurricane restoration costs of $677.8 million were reasonable and necessary for the restoration of electric service to CEHE's customers following Hurricane Ike. This amount includes estimated case processing expenses, the carrying charges on the cost of restoration from the date that the costs were incurred, and debt issuance costs (please see the testimony of Company witness Walter Fitzgerald for more discussion). CEHE also requests that restoration costs related to the transmission function be recovered from distribution service providers ("DSPs") through the Company's Transmission Cost of Service ("TCOS") charge in CEHE's Tariff for Wholesale Transmission Service in a future proceeding. For distribution-related system restoration costs, the Company proposes to securitize the amount in a separate proceeding. The revenue necessary to service the

securitization bonds will be recovered from Retail Electric Providers ("REPs") through a separate charge added to the Tariff for Retail Delivery Service. If securitization proves to not be beneficial for ratepayers, CEHE proposes to implement an appropriate surcharge mechanism to recover the costs. Finally, CEHE requests the approval of the manner in which hurricane restoration costs will be functionalized and allocated to customer classes.

Q. DOES THIS FILING REQUEST QUANTIFICATION OF ALL OF CEHE'S HURRICANE RESTORATION COSTS?

A. No. The hurricane restoration costs included in this filing are those that have been recorded on the Company's books through February 28, 2009, and include certain additional expenses. Any additional costs in excess of those identified in this filing will be sought by CEHE in a future proceeding.

Q. IS THERE PRECEDENT FOR THE COMMISSION RESPONDING TO SUCH A REQUEST?

A. Yes. In Docket No. 32907, *Application of Entergy Gulf States, Inc. For Determination of Hurricane Reconstruction Costs*, the PUCT accepted a similar filing from Entergy Gulf States, Inc. ("Entergy") and responded to a corresponding request from that company.

Q. IS THERE PENDING LEGISLATION THAT WOULD ADDRESS HURRICANE RESTORATION COSTS?

A. Yes. Legislation which would grant CEHE the ability to recover the amount of hurricane restoration costs (inclusive of carrying costs) authorized by the Commission has been filed with the 81st Texas Legislature. A copy of the legislation has been included as Exhibit 1 to the Petition in this filing. The Company anticipates the enactment of this legislation prior to the conclusion of this proceeding.

Q. PLEASE DISCUSS HOW THE COMPANY SUPPORTS THE $677.8 MILLION IDENTIFIED IN THIS FILING AS ELIGIBLE FOR RECOVERY.

A. The Company supports the amount by showing that the hurricane restoration costs requested are composed of expenditures that were reasonable and necessary for the restoration of service to its customers. Mr. Finley, Mr. Houston, and I present both high-level as well as cost-specific evidence to support the reasonableness and necessity of these costs. Whether the costs were reasonable and necessary must be determined based on the circumstances that existed at the time and on the resources and information reasonably available at the time. The high-level evidence presented by my testimony and that of Company witnesses Mr. Finley and Mr. Houston includes: 1) the identification and discussion of several major cost drivers, addressed in greater detail below, that directly affect the amount requested; and 2) a discussion of the Company's storm preparedness, which facilitated an efficient and cost effective response.

With regard to cost-specific evidence, the functionalized costs are further broken down into direct cost categories, as is discussed in the testimony of Company witness Fitzgerald. Direct cost categories include: Payroll, Contractor Services, Hotels, Security, Logistics, Materials and Supplies, Telecommunications, Fleet/Fuel/Transportation, Facilities and Other Costs (including estimated case processing expenses, debt issuance costs, and carrying costs through August 31, 2009). A summary of costs by these direct cost categories and functions is presented below as Figure 2.

Figure 2

Summary of Costs by Category and Function

Cost Category	Transmission Functionalized Cost	Distribution Functionalized Cost	Total Cost
Payroll	$4,497,771	$63,570,146	$68,067,917
Contractor Services	$9,270,936	$420,139,163	$429,410,099
Hotels	$242,190	$11,986,215	$12,228,405
Security	$5,647	$1,732,935	$1,738,583
Logistics	$919,033	$44,640,375	$45,559,409
Materials & Supplies	$2,554,709	$27,256,611	$29,811,321
Telecommunications	$162,501	$873,426	$1,035,927
Fleet/Fuel/Transportation	$223,946	$13,090,721	$13,314,667

Facilities	$360,163	$2,644,922	$3,005,085
Other	$2,243,775	$71,401,634	$73,645,408
Total Cost	$20,480,671	$657,336,149	$677,816,820
NOTE: All numbers in this chart have been rounded, and therefore summation of numbers may appear to differ from totals.			

The Company's witnesses explain why the expenditures reflected in these direct cost categories are reasonable and necessary. For example, each witness describes why it was necessary to obtain the various services and materials required to restore, or support the restoration of, the facilities within their designated operational area; why the costs paid to vendors who provided those services or materials were reasonable; and how the Company contracted for, monitored, and paid for the services or materials at issue. In addition to my testimony and that of the other witnesses who directly support these costs, the Company presents witnesses who address the following: 1) the thoroughness of the Company's processes to approve invoices associated with the restoration effort to ensure that the costs charged to the Company were for services actually performed and were consistent with the approved pricing for the services (Company witnesses Fitzgerald and Fagan); 2) verification of the process by which the Company captured and accounted for all restoration costs, including the functionalization and allocation (Company witnesses Fitzgerald, Gastineau, and Fagan); 3) the review of the Company's EOP and efforts to restore power after Hurricane Ike (Company witness Solganick); and 4) the Company's proposed methods

for recovering distribution and transmission related restoration costs, and the allocation methods and factors for allocating hurricane restoration costs among rate classes (Company witness Gastineau).

Q. PLEASE EXPLAIN THE COST DRIVERS THAT WILL BE ADDRESSED BY THE WITNESSES.

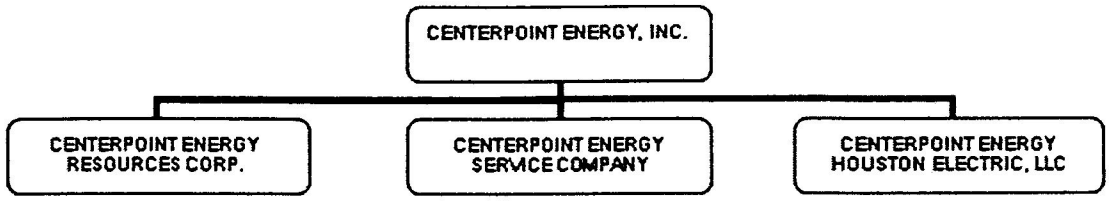
A. Hurricane Ike was the single most damaging hurricane to ever strike the Company's service territory and one of the most damaging weather events ever to strike the United States. The major cost drivers underlying CEHE's $677.8 million request arising from this event can be stated as follows: 1) the intensity of Hurricane Ike and the resulting damage sustained; 2) the obstacles to restoration caused by the storm; and 3) the urgency of the Company's response, resulting in the restoration of service to all customers who could safely receive service within 18 days of the storm's landfall. The following section of my testimony provides a broad overview of each of these cost drivers and Company witnesses Finley and Houston provide additional discussion with respect to how these cost drivers relate to the degree of damage and costs incurred by the Distribution and Transmission functions.

Q. DOES THE COMPANY'S REQUEST INCLUDE AFFILIATE COSTS?

A. Yes. The affiliate costs total approximately $15.2 million. Affiliates providing services included CenterPoint Energy Service Company, LLC ("Service Company") and CenterPoint Energy Resources Corp. ("CERC"). CEHE's relationship to its

affiliates is depicted in Figure 3 below. The other witnesses and I explain the necessity and reasonableness of these costs. Company witness Fitzgerald addresses recovery of affiliate costs and CEHE's share of these costs.

Figure 3



III. OVERVIEW OF STORM AND RESTORATION EFFORTS

Q. PLEASE DESCRIBE HURRICANE IKE AND ITS IMPACT.

A. Hurricane Ike was a very large, intense storm that devastated CEHE's service territory in September 2008. The center of the storm approached from the Gulf of Mexico and made landfall on Galveston Island as a category 2 hurricane on the Saffir-Simpson scale. It traveled generally south to north and passed through the heart of CEHE's service territory. It brought CEHE's service territory estimated maximum sustained winds of 109 miles per hour ("mph") and estimated wind gusts of over 130 mph. Its wind field was very large in comparison to most category 2 storms. Hurricane force winds (those in excess of 73 mph) extended across a path as wide as 240 miles, and tropical storm force winds (those in excess of 38 mph) extended across a path as wide as 550 miles at the time of landfall. All of CEHE's service territory received winds of

hurricane or tropical storm force with exposure for most areas exceeding ten hours. The hurricane also brought a storm surge estimated to be up to 20 feet above sea level. Much of CEHE's service territory along the coast and Galveston Bay received damage from the storm surge. The storm also was responsible for delivering up to 15 inches of rain on some locations within CEHE's service territory. Additional information on the intensity of Hurricane Ike is covered in the testimony of Company witness Solganick.

For a number of years, CEHE, other utilities, and weather services employed by the utility industry have realized that the size of the wind fields in a hurricane is just as, or possibly more, important than the maximum sustained wind or category of the hurricane on the Saffir-Simpson scale. Hurricane Ike confirmed this realization. Although Ike was a strong category 2 hurricane when it made landfall, its wind field was much greater than two previous hurricanes that significantly impacted CEHE's service territory (Hurricane Alicia in 1983, which was a category 3 hurricane, and Hurricane Rita in 2005, which was a category 2 hurricane). Although hurricane wind field records are generally not available prior to 1983, it may well be that Hurricane Ike's combination of maximum sustained wind and wind field make it the most severe hurricane to directly hit Texas since Hurricane Carla in 1961.

On September 13, prior to the hurricane's landfall, tropical storm force winds extended up to about 275 miles from its center, and hurricane force winds extended up to about

120 miles out. As with all hurricanes, Hurricane Ike weakened significantly after making landfall, however, it remained at hurricane strength with winds between 74 and 95 mph until approximately 1:00 p.m. on September 13, when it was centered about 128 miles north of Houston. The Houston area experienced sustained winds of 80 mph and wind gusts of 100 mph, with isolated reports of gusts up to 110 mph, along with almost 6 inches of rain. Hurricane Ike continued to track northward, producing damaging, sustained tropical storm force winds until the early morning hours of September 14. The storm generated a number of isolated tornadoes throughout the service territory. For tracking of the storm, see Exhibit KM-1 (Hurricane Ike Tracking Chart).

Q. HOW DID HURRICANE IKE AFFECT CEHE'S SYSTEM?

A. Hurricane Ike had a direct impact on CEHE's service territory. Apart from the storm surge and winds that devastated parts of Galveston Island and the flooding of a small portion of CNP's natural gas delivery system, the most dramatic aspect of Hurricane Ike was the enormous number of large trees in the Houston area that were broken off at the base or completely toppled over by the wind. As much as any other factor, these trees falling on power lines were the root cause of power outages. Moreover, virtually all of these trees were outside of CEHE's rights of way and easements, and they could not have been removed under a tree-trimming policy. Even under the most aggressive

right-of-way maintenance program, no amount of tree-trimming would have prevented the outages that were experienced during Hurricane Ike.

Q. PLEASE DESCRIBE THE DAMAGE SUSTAINED BY CEHE AS A RESULT OF HURRICANE IKE.

A. Hurricane Ike caused unprecedented damage to CEHE's system and the region. Hurricane Ike is on record as being the worst storm to hit southeast Texas in recent history. In terms of physical damage to electric facilities, Hurricane Ike was the most severe natural disaster ever to hit CEHE's service area.

Hurricane Ike severely damaged CEHE's distribution infrastructure. Most damage was caused by high winds, blowing debris, and falling trees. CEHE experienced severe damage to the eastern and northern portions of its service territory and along its coastal areas, and it experienced moderate damage over the remaining portion. In order to restore service to the distribution system following the storm, CEHE had to repair 1,302 circuits and 12 partial circuits (representing 88% of the total circuits on the system). The Company replaced 8,500 poles, 5,300 transformers, 850,000 pounds of wire, and 413,000 feet of cable. The impact of the storm on the CEHE distribution system is addressed in detail in Company witness Finley's Testimony.

With respect to the transmission system, most transmission facility damage was caused by high winds, blowing debris, and off right-of-way tree falls; however, substation

facility damage was most acute on Galveston Island due to flooding from Hurricane Ike's storm surge. A total of 142 transmission structures were either destroyed or damaged. Five out of CEHE's six substations on Galveston Island were damaged, and substations throughout CEHE's service territory also suffered damage. Ninety-nine (99) out of 320 CEHE transmission circuits and 49 out of 267 CEHE substations were forced out of service, completely de-energized, by Hurricane Ike. An additional 49 CEHE substations were partially de-energized. Also, 56 out of 137 substations owned by third parties connected to the CEHE transmission network were forced out of service. The impact of the storm on CEHE's transmission and substation facilities is addressed in Company witness Houston's testimony.

As further detailed in the testimony of Company witnesses Finley, the damage to CEHE's system was primarily to the distribution system and was extensive and catastrophic. It took a massive effort from the employees of CEHE and its affiliate companies, as well as those of the third-party utilities and contractors who participated in the restoration, to restore service to CEHE's customers. I am extremely proud of what CEHE and its affiliates, mutual assistance companies and contractors were able to achieve -- quickly and safely restoring service to the entire system. A restoration effort for such a large number of affected customers had never been attempted previously.

Q. WHAT WAS THE EXTENT OF CUSTOMER OUTAGES EXPERIENCED AS A RESULT OF HURRICANE IKE?

A. At peak during Hurricane Ike, CEHE had over 90% of over 2 million customers without power.

Q. HOW MANY WORKERS DID THE COMPANY EMPLOY TO ADDRESS THE DAMAGE CAUSED BY HURRICANE IKE?

A. CEHE utilized over 16,000 workers for the transmission and distribution restoration effort. Since many of the offsite lodging, eating and fueling facilities in the area were damaged and unavailable to accommodate the restoration personnel, CEHE established onsite feeding, sleeping, showering and fueling facilities for mutual assistance crews and contractors and for those employees with damaged homes. In addition to CEHE personnel, CEHE utilized resources from other CNP business units including its Texas gas operations and from mutual assistance utilities and third-party contractors. External contractors provided over half of the workforce required to reconstruct CEHE's system following Hurricane Ike. Mutual-assistance utilities accounted for over 10% of the workforce. CEHE, its regular contractors, and its affiliates provided the remaining resources. Company witnesses Finley and Houston provide a breakdown of these resources.

Q. WHAT OBSTACLES DID THE COMPANY ENCOUNTER THAT IMPEDED ITS RESTORATION EFFORTS?

A. The narrative accounts of the Company's activities in the wake of Hurricane Ike (presented by Company witnesses Finley and Houston) explain the obstacles encountered. Summarizing, the Company encountered hurricane-generated obstacles such as:

- Debris across road-ways caused by damage to the heavy vegetation in the Company's service territory.

- Obstacles to the accessibility of the Company's system. The majority of our distribution circuits are physically located in residential rear easements, inaccessible to our trucks. This included back-lot and alleyway construction, often requested by customers or governmental entities. This type of limited access construction required that equipment and materials be moved by specialized equipment or carried to rights-of-way without the use of company trucks, thereby lengthening the time required to restore service.

- Operational obstacles. A major factor affecting the restoration of service was the massive number of trees and tree limbs and other debris that fell on the distribution lines throughout our utility easements and all through the streets and right of ways. Vegetation and storm debris had to be cleared prior to reconstruction and service restoration. Much of CEHE's overhead distribution

system is located in rear lot easements, which are generally not accessible by truck. Work on these lines, both feeder-main and laterals, required individual linemen to climb poles and install rigging to make repairs since it is not truck accessible. Additionally, safe work practices required all tree clearance work to be performed with the conductors appropriately grounded on both sides of the site where the tree trimmers are working. These grounds must be installed by qualified linemen, a necessary process which adds time and cost to the recovery effort. Due to the wide-spread damage throughout our distribution system impacting the high number of circuit and laterals, additional grounds were acquired to meet the restoration needs.

- Congestion on Houston highways, roads and streets. As power was restored in some areas, people returned to the streets and attempted to go to their places of employment. While power may have been restored to area stoplights, many had defaulted to flashing red, creating a four-way stop. This caused massive traffic-jams at intersections and dramatically impeded the ability of crews and supplies to get to the areas where they were needed. Very quickly, CEHE recognized the need and was able to procure police escorts for some of the trucks that were shipping restoration materials, such as poles and transformers, to the needed locations, but continued to struggle with traffic difficulties.

- Reduced availability of key resources, such as the number of contract line crews due to the still-ongoing Hurricane Gustav response outside of CEHE's service territory, which restricted the availability of more local resources. As a result, the Company had to call on crews from 35 states and as far away as Canada, which also increased costs due to extended travel requirements. Additionally, critical materials such as poles, wire, transformers, and conductors were in short supply due to the demand caused by other recent hurricanes throughout the Gulf Coast. Poles and transformers had to be shipped in from numerous locations across the country.

Q. WHAT WAS THE SIGNIFICANCE OF THESE OBSTACLES TO THE RESTORATION EFFORT?

A. In the wake of Hurricane Ike, the Company was not only faced with a record number of outages and downed facilities that had to be restored and repaired, but the Company was hampered in commencing the restoration and repair work immediately because of numerous physical and operational obstacles. Overcoming or clearing those obstacles increased the restoration costs by increasing the time and resources required to complete the restoration.

Q. DID CEHE DEEM IT IMPERATIVE TO PROVIDE AN URGENT RESPONSE AND TO RESTORE SERVICE AS QUICKLY AS POSSIBLE?

A. Yes, it did. Restoring service to customers as quickly and safely as possible was deemed to be of the upmost importance. CEHE serves Houston, Galveston, Freeport, Baytown and surrounding communities. CEHE's service area covers approximately 5,000 square miles, accounting for approximately 2.5% of the Electric Reliability Council of Texas ("ERCOT") region's land but approximately 25% of the ERCOT region's load. CEHE serves the nation's 4th largest city (Houston), the nation's second largest port, the world's largest medical center (the Texas Medical Center), the NASA Johnson Space Center, a Department of Energy ("DOE") Strategic Petroleum Reserve facility, multiple industrial plants along the Houston Ship Channel and elsewhere, and various coastal communities. The area contains a significant portion of the United States' chemical production and petroleum refining capacity.

By any measure, Hurricane Ike was one of the most destructive and most costly hurricanes to strike the United States in recorded history. Restoration of electric service as quickly as possible was an essential first step for the region's recovery from the storm. It was essential to return the economy of the entire Gulf Coast to a position of strength to ensure the flow of energy (natural gas, crude oil, refined products, etc.) and other vital goods and services critical to the economy of the United States. In the aftermath of Hurricanes Gustav and Ike, the loss of oil refining capacity due to

damaged refineries that were shut down caused gasoline prices to spike nationwide. In addition, the loss of oil refineries and refined product pipelines due to damage and the loss of natural gas and electric service to these facilities hampered their timely restarts. This in turn contributed to rising prices for oil and gas products.

A timely restoration was also essential to the regional economy. Without electric service, virtually no other public or private services could be provided to a community. Very few facilities or buildings had redundant electrical generation equipment, and the equipment that did exist was for temporary "back-up" service, typically lasting a few hours to a few days at most. These generators are generally fueled with either diesel or natural gas, both of which were in short supply following the hurricane. Public facilities such as hospitals, airports, schools, offices, jails, water treatment facilities, courthouses, and universities were highly dependent on reliable electric service. Many private facilities were equally dependent on reliable power; some provide critical products and services to the community such as gasoline refining, crude oil unloading and terminalling, and natural gas shipping. Additionally, CEHE worked to quickly restore power to its residential customers who provide the workforce for so many of the vital aforementioned facilities.

Q. DID GOVERNMENT OFFICIALS URGE THE COMPANY TO TAKE THE NECESSARY STEPS TO RESTORE SERVICE AS QUICKLY AS POSSIBLE?

A. Yes. Local, state, and federal authorities immediately undertook a number of measures that had the effect of both helping and urging CEHE to focus on restoring service as quickly as possible. The urgency to restore service is reflected in the following: On September 8, 2008, five days prior to the storm making landfall, the Governor of Texas, Rick Perry, issued a disaster declaration in response to the imminent threat of danger to the Texas coast posed by Hurricane Ike. The proclamation, among other things, suspended all rules and regulations that might otherwise prevent a prompt response to the emergency condition. After the hurricane made landfall, Governor Perry signed another emergency proclamation on September 15, 2008, recognizing that "Restoring power is one of the most critical, humanitarian challenges we face in the immediate aftermath of this natural disaster. This proclamation will help public utility companies restore electricity faster to millions of homes, hospitals, schools and businesses affected by Hurricane Ike." The proclamation authorized all Texas utilities to enter private property, including for purposes of temporarily constructing facilities, without obtaining land use rights through condemnation or otherwise to restore power. Governor Perry had taken this same action following the devastation caused by Hurricane Rita in 2005. Additionally, Governor Perry stated, "Restoring power is a top priority now that search and rescue efforts are concluding. Bringing homes, business, schools and health care facilities back to full operation will be a milestone in our efforts

to help Texans recover from the damage they sustained." Moreover, as I discuss later in my testimony, the PUCT waived certain regulations, thereby allowing CEHE to apply all of its efforts toward service restoration.

Q. WHAT IS THE SIGNIFICANCE OF CEHE'S EXPEDITED RESPONSE?

A. Additional resources, largely in the number of crews and the amount of time worked, were required for such an expedited restoration. The Company could have utilized fewer crews and resources, thereby reducing the cost of restoration, but the length of restoration would have been extended by weeks. This result would have been unacceptable to the Company, our communities, and governmental officials. With such extensive damages impacting our entire service area, we required large, highly-skilled construction crews coordinated and assembled in appropriate areas to safely and efficiently restore services within a reasonable timeframe. Company witnesses Finley and Houston also address the reasonableness and necessity of the costs associated with the expedited response.

Q. WHAT WAS THE TIMELINE FOR RESTORATION OF SERVICE TO THE CUSTOMERS OF CEHE?

A. CEHE commenced service restoration activity as soon as safely possible. Along with emergency management personnel and law enforcement, CEHE employees are first responders to hurricane-impacted areas to assess damage, clear debris, and begin

repairs. Although the storm was the worst natural disaster to ever hit the CEHE service area, by utilizing the services of over 16,000 transmission and distribution restoration workers and field support personnel recruited from across the United States and Canada, power was restored to all customers in less than three weeks. One million affected customers were restored within six days and over 1.5 million customers were restored within ten days. After 18 days, all customers who could take power had service.

Q. WHAT IS CEHE'S APPROACH TO RESTORING SERVICE TO CUSTOMERS?

A. The ultimate goal of CEHE's efforts is always to maintain the safety and welfare of its workers and the public to the greatest degree possible before, during, and immediately after a hurricane or natural disaster. Generally, CEHE focuses on doing what is necessary to safely and quickly restore power to affected customers. This includes making repairs, some of which are temporary. Following restoration of service to affected customers, CEHE performs additional work to revise or reinforce temporary repairs and to further inspect the system to insure all storm-induced problems are permanently addressed. Such problems might include the loss of system reliability features.

Q. HOW DOES CEHE INSURE THAT SAFETY AND WELFARE OF ITS WORKERS AND THE PUBLIC ARE A PRIORITY?

A. Our key objective of the EOP is to accomplish the safe and orderly restoration of electric facilities after a major system-wide emergency. During the emergency, CEHE took out paid advertisement that included public safety messages. Throughout the storm restoration process, our media interviews and news releases included safety messages about downed power lines aimed towards our public. CEHE also had safety procedures in place that included training on and communication of safety matters to every mutual assistance lineman, contractor lineman, tree trimmer, and member of CEHE's internal workforce. Please refer to the testimony of Company witness Finley for more information.

Q. DESCRIBE THE SIGNIFICANT EFFORTS OF CEHE TO RESTORE SERVICE TO CUSTOMERS AS QUICKLY AS POSSIBLE.

A. The significant efforts of CEHE to restore service to its customers included the following, which is discussed in the testimony of Company witnesses Finley and Houston:

- Securing and safely mobilizing a massive restoration army, including logistical support and all pertinent resources, to implement our restoration plan.
- Reconstructing the transmission grid, including damaged substations.
- Restoring a heavily damaged distribution system.

- Communicating, prioritizing, and working with customers, regulatory agencies and other governmental representatives.
- Safely, timely and efficiently reducing our workforce as our restoration efforts neared completion.

Q. YOU STATE ABOVE THAT ALL CUSTOMERS WHO WERE ABLE TO RECEIVE SERVICE WERE RESTORED IN 18 DAYS. DID THE COMPANY'S RESTORATION ACTIVITIES AND RELATED COSTS END AT THAT TIME?

A. No. After power had been restored to all customers who were able to receive service, significant work still remained to completely restore the system. For example, crews returned to many locations where temporary repairs had been made to restore service in order to make permanent repairs. A full description of restoration activity both during and after the initial 18-day period is provided in the testimony of Company witnesses Terry Finley and John Houston. In this filing, the Company seeks a determination that all restoration costs booked through February 28, 2009, including the additional estimated costs, debt issuance costs and carrying charges, are reasonable and necessary.

IV. EMERGENCY OPERATIONS PLAN AND PROCESS

Q. PLEASE DESCRIBE CEHE'S EOP.

A. The EOP, a summary version of which has been filed under seal with the PUCT in Project No. 34202, *Rulemaking to Repeal PUC Subst. R. §25.53 and Propose New §25.53 Relating to Electric Service Emergency Operations Plans*, is an operating guide designed for use by CEHE departments responsible for the restoration of electric service should it be disrupted. Pre-emergency preparations are specified in the EOP and are made prior to hurricane season to ensure that emergency readiness remains at peak levels. Such pre-seasonal preparations include updating the Corporate plan for organizational changes, modifications to restoration processes, accounting for new automation or communication tools, refreshing employee emergency assignments, assessing material inventories, conducting training and drills, renewing staging site and logistic support contracts, and coordinating with state and local emergency agencies. Communications are conducted with contract line crews throughout the United States as well as mutual assistance utility companies to ensure appropriate resources of skilled line crews are located and made aware of the Company's plans and expectations. Our Company also maintains an active membership in multiple mutual assistance groups including the South Eastern Electric Exchange, Midwest Mutual Assistance, and Texas Mutual Assistance.

CEHE's EOP has four key areas of focus:

- Staffing the storm organization
- Materials planning
- Logistics planning
- Staging Site planning

Nearly all Houston-area employees have an assigned role in the Company's EOP Storm Roster. While some employees continue to perform their regular jobs during emergency operations, in most cases employees assume roles different than their regular responsibilities and for extended working hours.

Training is conducted for many storm personnel each year regardless of whether they are in a new role or a role in which they have served many times. This includes training on processes that range from analytical and clerical to reinforcing restoration processes for managers and directors.

To communicate with employees during EOP activation, CEHE utilizes a pre-programmed communication vehicle that sends alerts to employees using all possible communication means, including work e-mail, personal e-mail, cell phone, home phone, work phone, and pager. This alert advises employees of an impending storm, and provides instructions for employee response. CEHE also employs the use of its Storm Hotline phone message. In the event of a storm, employees call the hotline

number and a recorded message provides instructions and timeline expectations for employee response.

Preparations include a managed increase in EOP material inventory, pre-staging of Storm Kits containing minimum levels of EOP material, preparing for activation of the Distribution Material Evaluation Center, developing warehouse staffing plans in the event of an emergency, and coordinating mutual assistance resources in the event the restoration effort exceeds internal staffing capabilities.

Preparations also include establishing corporate office, service center, and staging site logistical needs, including: caterers, lodging, buses, laundry, and facilities (pre and post storm). Contracts are established prior to the storm season for providing these resources in addition to other critical support services such as trash disposal, security, and environmental support. To support the overall restoration effort and the thousands of workers involved, a logistics network of trained CNP employees has been created to prepare for and execute the multiple logistical requirements for a successful restoration.

Staging sites are temporary work sites that are opened to check in all external resources, provide parking, food, laundry service, medical care, hotel coordination, and, if necessary, housing for large numbers of external and internal resources. Communication lines are ordered for the staging sites and satellite communications can

be expanded to improve communication efforts. Depending on the storm track certainty and forecasted intensity, CEHE may begin to financially commit to acquire necessary resources in advance of the storm. Resource needs are continually reviewed and adjusted, as necessary, based on the storm's path, intensity and corresponding damage model results.

The EOP was designed for response and restoration of electric service in CEHE's service territory following major damage or disruption of service. The EOP's primary objective is to accomplish the orderly restoration of electric facilities through pre-planned, direct, efficient and safe use of all Company resources and available outside assistance. It is not meant to address issues pertaining to the connection, suspension, or disconnection of electric service in the ordinary course of the Company's business. A secondary objective is to accumulate and regularly disseminate to management, regulatory agencies, and the public an accurate assessment of the damage to the Company's system and the progress being made to restore service.

Each year prior to the start of hurricane season, CEHE tests its readiness during a hurricane preparedness exercise. This large-scale drill and training day takes place with active participation from employees throughout the Houston area. After months of preparation, the formal drill activities begin 72 hours from the mock hurricane's forecasted time and date of impact. The Central Evaluation Center ("CVAL"), the

Distribution Evaluation Center ("DVAL"), the transmission control center, and the Energy Control Evaluation center are all mobilized and staffed. Field patrollers are required to complete simulated damage assessments which are then utilized by office staff to practice updating storm systems, acquiring resources, and developing estimated times of restoration. The exercise also includes simulating customer and other external communications, updating our outage management system and other storm specific applications, reviewing crew spokesperson talking points, and preparing logistics network coordinators for their roles.

The EOP is intended to be placed into operation with or without prior warning that emergency conditions may arise. Responsibility for activating the EOP is clearly defined for various levels of system emergencies including ERCOT declared emergencies. A clear chain of command that provides for delegation of authority should the primary decision-maker be unavailable is contained in the full plan. An organizational chart of the EOP process is attached as Exhibit KM-2.

Events that may cause disruption to the area's electric service are varied and unpredictable as to severity and the portion of the system affected. CEHE's plan provides for the activation of the EOP for a system-wide basis emergency and describes responses for emergencies less than system-wide as the situation may warrant. The emergency may be restricted to the distribution, substation or transmission systems

independently without affecting the other parts. One region may be impacted versus multi-region damage.

V. CUSTOMER SERVICE

Q. DID CEHE'S HURRICANE IKE RESTORATION EFFORT AFFECT CUSTOMER SERVICE?

A. Yes. The restoration effort impacted CEHE's call center operations, field services activity and meter reading activity. The PUCT provided relief by issuing orders in its Project No. 36150, *Issues Related to the Disaster Resulting From Hurricane Ike*, which lifted certain tariff and rule requirements for CEHE.

Q. PLEASE DESCRIBE THE ORDERS ISSUED BY THE PUCT THAT RELATED TO CEHE'S FIELD SERVICES AND METER READING.

A. Several temporary provisions in the PUCT's orders in Project No. 36150 waived certain substantive rules and tariff provisions in order to "facilitate customers' return to the areas affected by Hurricane Ike and restoration of their electric service." (PUCT Project No. 36150, Order Suspending Certain Rules of the Commission at 2) Among others, the waivers included:

- Removal of the prohibition against more than three consecutive estimated meter reads.

- Removal of the requirement that CEHE disconnect end-use customers for non-payment.

- Removal of the requirement that CEHE connect or disconnect end-use customers in response to move-in and move-out requests.

These temporary changes allowed CEHE to focus on restoring service safely and quickly. The waivers were temporary and CEHE returned to normal execution of meter reading and customer-related field orders when the waivers expired, and in some cases before the waivers expired.

Q. PLEASE DESCRIBE THE IMPACT OF CEHE'S HURRICANE IKE RESTORATION EFFORT ON CEHE'S CALL CENTER OPERATIONS.

A. CEHE's Call Center operations group has a detailed EOP plan which was activated on September 12, 2008. CEHE's Customer Service group increased staff and activated back-up call centers in anticipation of high call volume. Between September 13 and October 1, 2008, the call centers were staffed by over 350 employees, including 282 customer service representatives ("CSRs"). In preparation for the immediate aftermath of the storm, CEHE had approximately 28 of its CSRs staged at the Company's Harrisburg facility to work through the storm. The Company also had staff housed near the Company's headquarters ready to report for work the morning of the storm's arrival, September 13, 2008. Approximately 37 CSRs were housed near and reported

for work at the Greenspoint Service Center and approximately 50 CSRs were housed in Shreveport, LA. CSRs worked in twelve hour shifts around the clock until October 1, 2009.

In addition, CEHE's Customer Service group activated back-up call centers in anticipation of high call volume. The Company contracted with third parties to provide call center operations. A group in Milwaukee, Wisconsin, Kelley Services, took Electric calls during weekday daytime hours. Another third party in North Carolina, IQOR, is primarily responsible for gas customer service, but it also assisted with electric customer service calls during the EOP.

Q. PLEASE DESCRIBE THE IMPACT ON CEHE'S METER READING ACTIVITY.

A. CEHE's meter reading ceased operations midday on September 11, 2008 due to the approach of Hurricane Ike and normal meter reading operations resumed on October 10, 2008. Although our employees did not take actual meter readings during that period, we still had to ensure that our customers would receive their gas bills and that REPs would receive required usage transactions. Therefore, Meter Reading Operations still continued to process the meter reading files daily by using a "bad weather" code to designate the force majeure event and employing meter usage estimations.

Q. ONCE METER READING OPERATIONS WERE SUSPENDED, WHAT ROLES DID METER READING EMPLOYEES PERFORM?

A. During the EOP, Meter Reading employees were used in various roles in order to support the EOP. These roles included:

- Patrol Drivers / Crew Spokespersons Drivers – 115 Meter Readers who are employed at the 5 district offices (Brazosport, Galveston, Cypress, Baytown and Fort Bend) and approximately 120 Meter Readers from the Harrisburg office were utilized as Patrol Drivers and Crew Spokesperson Drivers at all service centers. Their roles were to navigate the Patrol Inspectors and Crew Spokespersons to field locations for those individuals to perform their job duties.
- Runners – Meter Readers were also used as drivers or runners in various functions. They were utilized for delivering and picking up material for the service center warehouses and also delivering work packages to the staging sites.
- Assistance to the Central Warehouse – Similarly, Meter Readers were used by the central warehouse to make deliveries to the different service centers.

The other 150 Meter Reading employees who were not used as drivers were assigned as Operations Support. These employees were used in a variety of roles at numerous locations. These locations and roles included:

- George R. Brown Convention Center – Approximately 25 to 30 employees were assigned to this location, which was used as sleeping quarters to house visiting

crews. The Meter Readers set up over 4,000 army cots in two large rooms; served drinks and snacks to visiting crews; served as a meet and greet for incoming visitors; helped stock other sites with extra pillows, sleeping bags and cots; and continually cleaned and stocked the two sleeping areas.

- Staging Sites – The staging sites were set up for all of the visiting crews to park their vehicles over night as well as serving as food and laundry stations. These sites also stored material that the visiting crews would need and served as drop locations for their work packages. At the staging sites, Meter Readers were responsible for ensuring that all vehicles were fueled; they restocked the supply of food and drinks; they directed in-coming and out-going traffic; they performed custodial and janitorial duties; and they assisted with any other duties that were needed.

After the deactivation of EOP, special projects were necessary in order to ensure that Electric Operations, including Meter Reading Operations, could return to normal. These projects included:

- Meter Sweep – Meter Readers swept the surge prone areas to evaluate each site and verify if each meter location was able to accept service. The information received was passed back to the Electric Market Operations group and the Customer Account Area group.
- Additional Training – Refresher training was provided to all Meter Readers to help improve accuracy and time was spent on safety to ensure that the Meter Readers

were trained to recognize the new hazards that would be present in the field after the hurricane.

- Post Ike Storm Assessment – During this process CEHE's distribution system was inspected again to ensure that all damages were identified. Fifty-one drivers from the Meter Reading department were utilized as Patrol Drivers for this project.
- Street Light Damage Assessment – Up to 40 Meter Reader drivers from the Meter Reading Department were used to inspect the distribution system for all street light damages.

VI. COMMUNICATIONS

Q. WHAT COMMUNICATION METHODS WERE USED TO REACH EMPLOYEES BEFORE THE STORM?

A. The company activated its EOP plan for Texas on September 10, 2008, when the storm was predicted with above average confidence to impact CEHE's service territory. The employee Storm Hotline was initialized, which provided recorded updates several times per day from the time that EOP was activated until it was fully deactivated. In addition, the Company utilized an emergency communication service which is capable of short text messages and simultaneous voice transmissions to home, work, and cell phones. Email communications were sent to employees with regular updates and instructions,

and EOP leaders also made personal contact with those who would be reporting to them for storm duty to discuss EOP roles and confirm reporting instructions.

Q. WHAT COMMUNICATION METHODS WERE USED TO REACH EMPLOYEES DURING THE STORM?

A. In addition to information and instructions provided by the employees' EOP leaders and operational management, CEHE, through CNP's Corporate Communications group, had several ways to reach employees during the storm to convey CVAL updates. A print newsletter for employees was delivered each day to all CEHE work locations, including staging sites. The newsletter included information about restoration progress, as well as key messages for customers and safety tips. Since the Company's email servers were working throughout Hurricane Ike, the Corporate Communications group was able to send emails and text messages to employees (including a text version of the print newsletter), which many could receive in the field with mobile devices. A storm hotline with a recorded message was updated several times per day in synch with press releases and the latest outage restoration figures. Call volume suggests that this was called at least once per day by employees, with a peak of 17,709 calls on September 22, 2008. Frequently asked questions ("FAQs") were distributed to customer-facing employees, including crew spokespersons and customer service, and these were updated as new issues emerged and conditions changed. FAQs were printed in the

newsletter and also posted on the www.CenterPointEnergy.com web site, which both employees and customers could access.

Q. WERE THERE ANY COMMUNICATIONS WITH CONTRACT AND MUTUAL ASSISTANCE WORKERS TO HELP ORIENT THEM TO CEHE AND KEEP THEM INFORMED ABOUT KEY ISSUES AND RESTORATION STATUS?

A. Yes, there were. A safety orientation session was provided to all incoming workers, which included a CEHE video entitled, "After the Storm." The video covered a range of topics, including basic rules and expectations, safety tips, and electric system configuration to help familiarize contractors with CEHE's equipment. A system configuration handbook was also provided.

For ongoing communications, a mutual assistance newsletter was printed and delivered each afternoon to the staging site meal tent. While some of the information was carried over from the employee newsletter, including customer FAQ, safety tips, and outage/restoration information, the mutual assistance newsletter was geared toward motivating and informing non-employees about the service restoration process. A newsletter was also available in Spanish. Operational communications and instructions were handled in the field, and Field Crew Coordinators (CEHE employees directing teams of outside crews) were responsible for helping to pass along key messages.

Q. PLEASE DESCRIBE CEHE'S EFFORTS TO COMMUNICATE WITH CUSTOMERS.

A. Each year at the start of hurricane season, as an ongoing effort to educate customers about reliability and storm restoration priority, CNP and the City of Houston co-sponsor the National Weather Service's hurricane workshop that is open to the public and held at the George R. Brown Convention Center in downtown Houston, and I have been a keynote presenter the last three years. CNP advertises and promotes this event through press releases, Public Service Announcements ("PSAs"), paid media advertising, natural gas company bill inserts, email, and on the web. It is also promoted by co-sponsors using different mediums, including their respective web sites and newsletters. This workshop contains valuable information to help residents prepare for storm season, including information presented to explain CEHE's restoration process, evacuation information, and the forecast for the coming hurricane season. The workshop was featured in numerous live and taped broadcast news reports before, during, and after the event, as well as print news stories, and many of the local television meteorologists promoted their participation.

Each year, CNP, KHOU Channel 11 (CBS affiliate), and Randall's Grocery Store produce more than 350,000 free copies of a Hurricane Preparedness Guide and Tracking Chart that has helpful information and storm preparation tips. The document has been made available for free during hurricane season at KHOU studios, Keller

Williams Realty offices, and Randall's stores. A copy of this document is attached as Exhibit KM-3.

We know that trees planted too close or directly under power lines can cause outages, and consumer education about this reliability issue is, and will continue to be, a key initiative. CEHE conducts regular right-of-way clearing to address current tree problems. We also launched an aggressive consumer education campaign to prevent future improper tree planting called "Right Tree, Right Place," designed to educate homeowners, developers and landscapers. This ongoing campaign consists of print and radio ads designed to define the right types of trees (low growth) and proper planting distance from power lines, information kits and door hangers, as well as a press release issued in mid-April timed around Earth Day and Arbor Day. A web component combines paid web banner ads on selected third-party web sites and banner ads on the www.CenterPointEnergy.com home page, as well as a robust section on trees within the Electric Operations part of the Company's website. The outage problems directly attributable to trees during Hurricane Ike, and the clearing effort required to remove trees before restoration could begin, reveals that this issue needs greater attention and action by consumers and builders.

Q. HOW DID CEHE COMMUNICATE WITH CUSTOMERS ABOUT STORM PREPARATIONS AND EXPECTATIONS IN ADVANCE OF HURRICANE IKE?

A. In the week prior to landfall, CEHE communicated through the news media and local radio advertisements. The Company issued press releases, posted information on the Company web site, and participated in numerous interviews with local and national media. All communications were designed to reinforce expectations about outage durations of two to three weeks, and discussed our restoration priority and plans for bringing in additional resources.

Q. PLEASE DESCRIBE THE COMPANY'S INTERACTION WITH CUSTOMERS DURING AND FOLLOWING THE STORM.

A. Keeping customers informed about the status of restoration efforts and public safety issues, such as downed power lines and safe operation of electric generators, were top priorities during Hurricane Ike recovery. As I mentioned earlier, CEHE's Customer Service group increased staff and activated back-up call centers in anticipation of high call volume. On-hold messaging was utilized to reinforce key information, and customer service agents were provided the latest restoration estimates and FAQs. The average wait time per answered call was 25 seconds.

In addition to the CSRs, information was shared with customers through regular media updates and press releases (at least twice per day), numerous TV and radio interviews every day, media events at CEHE work locations and staging sites, and embedding reporters (allowing them to ride along with CEHE crews for extended periods to directly observe the restoration efforts). In addition to CEHE's own press conference mid-way through restoration, CEHE regularly participated in live TranStar news conferences with Houston Mayor Bill White, Harris County Judge Ed Emmett, Federal Energy Management Agency ("FEMA"), and other elected officials and emergency response organizations. The Corporate Communications Group also created an "Ike Storm Center" section on CEHE's internet site, easily accessible from the home page, that housed all press releases, tracked restoration efforts, and provided safety information, FAQs, eight short videos on restoration and safety topics, a photo library, maps and restoration estimates by zip code, and information on CEHE's restoration priority. The Ike Storm Center web site contained a Spanish language sub-section with maps, safety tips, FAQs, photos and videos. Despite power outages, CEHE's web site proved to be an effective communication vehicle, perhaps due to a proliferation of cell phones that can now easily access the internet. In fact, CNP had to increase system capacity due to a 2,700 percent increase in web visitors during Hurricane Ike. (The peak day was September 18, 2008, with 270,675 visits compared to an average day of approximately 10,000 visits.)

Q. DO YOU FEEL THAT CEHE COMMUNICATED OUTAGE AND RESTORATION INFORMATION EFFECTIVELY?

A. Given the circumstances with which we were faced, yes, I do. Our high-level restoration estimates proved to be quite accurate; we estimated 2 to 3 weeks to restore power before the storm hit, based upon the hurricane's expected strength and intensity. Restoration in actuality took 18 days. We also achieved other high-level milestones – 1 million affected customers restored within six days and over 1.5 million affected customers restored within ten days. These were remarkable achievements, given the scope of outages and the amount of tree and debris damage our equipment sustained due to prolonged exposure to hurricane-force winds.

While the high-level restoration estimates were on target, it was more difficult to predict restoration at a more granular level due to the varied amounts of damage in specific neighborhoods. However, because customers and the media expressed a strong desire to have more detailed information, CEHE published restoration estimates by zip code for the first time in its history (and to our knowledge the first time any utility has attempted this). The zip code maps and charts were an attempt to project "substantial" restoration (80 percent of customers) by area. Our results with the accuracy of these micro-level estimates were mixed. Some customers were restored ahead of our estimates if damage was light. Other customers, particularly those in heavily wooded areas, saw delays when crews had to make complex repairs. Because we tried to

estimate 80 percent restoration in zip codes, this naturally disappointed the 20 percent with isolated or more difficult repairs.

Although no utility builds its system according to zip codes, the CEHE restoration maps represented a good faith attempt to provide useful information to customers – with zip codes overlaid onto our grid at the substation and circuit level. Restoration dates were made based on crew work plans for substations and circuits, with dates subject to change (faster or slower) based on actual field conditions.

Q. PLEASE DESCRIBE THE FINDINGS FROM CENTERPOINT ENERGY'S POST-STORM CONSUMER RESEARCH.

A. CNP contracted with TNS Global (http://www.tnsglobal.com) for post-Ike consumer research, designed to measure public opinion of CEHE's pre-storm preparedness and post-storm performance. This research was conducted in two waves to assess changing perceptions over time, with the first wave held between October 20 and 24, 2008, and a second wave held between December 9 and 18, 2008.

Results from the October and December survey are complete and did not exhibit a significant statistical difference between the two. The high-level findings from the research suggest that:

- 65% were satisfied with restoration of power;

Storm Report

- **Period:** 4/27/2013 @ 15:28 p.m. through 4/28/2013 @ 19:28 p.m.
- **Remarks:** The combination of a very weak cold front that stalled out just north of the CNP area and a disturbance moving along the stalled front led to the development of severe thunderstorms Saturday afternoon through Sunday evening with lightning, heavy rain, and flooding.
- **Dispatcher Remarks:** Referred orders – 371. Storms moved across the system traveling down I-10 dumping heavy rain with wind and hail reported. Major flooding occurred in the HO Clark and Sugarland area. 8 inches of rain reported in Stafford area. 6 to 7 inches of rain in the HO Clarke / Sugarland area and 4 inches of rain reported in the Bellaire/Mag Park area. Preliminary numbers indicate that HOC service area will be able to exclude all outages as a major event since they went over the 25% SAIDI threshold. Other service areas will only be able to exclude individual flooding or flooding delayed cases. During the storm I.T. had two Posting Q events which slowed the Outage and Mobile data system from 6:36 to 7:51 pm and again from 10:05 PM to 1:11 AM.
- **System Impact:**
  - Customers Out - 138,511
  - MW Lost - 175
  - Highest Trouble Level - 7
- **Excluded events:**

	SAIDI	SAIFI
Exceeded 10% of CNP's total customers out so that all of the outages from the storm can be excluded from PUC reports	None	None
Exceeded 25% of Service Area's rolling 12 month customer minutes so that the outages can be excluded for that area	4.38	0.0196
Outages excluded due to documented tornados, wind shear, and flooding	0.10	0.0002
Outages reduced due to crew inability to access area due to flooding.	0.22	None

- **Service Areas impacted heaviest:** Hiram Clarke, Bellaire, Sugar Land, South Houston
- **System Impacts:** **SAIDI** **SAIFI**
  - **Overall System:**
    - Storm Period Addition - 8.25 minutes 0.0549 interruptions
    - Through 4/26 Status ---- 4.08 mins. ahead of target 0.0332 ints. ahead of target
    - Through 4/28 Status ---- 0.69 mins. ahead of target 0.0047 ints. ahead of target
  - **Causes:**
    - Weather ---------- 4.13 minutes 0.0188 interruptions
    - Vegetation ---------- 2.55 minutes 0.0138 interruptions
    - Equipment failure ------- 0.61 minutes 0.0044 interruptions
    - Substation ---------- 0.07 minutes 0.0007 interruptions
    - Transmission ---------- 0.16 minutes 0.0054 interruptions
    - Unknown ---------- 0.44 minutes 0.0061 interruptions
    - Other ---------- 0.20 minutes 0.0028 interruptions
    - Wildlife ---------- 0.02 minutes 0.0001 interruptions
    - Third Party Causes ----- 0.06 minutes 0.0028 interruptions
  - **Outage levels:**
    - Circuit ---------- 4.44 minutes 0.0448 interruptions

Storm Report

- Overhead fuses ---------- 2.67 minutes 0.0072 interruptions
- URD fuses ---------- 0.68 minutes 0.0019 interruptions
- Transformers ---------- 0.43 minutes 0.0009 interruptions

- **Service Area:**
  - Baytown ---------- 0.30 minutes 0.0033 interruptions
  - Bellaire ---------- 1.28 minutes 0.0055 interruptions
  - Cypress---------- 0.18 minutes 0.0029 interruptions
  - Ft Bend ---------- 0.05 minutes 0.0002 interruptions
  - Galveston ---------- 0.05 minutes 0.0009 interruptions
  - Greenspoint ---------- 0.18 minutes 0.0018 interruptions
  - HO Clarke ---------- 4.39 minutes 0.0199 interruptions
  - Humble ---------- 0.02 minutes 0.0017 interruptions
  - Katy ---------- 0.02 minutes 0.0001 interruptions
  - Spring Branch ---------- 0.10 minutes 0.0004 interruptions
  - South Houston ---------- 0.70 minutes 0.0047 interruptions
  - Sugarland ---------- 0.99 minutes 0.0134 interruptions

- **Automation Update:** 40 successful operations out of 44 attempts = 90.91% successful
- **Trouble Cases:**
  - Circuit Operations ---------- 641
  - Circuit Lockouts ---------- 52
  - Partial Circuit Outages ---------- 11
  - Overhead Line Fuses Blown ---------- 416
  - Overhead Transformer Fuses Blown ---------- 312
  - Burned Up Overhead Transformers ---------- 100
  - Spans Overhead Primary Down ---------- 106
  - Spans Overhead Secondary Down ---------- 87
  - URD Terminal Poles Blown ---------- 127
  - URD Transformer Fuses Blown ---------- 5
  - Burned Up URD Transformers ---------- 19
  - URD Primary Failure ---------- 26
  - URD Secondary Failure ---------- 3
  - Major Underground Line Fuse -------- 9
  - Major Underground Transformer Fuse --------- 1
  - Major Underground Transformer BU - -------- 0
  - Major Underground Primary Failure -- -------- 1
  - Major Underground Secondary Failure -------- 0
  - Poles Down ---------- 20
  - Burned Up Disconnects ---------- 24
  - Drops Down ---------- 109
  - Meter Burned Up ---------- 19
  - Total Customers ---------- 138,511
- **Substation Outages:**
  - 138/12kv Transformer #2 @ Holmes tripped
  - 138/35kv Transformer #1 @ Barker tripped

Storm Report

- 138/12kv Transformer #2 @ Telephone tripped
- 138/12kv Transformer #4 @ Hall tripped

- **Transmission Outages:**
  - Instantaneous operation on 138kv line 81 Britmoore-Woodcreek-Memorial
  - Instantaneous operation on 138kv line 81 T.H. Wharton-Jester-Veterans-Bammel
  - Instantaneous operation on 138kv line 21 Gable Street-Franklin
  - Instantaneous operation on 69kv line 12 University-General Foods
  - Instantaneous operation on 138kv line 21 Greens Bayou-Witter--Davson
  - Lockout on 138kv line 02 H.O. Clarke-Blue Ridge-Mula-Dewalt
  - Instantaneous operation on 69kv line 13 Webster-South Houston-Deepwater
  - Instantaneous operation on 138kv line 63 Webster-La Marque
  - Instantaneous operation on 138kv line 06 P.H.Robinson-Pilgrim-Gulfgate-Mary's Creek-Hall-Telephone-Pearland-Knight-Plaza

Storm Report

- **Period:** 8/16/2013 @ 16:58 p.m. through 8/17/2013@ 23:58 p.m.
- **Remarks:** An outflow associated with central Texas storms that pushed south through the CNP area provided a trigger for severe thunderstorms Friday evening with high winds, lightning, and heavy rain.
- **Dispatcher Remarks:** Total Referred Cases = 397. Thunderstorms developed over the system, moving south. Heavy rain, frequent lightning, 48 mph winds with gusts up to 61 mph with some hail reported. Most of the heavy activity occurred south of I-10, in southern Harris, Brazoria, Galveston, and Fort bend counties. System went to Level 3 at 17:27, Level 5 at 17:58, Level 8 at 18:27. System dropped to Level 7 at 23:58, Level 6 at 02:58, Level 5 at 03:58, level 4 at 09:27, level 3 at 16:58, Level 2 at 21:27. The system returned to Level 1 at 23:58.
- **System Impact:**
  - Customers Out - 219,681
  - MW Lost - 729
  - Highest Trouble Level - 8
- **Excluded events:**

	SAIDI	SAIFI
Exceeded 10% of CNP's total customers out so that all of the outages from the storm can be excluded from PUC reports	None	None
Exceeded 25% of Service Area's rolling 12 month customer minutes so that the outages can be excluded for that area	3.55	0.0181
Outages excluded due to documented tornados, wind shear, and flooding	None	None
Outages reduced due to crew inability to access area due to flooding.	None	None

- **Service Areas impacted heaviest:** South Houston, Hiram Clarke, Greenspoint, Bellaire
- **System Impacts:** **SAIDI** **SAIFI**
  - **Overall System:**
    - Storm Period Addition - 12.71 minutes 0.0878 interruptions
    - Through 8/15 Status ---- 14.82 mins. ahead of target 0.1209 ints. ahead of target
    - Through 8/17 Status ---- 6.35 mins. ahead of target 0.0579 ints. ahead of target
  - **Causes:**
    - Weather ---------- 6.78 minutes 0.0496 interruptions
    - Vegetation ---------- 3.49 minutes 0.0179 interruptions
    - Equipment failure ------- 1.79 minutes 0.0060 interruptions
    - Substation ---------- 0.14 minutes 0.0017 interruptions
    - Transmission ---------- 0.00 minutes 0.0000 interruptions
    - Unknown ---------- 0.50 minutes 0.0123 interruptions
    - Other ---------- 0.01 minutes 0.0001 interruptions
    - Wildlife ---------- 0.01 minutes 0.0001 interruptions
    - Third Party Causes ----- 0.00 minutes 0.0002 interruptions
  - **Outage levels:**
    - Circuit ---------- 7.05 minutes 0.0760 interruptions
    - Overhead fuses ---------- 4.84 minutes 0.0098 interruptions
    - URD fuses ---------- 0.33 minutes 0.0010 interruptions
    - Transformers ---------- 0.46 minutes 0.0010 interruptions

Storm Report

- **Service Area:**
  - Baytown ---------- 0.13 minutes 0.0007 interruptions
  - Bellaire ---------- 1.85 minutes 0.0081 interruptions
  - Cypress---------- 0.07 minutes 0.0002 interruptions
  - Ft Bend ---------- 0.31 minutes 0.0020 interruptions
  - Galveston ---------- 0.00 minutes 0.0000 interruptions
  - Greenspoint ---------- 2.13 minutes 0.0259 interruptions
  - HO Clarke ---------- 3.25 minutes 0.0227 interruptions
  - Humble ---------- 0.71 minutes 0.0061 interruptions
  - Katy ---------- 0.01 minutes 0.0000 interruptions
  - Spring Branch ---------- 0.52 minutes 0.0025 interruptions
  - South Houston ---------- 3.55 minutes 0.0181 interruptions
  - Sugarland ---------- 0.18 minutes 0.0015 interruptions

- **Automation Update:** Attempted to operate 35 devices with 32 operating successfully (91%). 5 operated successfully with multiple tries.
- **Trouble Cases:**
  - Circuit Operations ---------- 456
  - Circuit Lockouts ---------- 57
  - Partial Circuit Outages ---------- 13
  - Overhead Line Fuses Blown ---------- 541
  - Overhead Transformer Fuses Blown ---------- 275
  - Burned Up Overhead Transformers ---------- 94
  - Spans Overhead Primary Down ---------- 174
  - Spans Overhead Secondary Down ---------- 100
  - URD Terminal Poles Blown ---------- 48
  - URD Transformer Fuses Blown ---------- 5
  - Burned Up URD Transformers ---------- 14
  - URD Primary Failure ---------- 13
  - URD Secondary Failure ---------- 0
  - Major Underground Line Fuse -------- 13
  - Major Underground Transformer Fuse --------- 1
  - Major Underground Transformer BU - -------- 0
  - Major Underground Primary Failure -- -------- 2
  - Major Underground Secondary Failure -------- 0
  - Poles Down ---------- 31
  - Burned Up Disconnects ---------- 33
  - Drops Down ---------- 122
  - Meter Burned Up ---------- 7
  - Total Customers ---------- 219,681
- **Substation Outages:**
  - None.
- **Transmission Outages:**
  - 8/16 17:35 FAIRBANKS 138/35kv TR2 tripped.
  - 8/16 17:43 LITTLE YORK 69/12kv TR3 tripped.

Storm Report

- 8/16 18:04 BRINGHURST 69/12kv TR4 tripped.

Storm Report

- **Period:** 05/25/2015 @ 19:50 p.m. through 05/28/2015 @ 01:25 a.m.
- **Remarks:** A very strong line of thunderstorms moved into the CNP area from the northwest and slowly moved southeast producing strong wind gust, frequent lightning, flash flooding due to saturated grounds and causing numerous scattered storms to develop ahead of and behind the storm line.
- **System Impact:**
  - Customers Out - 346,610 (12.2% in max 24hr window) – Forced & Outside Causes
  - MW Lost - 516
  - Highest Trouble Level - 8
- **Excluded events:**

	SAIDI	SAIFI
Exceeded 10% of CNP's total customers out so that all of the outages from the storm can be excluded from PUC reports	31.65	0.1424
Exceeded 25% of Service Area's rolling 12 month customer minutes so that the outages can be excluded for that area	None	None
Outages excluded due to documented tornados, wind shear, and flooding	None	None
Outages reduced due to crew inability to access area due to flooding.	None	None

- **Service Areas impacted heaviest:** Bellaire (30.0% exclusion value), Sugarland (31.8% exclusion value), Spring Branch (34.2% exclusion value), and Greenspoint (18.1% exclusion value).

System Impacts:	**SAIDI**	**SAIFI**
Overall System:		
• Storm Period Addition ---	31.65 minutes	0.1424 interruptions
• Through 05/24 Status ----	13.40 mins. behind target	0.0692 ints. behind target
• Through 05/28 Status ----	13.26 mins. behind target	0.0559 ints. behind target
Causes:		
▪ Weather ----------	15.80 minutes	0.0353 interruptions
▪ Vegetation ----------	4.00 minutes	0.0212 interruptions
▪ Equipment failure -------	1.28 minutes	0.0078 interruptions
▪ Substation ----------	0.00 minutes	0.0005 interruptions
▪ Transmission ----------	0.00 minutes	0.0000 interruptions
▪ Unknown ----------	10.36 minutes	0.0764 interruptions
▪ Other ----------	0.13 minutes	0.0006 interruptions
▪ Wildlife ----------	0.02 minutes	0.0001 interruptions
▪ Third Party Causes -----	0.05 minutes	0.0005 interruptions
Outage levels:		
▪ Circuit ----------	11.53 minutes	0.1151 interruptions
▪ Overhead fuses ----------	13.03 minutes	0.0176 interruptions
▪ URD fuses ----------	3.87 minutes	0.0056 interruptions
▪ Transformers ----------	2.98 minutes	0.0036 interruptions
Service Area:		
▪ Baytown ----------	0.52 minutes	0.0017 interruptions
▪ Bellaire ----------	6.94 minutes	0.0150 interruptions
▪ Cypress----------	1.49 minutes	0.0104 interruptions

Storm Report

▪ Ft Bend ----------	1.86 minutes	0.0051 interruptions
▪ Galveston ----------	0.02 minutes	0.0009 interruptions
▪ Greenspoint ----------	4.21 minutes	0.0217 interruptions
▪ HO Clarke ----------	3.03 minutes	0.0121 interruptions
▪ Humble ----------	1.59 minutes	0.0133 interruptions
▪ Katy ----------	0.54 minutes	0.0044 interruptions
▪ Spring Branch ----------	4.23 minutes	0.0166 interruptions
▪ South Houston ----------	1.70 minutes	0.0061 interruptions
▪ Sugarland ----------	5.50 minutes	0.0296 interruptions

- **Automation Update:** Attempted to operate 80 devices with 72 operating successfully (90%). 13 devices were operated successfully after multiple attempts.
- **Trouble Cases (Forced &Outside Causes)**
  - Circuit Lockouts ---------- 125
  - Partial Circuit Outages ---------- 44
  - Overhead Line Fuses Blown ---------- 546
  - Transformer Fuses Blown ---------- 444
  - Burned Up Transformers ---------- 153
  - Spans Primary Down ---------- 153
  - Spans Secondary Down ---------- 93
  - URD Terminal Poles Blown ---------- 238
  - Major Underground Line Fuse -------- ---------- 2
  - Poles Down ---------- --------- 20
  - Drops Down ---------- 180
  - Meter Burned Up ---------- 37
  - Total Customers ---------- 346,610
- **Substation Outages:**
  - 5/25/2015 21:31 138/12kV TR.1 at Campbell tripped.
  - 5/26/2015 00:25 138kV TRRT1 at Crosby tripped due to snake contacting bus.
  - 5/26/2015 01:28 138/12kV TR.1 at Pearland tripped.
  - 5/26/2015 16:05 138/12Kv TR.1 at San Felipe tripped.
- **Transmission Outages:**
  - 5/25/2015 20:00 Instantaneous Operation on 69kV line 33 Harrisburg – Reed- McDonough – Clinton
  - 5/25/2015 21:23 Instantaneous Operation on 138kV line 81 T.H. Wharton – Willow
  - 5/25/2015 21:24 Instantaneous Operation on 69kV line 29 T. H. Wharton – Little York
  - 5/25/2015 21:44 Instantaneous Operation on 69kV line 29 T. H. Wharton – Little York
  - 5/25/2015 22:42 Instantaneous Operation on 138kV line 94 Galena Park – Normandy – Citifil
  - 5/25/2015 23:03 Instantaneous Operation on 138kV line 81 Willow- Klein – Kluge
  - 5/25/2015 23:03 Instantaneous Single-End Operation at T.H. Wharton on 138kV line 81 T. H. Wharton – Willow
  - 5/26/2015 00:00 Instantaneous Operation on 138kV line 92 Scarsdale – El Dorado – Webster 12kV – Kemah – P.H. Robinson
  - 5/26/2015 00:00 Instantaneous Single-End Operation on 138kV line 93 Webster – P.H. Robinson

Storm Report

- 5/26/2015 00:17 345kV Section of Bus T. H. Wharton between H600 – H610 – T.H. Wharton 5 Series GTs
- 5/26/2015 01:45 Instantaneous Operation on 69kV line 53 H.O. Clarke – Briscoe – Juliff – Karsten
- 5/26/2015 01:59 Instantaneous Operation on 69kV line 53 H.O. Clarke – Briscoe – Juliff – Karsten
- 5/26/2015 03:30 Instantaneous Operation on 69kV line 53 H.O. Clarke – Briscoe – Juliff – Karsten
- 5/26/2015 03:52 Instantaneous Operation on 138kV line 06 Plaza – Knight – Pearland – Gulfgate – Telephone – Hall – Mary's Creek – Ellington – Pilgrim – P.H. Robinson
- 5/27/15 07:29 Instantaneous Operation on 138kV line 81 T.H. Wharton – Willow

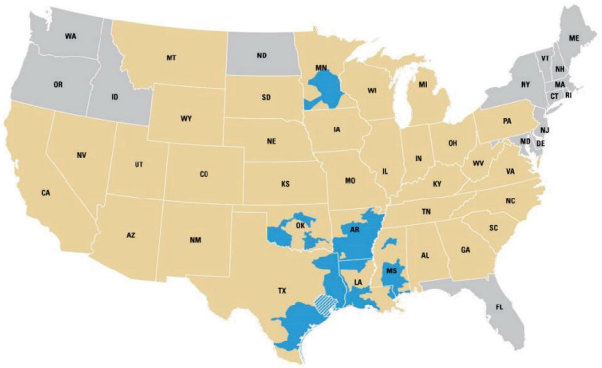
CenterPoint Energy

How we define resiliency: One year after Harvey

Kenny Mercado
Senior vice president of Electric Operations for CenterPoint Energy

Sept. 24, 2018

CenterPoint Energy:
An Electric and Natural Gas Utility



Electric Transmission & Distribution and Natural Gas Distribution

Natural Gas Distribution

CenterPoint Energy Services

Not active

Source: Form 2017 10-K

Electric Transmission & Distribution:

- Electric utility operations serves nearly all of the Houston/Galveston metropolitan area
- ~68 retail electric providers sell electricity to ~2.4 million metered customers across ~5,000 square miles
- 88,636 GWh delivered

Natural Gas Distribution:

- Regulated gas distribution jurisdictions in six states with ~3.5 million customers
- Delivered 412 Bcf of natural gas

Energy Services:

- Provides competitive energy services to meet the needs of more than 100,000 customers in 32 states
- Marketed 1,200 Bcf of natural gas

Advance Preparations – Emergency Operating Plans

- Our Electric and Natural Gas businesses each has an Emergency Operations Plan
- Annual drill to test our emergency response
- Coordinate our EOP with state and local officials
- Work with a mutual assistance network that allows us to provide/receive assistance to/from other utilities across the country following natural disasters
  - On average, CenterPoint Energy sends linemen 4-6 times per year to help other utilities restore power
- Contracts for fuel, lodging and materials are executed in advance so we're ready if a storm strikes

Harvey Video

CenterPoint Energy

Hurricane Harvey

Timeline

CenterPoint Energy

employees 1st

Preparations	Outreach	EOP	Harvey Makes Landfall	Resources	Operations	Employee Assistance	Status
Aug. 22, 2017 Electric and Gas Operations, logistics, fleet, service centers and facilities make preparations Begin posting storm readiness tips and safety information on social media	**Aug. 23, 2017** Regulatory and Gov't Relations work with officials News release distributes on hurricane preparedness Email to employees on preparedness	**Aug. 24, 2017** Electric and Gas Operations activate EOP Media interviews Publish social media messages on preparedness and safety Increase in employee messages on preparedness and EOP assignments	**Aug. 25, 2017** Harvey makes landfall as a Category 4 hurricane near Port Aransas, Texas Over the next five days, Harvey drops more than 50 inches of rain across our service territory	**Aug. 26, 2017** Activate Incident Command Center Issue news release on damage assessment and restoration update First wave of mutual assistance crews for Gas and Electric Operations	**Aug. 26-early Sept. 2017** Electric Operations builds a mobile substation to restore service to the Memorial area Gas Operations helps the city of Beaumont address a breach in the pipeline under the Neches River	**Sept. 1, 2017** CNP announces Employee 1st Fund to support impacted employees CNP announces $1.25 Million to assist Harvey recovery	**Sept. 7-8, 2017** Electric Operations resumes normal operations for most employees on Sept. 7 Gas Operations resumes normal operations on Sept. 8 A Corporate Response Team is established to manage ongoing issues

Wind Event vs. Water Event

CenterPoint Energy

Hurricane Ike

Hurricane Harvey

Hurricane Comparisons

Year	Name	Cat.	Winds - Sustained (mph)	Tropical Storm Wind Field (Miles)	Electric Outages	Restoration
1983	Alicia	3	115	125	750,000	16 days
1989	Hugo	4	140	190	696,000	18 days
1992	Andrew	4	160	105	1.4 million	34 days
2004	Charley	4	150	170	874,000	14 days
2005	Katrina	3	125	230	970,000	6 weeks
2005	Rita	3	115	205	719,000	6 days
2005	Wilma	3	120	230	3.2 million	18 days
2008	Ike	2	110	450	2.15 million	18 days
2017	**Harvey**	**4**	**130**	**270**	**1.27 million**	**10 days**

Hurricane Harvey – A Record-breaking Storm

- After making landfall as a Category 4 storm near Port Aransas, Texas, Hurricane Harvey stalled, impacting south Texas, southeast Texas and Louisiana for days

- Maximum sustained winds were **130 mph winds** at landfall
- **51.88 inches** of rainfall in southeast Texas, breaking the single-storm record of 48 inches set in 1978 and more than 10-year annual average

- More than **42,000** lightning strikes across electric service territory
- Harvey spawned tornadoes in southeast Texas, Louisiana, Alabama, Mississippi, Tennessee and North Carolina

Restoration Execution

Restore Power Safely and Efficiently

CenterPoint Energy

1. Restore service to key facilities vital to public safety, health and welfare and secure downed power lines
2. Repair major lines and fuses that restore power to greatest number of customers in least amount of time
3. Repair transformers, which typically serve about 10 customers
4. Repair individual electric drops to homes

Impact of Grid Modernization

Benefits of Advanced Metering System (AMS) and Intelligent Grid

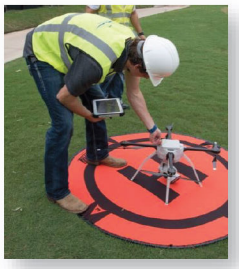
- The Smart Grid, including distribution automation devices such as intelligent grid switches, allowed us to quickly isolate problems on our grid and restore service to customers through those devices.
  - Operated more than **250** of these devices during the event impacting more than **140,000 customers**
  - Were able to avoid almost **41 million outage minutes** for our customers
  - **16.71 SAIDI minutes** saved due to automation
- AMS meters increased efficiency during the storm
  - Executed **45,000 orders** remotely at **97% performance**
  - Billed **700,000 accounts** with actual readings at **98.9% performance**
  - Executed remote turn off/on for safety reasons
- Use of real-time analytics to assess, monitor and resolve cases
  - Aided in developing better situational awareness
  - Allowed us to correlate weather and flooding information with outages, providing operations with critical decision-making tools

Impact of Grid Modernization

Use of Technology during Storm

CenterPoint Energy

- Drones helped to assess damage and evaluate work conditions
  - More than **500 locations** were tracked using **15 drones**
  - Enabled real-time situational awareness, accelerating restoration assessments
  - Allowed us to efficiently direct crews to accessible locations
  - Infrared capabilities helped identify equipment that needed further inspection



- Mobile data on each crew kept outage management efficient
- Ability to use **Power Alert Service (PAS)** to keep customers informed
  - AMS meters provide outage information that enables our predictive analytics engine to supply data to PAS and IVR systems, ultimately allowing for better, more detailed customer updates

- Memorial mobile substation
  - Memorial substation impacted by several feet of water
  - **50MVA** mobile substation installed on private property in **7 days**
  - Provided service to more than **9,000 customers** without power
- Flood wall at Grant substation helped protect service to Texas Medical Center

Harvey by the Numbers

Electric Operations Response

- **293** total electric circuits locked out and **4,494** total electric fuses out
- **8** substations out of service and **9** substations inaccessible due to high water
- More than **2,200** employees plus **1,500** contractors & mutual assistance personnel from **7** states
- **308** SAIDI minutes with **1.2 million** customers impacted
- **755 million** total minutes out over 10 days

Harvey by the Numbers

Electric Operations Response

CenterPoint Energy

- **5** staging sites
- **352,000** total hours worked during EOP event (160 hours per employee)
- Approximately **85 crew spokespersons** used
- **104,412** meals served
- More than **12,000** hotel rooms utilized

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