EXHIBIT NO. ___(GJZ-9)
DOCKET NO. UE-07___/UG-07___
2007 PSE GENERAL RATE CASE
WITNESS: GREG ZELLER

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY, INC.,** **Respondent.**	**Docket No. UE-07____** **Docket No. UG-07____**

EIGHTH EXHIBIT (NONCONFIDENTIAL) TO THE PREFILED DIRECT TESTIMONY OF GREG ZELLER ON BEHALF OF PUGET SOUND ENERGY, INC.

DECEMBER 3, 2007

PUGET SOUND ENERGY

KEMA after-action review of December 14 - 15, 2006 windstorm *"Hanukkah Eve Windstorm of 2006"*

KEMA recommendations and subsequent actions taken by PSE

Dated November 28, 2007

EMERGENCY RESTORATION – ANNUAL PLANNING

4.4 RECOMMENDATIONS

4.4.1 Expand the company emergency response capability through enhanced personnel utilization.

Puget Sound Energy (PSE) actions:

PSE accepted KEMA's recommendations.

KEMA highlighted the value of on-going training initiatives, particularly in the area of damage assessment. KEMA noted the importance of knowledge transfer in anticipation of future retirements. KEMA also acknowledged the success of the PSE liaison role utilized at the King County Emergency Coordination Center during the December 2006 windstorm and recommended that PSE apply this model to other jurisdictions.

During the period June through October 2007, 667 of PSE's 2,400 employees were provided emergency response assignments for storm activations (see Exhibit 4.4.1-A for sample of 2007 assignment letter to employees). Employees assigned to the following roles were offered opportunities to participate in training or storm planning orientations: (those assigned "damage assessor" as their primary role were required to participate in training)

- Damage Assessors
- Contract Crew Coordinators
- Drivers
- 911 Call Takers
- CLX Specialists
- Lodging Coordinators

- Emergency Operations Center (EOC) Team Members
- Back-up Dispatchers
- EOC Liaisons

A total of 498 PSE employees participated in training or storm planning orientations, representing 75% of those with 2007-08 emergency response assignments. PSE is following up with the 25% who did not participate to ensure their understanding of new processes in place for the 2007-08 storm season. This is done through one-on-one meetings or presentations at staff meetings.

Ninety percent (87 of 96) of the assigned damage assessors participated in the required Damage Assessment training. PSE's emergency planning manager is following up with 9 individuals who did not participate in 2007 to determine what training is needed for them or whether they should remain assigned to damage assessment. The follow-up will be completed by year-end 2007.

For comparison, in 2006, an estimated 550 employees received emergency response assignments; however only 223 (40%) participated in training.

PSE maintains an "emergency response" assignment database which includes employee name, title, work location, home city, contact numbers (home, work, cell), emergency response assignment and assignment location if applicable. This database is updated annually with new hires, job changes, terminations, and contact information.

Personnel with roles in operating bases and the EOC participated in a 1.5 hour orientation on storm plan processes for the 2007-08 year. Those in attendance at the operating base orientations included Potelco operations base managers, storm board coordinators, and damage assessment coordinators, PSE first response supervisors and dispatchers. Attending the EOC orientations included those assigned as EOC Directors, EOC Managers, CLX Data Specialists, Administrative Support, 911 Call Takers, EMS Analysts, Media Liaisons, Major Account Representatives, and Resource Coordinators. A total of 88 employees participated in the EOC orientations of the 102 individuals assigned to those roles, (Exhibit 4.4.1-B1 and B2). All but four of the team members on duty every fifth week attended. The five who missed the orientations will be followed up with individually by year end 2007. Some of these same individuals participated in a mock storm exercise held September 5, 2007.

Training and orientation as well as a storm/emergency drill will be repeated annually for those assigned emergency response roles. It is PSE's goal to have 100% participation in storm training or orientations in 2008 by providing a training schedule with multiple options for participation, including several make-up sessions.

On October 3, 2007, 46 PSE and Potelco operations leadership personnel participated in a 3-hour discussion on KEMA recommendations and actions taken by PSE in preparation for the 2007-08 storm season. The meeting began with a presentation by the National Weather Service on the winter forecast. Participants in the meeting included PSE and Potelco vice presidents and directors, Potelco operations managers, PSE electric first response manager and supervisors, system operations manager and supervisors,

corporate communications managers, customer access center director, and EOC directors and managers. Two consultants from KEMA were also present in the session. The meeting included a discussion of leadership and management expectations, roles and responsibilities, and expected outcomes for the storm season (see Exhibit 4.4.1-C).

PSE developed and incorporated into the 2007-08 plans a new emergency response role titled "EOC Liaison." Employees assigned as EOC liaisons will report to the state or county emergency operations centers on request of the jurisdiction, and will act as the PSE liaison during the emergency event. This was modeled after the King County EOC/PSE liaison role instituted during the December 2006 windstorm (Exhibit 4.4.1-D).

PSE hosted "pre-winter storm" meetings with seven county emergency management agencies. Topics included information on lessons learned from the December windstorm, actions taken following some of the KEMA recommendations and the Governor's after action review, internal debriefs, and customer feedback. Meetings were held in Whatcom, Skagit, Island, King, Pierce, Thurston and Kitsap Counties during September and October 2007.

PSE also held several community meetings with city councils and service clubs to discuss storm preparedness.

Finally, to assure knowledge transfer in anticipation of employee retirements over the next decade, PSE is teaming less experienced and tenured engineering personnel with more experienced damage assessors and contract crew coordinators as their drivers. Prior to storm season, a team of PSE and Potelco operations and engineering managers review and update the lists of employees assigned to these roles and identify those with extensive experience in storm response, and those with less experience. This categorization is based on an employee's tenure with PSE and/or Potelco, operations (line) field experience, and storm experience. During an event, when an operating base requests additional teams of damage assessors or crew coordinators from the PSE EOC, resource coordinators work from the lists previously established.

PSE and Potelco have identified 2-3 individuals with the skills and experience required for each of the emergency response assignments at the operating bases, providing depth and opportunity for training and experience. PSE and Potelco will also augment less experienced storm base management personnel with those with extended experience at each location.

EMERGENCY RESTORATION – IMMINENT EVENT PLAN

5.4 RECOMMENDATIONS

5.4.1 Develop a storm categorization methodology and tailor aspects of the Company Emergency Response Plan (CERP) to the various levels of storms.

PSE actions:
PSE accepted KEMA's recommendation.

KEMA observed that PSE did not utilize storm categories to develop emergency response plans. Using industry leading practices, KEMA noted that PSE's Corporate Emergency Response Plan (CERP) worked well for small and mid-sized storms, but was overwhelmed by the severity of the December 14 event. KEMA recommended the creation of storm categories, as well as processes to establish general restoration times using past storm data and historical knowledge.

In response to this recommendation, PSE developed and implemented the emergency event levels shown below (to be used for both electric and natural gas events) (Exhibit 5.4.1-A):

Levels	Electric Criteria	Gas Criteria	Level of Response
Level 0 - Normal	Nominal conditions across system	Nominal conditions across system	Normal daily response activity.
Level 1 - Regional	Event localized to individual geographic areas; resources within region adequate for response.	Localized event managed with regional resources.	Operations base(s) open; coordination with system operations or gas control. Gas Planning Strategy Center open for gas emergencies.
Level 2 - Significant	Multiple regions affected; requires resources from other PSE regions and/or outside PSE service territory.	Multiple regions affected; requires resources to be allocated to other PSE regions.	EOC open; multiple operating bases and may activate local area coordination. Employees with emergency response assignments mobilized.
Level 3 - Major	Most or all regions affected; maximum level response required; need extensive resources from outside area.	Most or all regions affected; may request operator qualified resources from outside PSE.	EOC open; most or all operating bases open; external logistics support may be employed; full corporate response to support restoration efforts.

The CERP will incorporate the three emergency event levels and will scale response activities accordingly. The CERP plan update is expected to be completed by year-end 2007.

Departments such as Operations, Customer Service and Corporate Communications are already using the above matrix to drive departmental specific response actions. Example follows for Operations:

Levels	Operations Actions
Level 0 - Normal	Normal operations.
Level 1 – Regional	EOC not opened. Internal resources utilized. Some use of employees with ER assignments.
Level 2 – Significant	EOC opened. Additional contractor resources needed; some from bordering states. Moderate to extensive use of employees with ER assignments. Windshield assessment utilized. Complete assessment within 24-36 hrs. Local Area Coordination possible.
Level 3 – Major	EOC opened. Resources obtained from outside of region. Full utilization of employees with ER assignments. Local area coordination implemented. Windshield assessment utilized; complete assessment within 48-72 hrs.

EMERGENCY RESTORATION – EVENT ASSESSMENT

6.4 RECOMMENDATIONS

6.4.1 Enhance the damage assessment capability and process to provide better and faster estimates of restoration times and resource requirements.

PSE actions:
PSE accepted KEMA's recommendation.

KEMA pointed out in their report that PSE's assessment process could be better supported by acquiring technology and by increasing the number of trained damage assessors.

PSE sees damage assessment and technology as separate recommendations. For actions taken by PSE related to technology in this context, refer to 10.4.3.

PSE increased the number of damage assessors from 79 in 2006 to 179 in 2007. PSE has a total of 96 employees with "Damage Assessor" as their primary role in storm response and another 83 employees with damage assessment as their secondary role. Sign in rosters for the damage assessment training reflect 193 participated in training, indicating that some employees who have other emergency response assignments also participated, even though this was not their primary or secondary emergency response role.

PSE and Potelco operations and engineering management identified employees in both organizations with the skills and experience required to be qualified damage assessors (DAs). Those with more experience and skills were identified as "A" DAs. These are employees who work with the electrical system in a technical manner on a daily basis. Those with less experience were identified as "B" DAs. PSE and Potelco team an A and B

member for storm response. This will enable PSE to provide additional experience and develop the skill set for the "B" DAs to prepare them to be our future "A" team DAs. PSE DAs total 179 and Potelco DAs total 38. Of those totals, there are 115 "A" and 102 "B" assessors identified at PSE and Potelco combined.

PSE "A" and "B" DAs were required to participate in a four-hour training program that was significantly enhanced from previous years (Exhibit 6.4.1-A). The training added skills testing and practical experience in the classroom developed by a team of standards employees well skilled in damage assessment, line construction standards, safety, etc. Training also included basic safety, materials identification, navigating circuit and Thomas Brothers maps to pinpoint locations of system damage, and practice completing new DA forms to be used in storm response. The forms completed by the DAs include estimated manpower requirements and provide detailed damage descriptions for the operating base "Damage Assessment Coordinator" to use in preparing crew assignments.

PSE held seven regional "Storm Base Orientations" with Potelco and PSE employees with emergency response roles in the operating bases. At these orientations, process changes for storm response were reviewed in detail, including the commitment to have a "windshield" assessment of damage across the system within 24 hours or less; and general area restoration information within 48-72 hours of the event, depending on the severity of the emergency event (same as Exhibit for 4.4.1-B1).

This new process was tested in the first storm of the 2007-08 season on October 18, 2007. PSE was able to assess system damage, communicate estimated restoration times, and restore service in impacted areas in less than 24 hours.

KEMA was retained by PSE through year-end 2007 to assist in developing a damage assessment strategy based on historical data (system damage, weather, restoration times, etc.) to further enhance our ability to provide early restoration estimates. Any additional improvements resulting from this work will be implemented during the 2008-09 storm season. The internal PSE team working with KEMA on this strategy is examining leading practices in the industry in modeling storm damage and corresponding restoration time estimates.

EMERGENCY RESTORATION – EXECUTION

7.4 RECOMMENDATIONS

7.4.1 Institute consistent accountability for executing the storm plan.

PSE actions:
PSE believes that the appropriate level of accountability currently exists and that no changes in contracts or operating base management processes are necessary at this time. PSE acknowledges the need for ongoing reinforcement of leadership expectations and role clarification for both PSE and Potelco personnel. This will be accomplished through annual storm plan orientations, event debriefings and training efforts as described in 4.4.1 and 6.5.1.

In our discussions with KEMA, the strong role played by our service provider, Potelco, in emergency restoration and plan execution was acknowledged. KEMA noted in their interviews with PSE and Potelco operations management that certain parties viewed the CERP as bureaucratic. As noted in 6.4.1, PSE held "Storm Base Orientation" meetings in all regions with Potelco and PSE employees with operating base emergency response roles, and also held three EOC orientations for EOC team members. Expectations were communicated and roles and responsibilities were clarified as documented in the existing CERP (Exhibits 7.4.1-A and B).

7.4.2 Formalize local area coordination and transmission restoration priority activities.

PSE actions:
PSE accepted KEMA's recommendation.

KEMA recommended that PSE formalize the establishment of local area coordination sites. This proved to be an effective operating model for restoration and provided a community presence during the December 2006 windstorm. In addition, KEMA found that PSE's initiation of a transmission restoration team to coordinate transmission and substation outages was extremely effective and should be considered an option whenever transmission lines sustain significant damage.

While PSE has utilized the model of establishing "mini" storm bases or "local area coordination sites" in the past several years, formalization of this process is appropriate. PSE developed a Local Area Coordination (LAC) Plan document dated October 10, 2007 (see Exhibit 7.4.2-A) that has been incorporated into operating base and EOC resource materials. The document outlines the role of the operating base and EOC in considering when and where to open LAC sites, site staffing plans and role descriptions and includes appendices with lists of pre-identified sites, staffing, and logistics checklists.

System Operations developed, in support of the LAC Plan, Local Area Coordination Clearance Procedures (Exhibit 7.4.2-B). These procedures will assist in reducing the

radio and phone traffic into System Operations causing delays for line crews waiting for switching and clearance orders.

PSE documented the establishment of the Transmission Restoration Team. The plan document (see Exhibit 7.4.2-C) formalizes a process to centralize and prioritize transmission restoration when major damage of PSE's transmission system has occurred. This plan covers the restoration of PSE's 115kV and 230kV high voltage transmission lines.

EMERGENCY RESTORATION – EXTERNAL COMMUNICATIONS

8.4 RECOMMENDATIONS

8.4.1 Create an integrated corporate and local communication strategy that is scalable to storm severity.

PSE actions:
PSE accepted KEMA's recommendation.

Customers and the public, in general, expect Puget Sound Energy to inform them when a power outage or natural gas emergency occurs. Delivering timely, accurate and consistent information is key to meeting customer and community expectations.

Regardless of the level of the storm event, communication with customers and the media goes 'live' each day with even the smallest events. On a day-to-day basis, the Corporate Communications, Customer Services and the Operations departments collaborate on external messages prior to issuing or posting information about disruption of electric or natural gas service.

This tag-team approach ensures accuracy and consistency and accuracy of information provided to customers by way of various communications channels, including:

- A brief recorded message about the disrupted service all customers hear upon calling PSE
- Reports to the news media
- Key messages PSE's government and community relations managers provide local jurisdictions and emergency management agencies
- Web information posted to www.PSE.com, if the disruption of electric or natural gas service affects a significant number of customers (e.g., a Level 2 "Significant" event) (Exhibit 8.4.1-A)

KEMA's discussions with PSE focused on a communications strategy that scales to various levels of storm response and the need for different messages and delivery across the service territory.

PSE's Corporate Communications department manages a communication process scaleable to the three storm event levels (referenced in 5.4.1 above).

Based on weather forecasts predicting a wind storm at least 24 to 48 hours prior to reaching PSE's service territory, PSE's Corporate Communications team collaborates with the Operations and Customer Services teams on development of messages about PSE's readiness to respond to possible damage caused by the weather system, and tips for citizens. These messages, through a news release and/or interviews with news reporters are delivered to the media and key government and social service agencies (Exhibit 8.4.1-B). In the case of a predicted major wind storm, PSE collaborates with the National Weather Service and local utilities on the development of the messages to ensure consistency throughout Western Washington (Exhibit 8.4.1-C and D).

Once the storm hits, PSE's process is as follows:

Level 1

1. Designated Corporate Communications team member (hereinafter "team member") gathers information from the utility's Operations team about the extent of disrupted service and estimated restoration times and reviews intended message to be provided to customers via Customer Services, the media and local community outreach.
2. Team member develops message and provides to the Customer Service (Access Center) 24-hour point desk or customer communications program manager for recording on phone line.
3. Team member delivers the same message to the media and the local Government and Community Relations team members in areas affected by the event. As the utility's Operations team (primarily the System Manager) provides the Corporate Communications team member with updates about the restoration effort, the team member goes through steps 1-3 to ensure timely and consistent distribution of new information.

Level 2 and Level 3

1. At least 24 hours prior to the prediction of a significant weather system reaching PSE's service territory, and in response to an employee alert issued by Operations, the Corporate Communications, Operations, Customer Services and Government and Community Relations teams collaborate on 'readiness' messages to provide customers, the media, communities, key agencies, and others, and to post on PSE.com in advance of possible service disruption.
2. Operations notifies Corporate Communications about opening of regional storm operating bases as well as the PSE Emergency Operations Center (EOC). A Corporate Communications team member reports to the EOC (hereinafter EOC communications representative) to develop corporate-wide information and messages about the extent of the damage to the energy system, estimated number of customers whose service is disrupted and process for estimating time of restoration.
3. Approximately every four hours, the EOC holds a conference call for updated reports from the field, Customer Access Center, Government and Community Relations and Corporate Communications representatives. Immediately after the conference call, these members stay on the line to develop consistent messages.

Based on information from the conference call, the EOC communications representative develops an updated message and reviews it with the Director on-duty in the EOC. The updated message is distributed companywide and used for:

- Updating the recorded phone message for customers
- Communicating to appropriate local and state agencies
- Reporting to the news media every four hours timed to radio and television broadcast times (media advisories distributed on wire services and/or phone contact, with first call made to the Associated Press) 5 a.m., 9 a.m., 1 p.m., 5 p.m., 9 p.m., 1 a.m., and in response to inquiries on the company's 24-hour media line, which is picked up live during storms and regular business hours and alerts a news representative who responds immediately.
- Posting to "Service Alert" on PSE.com home page, which includes an updated outage map

4. In the event a small number of power outages still exist in a specific geographical region when the EOC closes, the Corporate Communications team continues to collaborate with the Operations, Customer Services and Government and Community Relations team members on development and distribution of the message (as listed in Step 3).

EMERGENCY RESTORATION – CUSTOMER SERVICE

9.4 RECOMMENDATIONS

9.4.1 Formalize a customer escalated call process.

PSE actions:
PSE accepted KEMA's recommendation.

PSE formalized the process for managing escalated calls. A "communications lead" role in each operating base is being developed. The position will serve as a central point of contact for specific customer information. The employees serving as operation base communication leads will be individuals with past storm room experience, and possess the skills to find the information for specific customers without disrupting operations management who are focused on restoration. PSE will have the list of qualified employees identified for this role and orientation completed by the 2008-09 storm season. PSE will, however, fill the role on an ad hoc basis for storms in this season as needed.

Logistics to support the process include the establishment of the Bothell Emergency Center (BEC), and the identification of qualified staff for PSE corporate headquarters. Officers of PSE have been provided emergency response roles for "Major" events, including a group of officers identified to support escalated calls. The matrix below summarizes the actions of Customer Service, Corporate Communications, Government and Community Relations for handling escalated calls (Exhibit 9.4.1-A):

Levels	Electric Criteria	Level of Response	Customer Service, Corporate Communications, Community and Government Relations Actions
Level 0 - Normal	Nominal conditions across system Event localized to individual geographic areas; resources within region adequate for response.	Normal daily response activity.	Areas work with System Operations leadership to manage customer issues or needs.
Level 1 - Regional	Multiple regions affected; requires resources from other PSE regions and/or outside PSE service territory.	Operations base(s) open; coordination with system operations or gas control. Gas Planning Strategy Center open for gas emergencies.	Operating bases will assign a "communications lead" as required to be a central point of contact for customer or community information. These individuals have past storm room experience, and the ability to find the information without disturbing storm base operations management who are focused on restoration. Logistics to support the process include the establishment of the Bothell Emergency Center (PSE's Call Center) with a formal escalation process and specifically trained personnel on point to manage customer calls, and the identification of qualified staff for PSE corporate headquarters. PSE's major and business account customer representatives work out of the EOC and gather information from System Operations.
Level 2 - Significant	Most or all regions affected; maximum level response required; need extensive resources from outside area.	EOC open; multiple operating bases and may activate local area coordination. Employees with emergency response assignments mobilized.	(Same as above)
Level 3 - Major	Nominal conditions across system	EOC open; most or all operating bases open; external logistics support may be employed; full corporate response to support restoration efforts.	Operating bases will assign a "communications lead" as required to be a central point of contact for customer or community information. Depending on the volume of escalation in a major event, Base Operations may provide a point person in the Call Center to assist with information gathering. Officers of PSE have been provided emergency response roles for "major" events, including a group identified to support escalated calls at the Call Center. PSE's Industrial, major business customer and school/hospitals account representatives work out of the EOC and gather information from System Operations.

9.4.2 Use local carrier phone network in front of CLX/IVRU to enhance call-taking capacity and capabilities.

PSE actions:
PSE accepted KEMA's recommendation in concept with implementation in two phases.

Phase I will be implemented for emergency events when community messaging is necessary. The plan is to use Qwest's (local carrier) EZ Route VRU in conjunction with PSE's VRU to overflow callers to a recorded message with information specific to their community, possibly using zip codes to channel information. If requested, customers will have the opportunity to be re-routed back to PSE if they wish to speak to a live representative. A requirements document is in the process of being developed and the goal for implementation of Phase I is end of January 2008.

Phase II is more complicated as it requires data interface and integration between CLX (PSE's customer information system) and Qwest to allow customers calling into the Qwest system to be recognized by their phone number. Requirements gathering, cost/benefit analysis and a project scope will commence in 2008.

EMERGENCY RESTORATION – INFORMATION SYSTEMS AND PROCESSES

10.4 RECOMMENDATIONS

10.4.1 Establish enterprise-level technology, data and integration architecture for outage management related processes.

PSE actions:
PSE is considering KEMA's recommendation.

KEMA found that while PSE's information systems provide adequate outage response functionality and performance for typical storms, those systems were overwhelmed in the December 2006 event by an extreme volume of data. Additionally, manual data input could not maintain pace, resulting in PSE's information systems being inadequate to support the level of outage response required. When comparing PSE's information systems to those used by leading practice organizations, KEMA observed that PSE's systems for outage response are limited in functionality and heavily reliant upon on manual operations.

KEMA noted that that PSE does not utilize a dedicated Outage Management System (OMS) or a system connectivity model – usually contained within in a Geographic Information System (GIS). Additionally, integration between PSE's current outage response tool, ConsumerLinX (CLX) and several external systems, including Advanced Metering Infrastructure (AMI), Energy Management System (EMS) and Distribution Data Display (DDD) is limited.

Leveraging the results of studies completed by KEMA for its after action review, PSE has contracted with KEMA to further define what a new, enterprise-level architecture for integrating technology and data for outage management might require and cost. The roadmap includes defining a new system connectivity model, to be housed in a Geographic Information System (GIS), which would serve as the core for an advanced Outage Management System (OMS). The cost/benefit analysis is expected to be completed by first quarter 2008. For PSE's 21,000 distribution mile service territory, cost may be significantly higher than that for a utility with fewer infrastructure components. PSE will make its decision on cost, benefits and value-added functionality in emergency response and restoration.

10.4.2 Develop end-to-end information and business process flows for outage management and emergency restoration processes.
And
10.4.3 Enhance existing technology and systems to close functionality gaps with the strategy of migrating them toward the final architecture.

PSE actions:
PSE partially accepted KEMA's recommendations. Further study is required to evaluate the OMS/GIS solution.

KEMA suggested that PSE map outage management and emergency restoration process flows. Mapping process flows will allow PSE to identify key functionality that should be migrated from existing outage response applications to OMS/GIS systems and will support enhancing current state processes to take advantage of new capabilities realized by implementing these new systems.

Process mapping will be conducted as a preliminary project step if the OMS/GIS cost/benefit analysis proves beneficial to PSE and its customers.

KEMA noted the functional limitations PSE's systems have in comparison to leading practice outage management systems. They included the lack of integration of SCADA/EMS and CLX systems, the need for additional SCADA coverage of distribution circuits and the need to expand distribution automation capabilities. KEMA reviewed PSE's automated metering information (AMI) system and recommended PSE determine if the functionality and gaps of that system can be bridged.

Enhanced SCADA integration (with OMS) will be considered as a part of the cost/benefit analysis that will be completed by first quarter of 2008. In the meantime, PSE continues to evaluate further integration of data sources within existing systems (SCADA/AMR Dashboard/CLX).

SCADA: All of PSE's transmission substations (59 facilities) currently have SCADA. Of the 281 distribution substations in PSE's system, 224 have SCADA. Thirty-two of the remaining 57 substations currently without SCADA will have SCADA installed by year end 2010. PSE has projects scheduled from 2007-2015 to upgrade SCADA in 77 distribution

substation facilities. All new substations are installed with SCADA. The projects, when completed, would ensure all but 25 PSE distribution substations will have SCADA by 2015. (The remaining 25 stations are customer leased, submarine stations or are being retired over the next several years.)

Distribution Automation: In the first quarter of 2007 PSE began exploring options for implementing some level of Distribution Automation within PSE's electric distribution system. To gain additional information PSE implemented a Distribution Automation pilot in June 2007. The pilot included installing the appropriate communications equipment to prove communication and to evaluate data elements and control possibilities with a recloser and voltage regulator on a distribution circuit. Results from the pilot should be available in the first quarter 2008. In addition, PSE has planned additional Distribution Automation pilots to further evaluate and explore Distribution Automation over the next five years.

AMI-Cellnet: As recommended, PSE reviewed the functionality and reliability gaps of the Cellnet AMI system for outage reporting and verification. PSE determined that outage reporting cannot be dramatically improved without substantial changes to the supporting radio frequency infrastructure. Negotiations with Cellnet will be initiated in the first six months of 2008. However, outage verification functionality can be improved by taking advantage of a new messaging service being implemented by Cellnet. Once corresponding changes are made to the Meter Data Warehouse, expected to be completed by year-end 2008, PSE will be able to trigger an AMR outage restoration verification shortly after power is restored to a circuit and receive restoration results for customers with AMR metering being served by the circuit within minutes.

Other: On a pilot basis, PSE is testing a handheld electronic Personal Data Assistant (PDA) based device that would allow gathering and transmitting damage assessment information electronically to operating bases. PSE anticipates being able to begin field trials with 10 PDA devices in Pierce and North King operating bases by year-end 2007.

10.4.4 Deploy new systems to close the functionality gaps and build out the outage management architecture.

PSE actions:
PSE is considering KEMA's recommendation.

KEMA noted functionality gaps when comparing PSE's outage response systems to similar systems utilized by benchmark utilities. KEMA observed that PSE's existing outage response tool in ConsumerLinX (CLX) associates customers to a substation circuit. This works well for routine or simple outages where there is a single point of damage on the circuit; however, CLX is quickly overwhelmed when there are multiple points of damage on the same circuit. Additionally, the simplicity of the customer/circuit data model within CLX severely limits the ability to isolate the specific portion of the electric system that is associated to the particular outage. The inability to effectively isolate multiple outages from one/another on the same circuit has cascading impacts: it limits the ability to align damage assessment results to those isolated outages; limits

the ability to track resources assigned to the outage, and importantly – limits the ability to provide relevant or individualized outage restoration information to customers.

Further study is underway to evaluate the OMS/GIS solution and develop an integration strategy to address the functionality gaps identified in 10.4.4.

10.4.5 Develop a phased implementation plan for outage management related information system and processes.

PSE actions:
PSE will consider KEMA's recommendation after the definition, requirements and cost/benefit implications are completed.

SUPPORT SERVICES

11.4 RECOMMENDATIONS

11.4.1 Refine the ESERSC (Emergency/Storm Event Response Services Contract) **contract to add the planning, training, communication and evaluation roles necessary to plan for and implement major restoration efforts.**

PSE actions:
PSE did not accept KEMA's recommendation.

PSE did not implement KEMA's recommendation to make changes to the Emergency/Storm Event Response Services Contract (ESERSC, storm contract) with Potelco. However, PSE conducted a thorough review of the current contract language and determined that the roles and responsibilities are appropriately defined. PSE also reviewed documentation of operating base management processes and the CERP and determined that these documents were sufficient. Existing language in the ESERSC includes the following:

- "Service Provider shall be responsible for coordinating damage assessment through their allocation of Service Provider damage assessment teams and requesting assistance from PSE for circuit patrol and other damage assessment as required".
- "Service Provider shall be responsible for mobilizing and assigning Service Provider's resources necessary or appropriate to provide Emergency/Storm Event Response Services including, without limitation, all scheduling necessary to meet PSE priorities, customer commitments, governing agency requirements and contract requirements. Both the PSE Emergency Operations Center and Service Provider shall be responsible for mobilizing such additional resources as are necessary to supplement Service Provider's work force during an Emergency/Storm Event, including, without limitation, flagging personnel, tree

crews and additional line crews, subject to PSE review and approval. Service Provider shall have management direction and control of these Outside Resources and shall assign these Outside Resources in response to PSE priority designations."

- "Service Provider will maintain and operate Storm Boards at pre-designated locations during an Emergency/Storm Event so as to maximize restoration of service to PSE customers as expeditiously as possible and consistent with the PSE Corporate Emergency Response Plan and the Storm Management Plan."

The KEMA conclusion in section 11.3.5 of their report to develop operational metrics for storm events was based on the fact that the contract (ESERSC) referred to an Appendix for Operational Metrics that had not yet been developed. As noted above, PSE believes the current contract language appropriately defines roles and responsibilities without the "to be developed" operational metrics. In addition, PSE's Master Services Agreement with Quanta Services, Inc. (the parent company of Potelco) includes forty (40) operational performance metrics. These metrics cover all services provided by Potelco, including response and restoration. As stated in PSE's Master Services Agreement "Emergency/Storm Event Response performed by Service Provider under this contract shall take precedence over all other work...for PSE or third parties." Given this contract language, PSE does not believe that specific storm event operational metrics are meaningful. PSE is working on amending the ESERSC to eliminate reference to operational metrics specific to storms.

For the 2007 training requirements, PSE established a work order for Potelco employees to charge training time and authorized Potelco to send individuals to this training, if the individuals were not being briefed in some other fashion.

KEMA recommended that PSE clarify and define the communications required between Potelco and the EOC. PSE has implemented an "operations conference call" (Exhibit 11.4.1-A) to enhance information on resource requirements and estimated restoration times. These calls are initiated by the EOC and operating base management from Potelco. At this time PSE feels that these calls are within the scope of the work defined within the ESERSC and do not need to be explicitly identified within the contract.

MATERIALS MANAGEMENT AND LOGISTICS

12.4 RECOMMENDATIONS

12.4.1 Enhance logistics to better support the number of crews supporting the restoration.

PSE actions:
PSE accepted KEMA's recommendation.

KEMA concluded that while PSE's material management practices and functions performed well during the event, PSE's processes were not scaleable to an event of the magnitude of the December 2006 windstorm. They recognized the effort of PSE's EOC and others to create ad hoc practices to respond to the event and recommended that logistics support be enhanced.

PSE is in the process of selecting a 'logistics' vendor to support PSE's needs for crew staging areas and/or establishment of local area coordination sites. Contracts are anticipated to be signed by year-end 2007 with one or two vendors that will provide logistics support such as: mobile offices, walled tents, generators, hot and cold meal provisions, sanitation facilities, fuel, etc.

PSE has also established the new role of "Lodging Coordinator" as an emergency response assignment (Exhibit 12.4.1-A). Forty-three (43) employees have been assigned this role and 40 of them participated in training in October. These employees are responsible for coordinating the lodging needs for all emergency response personnel. PSE has direct bill arrangements with dozens of hotels throughout its service territory, with information available to the lodging coordinators about past experience and contact information. Since 2004/2005, PSE has increased the number of hotels on its directory by 138 percent, increasing from 51 to 119 by October 2007.

12.4.2 Document material management policies and processes created to support storm levels.

PSE actions:
PSE accepted KEMA's recommendations.

KEMA noted a number of recommendations, each *(in italics)* addressed below.

Document the material requirements procured during the December 14-15 storm restoration effort;

> The recommended action has been completed. Materials procured during the December 14-15, 2006 storm were tracked, analyzed post-storm and documented. Documentation for major storms since the 1993 Inauguration Day Storm has been retained and is considered when establishing storm materials inventory target levels.

Document the new processes created to source, procure and ship materials on a short lead-time basis;

> Pre-December 14-15, 2006 storm sourcing and shipping procedures proved to be highly effective. Nonetheless, post-storm debriefing sessions were held with major storm suppliers (pole-line hardware, materials, transformers, cable/wire, etc.) and our partnered transport logistics provider with a goal to identify improvement opportunities. New processes have been incorporated into the Purchasing/Materials Management's Emergency Manual and include use of an

enhanced materials order form aimed to expedite placement of orders by ensuring all required data has been provided and improved order tracking (Exhibit 12.4.2-A). Ground transport deliveries were timely and met storm materials delivery needs, as did delivery of large quantities of materials via airfreight. However, it is recognized procedures should include an advance acknowledgement of air transportation needs, even when unlikely; thereby reducing the risk of delay in air transport. Further, Purchasing/Materials Management recognize, through shared experience, that emergencies have unique characteristics and as such future emergencies could prevent the landing of air transport in the region (heavy snow, earthquake).

Review the additional stores requirements for the anticipated storm season and balance against the usage rate during the season. PSE should consider increasing stock levels to cover the first eight to ten days of a major restoration effort;

Stores requirements underwent an after-event review. Traditionally, the inventory of storm materials is built up to targets starting in August in advance of storm season, considered to be October to April. From May through July storm inventory is allowed to decrease to desired non-storm season levels. However, as a result of the December 14-15 storm and sustained longer lead-times in the marketplace, emergency materials will be sustained at target levels year round. The change will provide protection against an unexpected storm or emergency outside of "normal" storm season and in the event there are material supply challenges during the August-September storm inventory build-up period. In addition, storm materials overall will be maintained at a higher level which will extend the time during restoration efforts where materials can be supplied out of existing stock.

It is important to note PSE has been successful in sharing the carrying cost of storm materials with its major suppliers, alleviating the need for the company to hold excessive levels of inventory for storm restoration and normal operations. The major suppliers are strategically located. For example, a major distribution transformer supplier maintains a large inventory of distribution transformers of various sizes on consignment at PSE's central warehouse. Another transformer supplier is based within an hour of PSE's service territory. The company's primary major pole-line hardware and materials supplier maintains a satellite warehouse in Auburn, Washington dedicated primarily to PSE. PSE's long-term pole supplier locates its primary manufacturing plant within the PSE service territory and has passed its annual audit of emergency storm stock this past summer. The company's primary wire supplier has a satellite warehouse in Seattle. Three major material suppliers are located in Portland, Oregon. Further, manufacture of PSE's overhead repair wire is performed in Roseburg, Oregon. The company also has major stocking distributors and manufacturers of all storm materials and equipment out of state which protects against a major earthquake or disaster on the West Coast. The 24/7 contact information for each of these critical supply partners is maintained and updated on an annual basis in Purchasing/Materials Management's Emergency Manual.

Arrange for critical materials to be stored on site as vendor stock that can be released on short notice with email confirmation to purchase from PSE; and

PSE has a vendor managed transformer inventory arrangement at its central warehouse in Kent. The consignment transformer inventory can be drawn upon at any time. The company also has materials suppliers with satellite warehouses in PSE's service territory (i.e., Auburn, Seattle) which provided timely re-supplying during the 2006-2007 storm season. Further, PSE stipulates emergency storm stock requirements of its stocking distributor partners within its material contracts. An after-event action taken was a full audit of these requirements on PSE's (two) primary stocking distributors. Each passed this audit with 100 percent accurate and maintained storm stock at their warehouses within two hours of PSE's service territory.

Prearrange for expedited shipping to ensure availability of transport as well as best pricing.

PSE has pre-existing shipping arrangements with current suppliers and uses a transportation logistics provider, as needed, to procure transportation based on ability to deliver, timing and cost-effectiveness. This practice has been recognized by our suppliers as a best practice in relation to expedited and accurate emergency order fulfillments.

POST-EVENT REVIEW

13.4 RECOMMENDATIONS

13.4.1 Ensure the existing post-storm actions and recommendations are consistent with the leading practice model presented in this report.

PSE actions:
PSE accepted KEMA's recommendation.

KEMA recommended that PSE consolidate all ongoing actions and recommendations from internal storm debriefings, the Governor's After Action Review and customer feedback, prioritize them for implementation, and develop a master work plan with schedules, assignments, etc.

PSE has developed a master task list (see Exhibit 13.4.1-A) incorporating recommendations from PSE internal storm debriefs held during the weeks following the December 14-15 windstorm, the Governor's After Action Review recommendations pertinent to PSE, and customer focus group and survey input. The company formed the Emergency Event Management and Communication Team (EEMAC) to lead the efforts in implementing actions and processes based on the consolidated list of recommendations. EEMAC is a team of four operations managers lead by a project manager (currently the

Director Electric Operations). Each operations manager has an assigned focus area. The four areas of focus for implementing recommendations are as follows: Operations; Technology; System Hardening; and Customer Service and Communications.

Actions to be taken were categorized into what could be accomplished for the 2007-08 storm season, what may be accomplished by the 2008-09 storm season, and those that were longer-term initiatives (e.g., the study and potential implementation of an OMS/GIS system; system hardening, etc.).

INFRASTRUCTURE CONDITIONS

14.4 RECOMMENDATIONS

14.4.1 Enhance PSE's transmission vegetation management policy and standards for ROW width.

PSE actions:
PSE partially accepted KEMA's recommendation.

KEMA recognized that PSE and other utilities in our region face challenges in addressing wider rights of way (ROWs) and increased vegetation management programs due to political and social pressures. KEMA recommended that PSE work with other utilities in the region to change public perception to support improved reliability, consistent with NERC guidelines, as well as formalize a plan to broaden ROWs in particularly hard hit areas.

PSE continues to address the challenges in gaining wider ROWs, working with local jurisdictions across our service territory. PSE is working proactively with key stakeholders to develop and introduce legislative and regulatory solutions for vegetation management policy issues including:

- Creating healthier buffers when lands are converted for development.
- Hazardous trees outside existing ROWs that present risk to utility infrastructure.
- Ensuring vegetation within utility ROWs is compatible.

PSE has solicited a proposal from a consultant to evaluate PSE's existing practices for vegetation management along high voltage distribution lines, and to offer suggestions for improvements. (Exhibit 14.4.1-A: Abstract developed by consultant as sample of work.)

Additionally, PSE increased its vegetation management spending by $2 million, for a total expenditure of $12 million in 2007.

14.4.2 Aggressively develop and maintain cross country transmission access roads.

PSE actions:
PSE accepted KEMA's recommendation.

KEMA noted in certain cases poor accessibility to transmission system access roads created delays in transmission restoration. KEMA recommended we continue our efforts to catalogue all existing access roads and develop a comprehensive access road program for cross country transmission lines.

PSE recently initiated a project to consolidate information on access point locations, and transmission pole location information. This project will result in marking transmission poles at road crossings with the transmission line name to enhance helicopter patrols and damage assessment data gathering. PSE has allocated funds for ongoing work on the maintenance of access points and access along critical rights of way.

14.4.3 Evaluate hardening opportunities for both transmission and distribution.

PSE actions:
PSE accepted KEMA's recommendation.

KEMA recommended that we undertake a system hardening study to identify additional opportunities for under-grounding, as well as the use of different tower/pole designs in particularly hard hit areas.

PSE has identified a number of system enhancements that may improve the electric system's resilience to minor or major storm events. Enhancements considered include the following: design changes to reduce overhead electric line exposure to trees and windblown limbs; reviewing the type of fuses that are installed in the field; installing switches that will allow isolation of sections of line damaged for service restoration; strengthening selected transmission line structures to reduce damage due to trees; labeling more transmission structures for ease in identifying damaged circuits in a storm; and looking at opportunities for the use of "breakaway" devices that will prevent major damage to transmission structures when the lines are struck by trees.

Next steps include the development of relative costs for each of these opportunities, and identification of the number of locations where PSE may make these improvements. PSE expects to complete the evaluation phase of the work by first quarter 2008.

In the second quarter 2008 PSE will bring in a consultant to review these tactics and relative costs and to identify additional techniques with cost information that should be considered in the system planning process.

Exhibits Index

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4.4.1-B1:	Fall Operating Base Orientation Meeting Agenda and Materials
4.4.1-B2:	EOC Orientation Power Point Presentation
4.4.1-C:	PSE/Potelco Fall (October 3, 2007) Leadership Meeting Agenda and Materials
4.4.1-D:	PSE EOC Liaison Role Description
5.4.1-A :	Event Categories Chart
6.4.1-A :	Damage Assessor Required Training Session Notices
6.4.1-B:	Damage Assessor Training Power Point Presentation
7.4.1-A:	Storm Base Expectations for 2007-08 *(used as handout in Operating Base Orientations)*
7.4.1-B:	Cover and "Emergency Response Roles – Electric" Section of the Corporate Emergency Response Plan (CERP)
7.4.2-A:	Local Area Coordination Plan
7.4.2-B:	Local Area Coordination /Clearance Procedures
7.4.2-C:	Transmission Restoration Team Plan
8.4.1-A:	PSE.com Web Screen Prints from October 18 and November 12, 2007 Storms
8.4.1-B:	PSE Corporate Communications Windstorm Update Sample and News Clips from October 18 and November 12, 2007 Storms
8.4.1-C:	PSE Internal Email Dated November 11, 2007 re: High Wind Watch
8.4.1-D:	PSE EOC External Updates from October 18 and November 12 Storms
9.4.1-A:	Escalated Call Process Matrix
11.4.1-A:	Operations Conference Call Agenda
12.4.1-A:	Lodging Coordinator Role Description

Exhibits Index continued

15 May 2007

To: NAME, Mail Stop

From: Mark Wesolowski
Emergency Planning Manager

Re: 2007/2008 Emergency Response Assignment

Following one of the most significant storm seasons we've ever experienced, we're making preparations for the upcoming year. Below is your emergency response assignment for 2007/2008 as well as the contact information we have on file you. Please take a moment to review your assignment and verify the accuracy of your contact information.

Training or orientation may be ***required*** for your assignment. Additional information about training/ orientation will be provided once the training schedule has been determined. Damage assessor and crew coordinator training may start as soon as the last week of June and will be completed by the first week of August. All other training and orientations will take place in August/September.

Primary ER Assignment:	Assignment
Primary ER Location:	Location*
Role Description:	«Role_Description»
Secondary ER Assignment:	Assignment
Secondary ER Location:	*

* The nature of the emergency may necessitate working from other locations.

Your Contact Information

Home:	Number
Cellular:	«Cellular_Phone»
Number to call first:	Unknown

Should you have any questions regarding your assignment, or need to make corrections to your contact information, please contact Kathryn (Kathe) Conner at (81) 2847 or by e-mail.

If you haven't already done so, I encourage you to become personally prepared both at home and work. Preparedness information is available at web sites such as 3days3ways.org, Ready America (ready.gov) and, the American Red Cross (www.redcross.org).

AGENDA

Fall Base Orientation Meeting – PSE/Potelco

5 min	**Introductions**
5 min	**2007-08 Weather Outlook** *Wesolowski*
10 min	**Key Messages** *Zeller / Soetenga / Gregorius*
10 min	**Emergency Event Management and Communication Team Update** *Operations, Communications/Customer Service, System Hardening, Technology* *Wesolowski/Zeller*
30 min	**What's New for 2007-08** Wesolowski
15 min	**Expectations** Zeller/ Soetenga / Gregorius
15 min	**Questions???** **Adjourn**

Category	Focus	What's Changed or New?	Benefit	Who
Customer Communication	Operations Base Communications Narratives	Request area specific damage and restoration information from each operating base for use in media and customer messaging.	Improved customer messaging; reduced escalated calls.	**Base**
Interagency Coord	Utility Road Clearing Task Force	***In process (expected completion 11/30/07)***: formalizing plan for teaming qualified tree crews, Potelco, roads crews for clearing and making safe public roadways.	Coordinated and planned approach to clearing downed wire/trees. Improves road openings.	**Base**
Process Improvement	Early Storm Restoration Estimates	Developed process to deliver Regional storm restoration estimates within the first 24 hours of an event.	Enhances customer outage communications.	**Base**
Process Improvement	Training	Enhanced training to include skills testing; trained over 150 PSE and Potelco damage assessors.	Skilled, qualified emergency response personnel; increased numbers of trained personnel.	**Base**
Process Improvement	Damage Assessment Strategy	Windshield assessment within first 24 hours; with area specific assessment and restoration times in 48-72 hours.	Timely information to customers on event characterization; estimated restoration times by region or area early in response effort.	**Base**
Process Improvement	Local Area Coordination	Formalized process for establishing, sourcing and supporting local area coordination sites.	Streamlines process for staffing, sourcing and supporting logistics needs in a specific area. Provides a PSE community presence and expedites system restoration.	**Base**
Process Improvement	Lodging Coordination	New emergency response role defined and staffed.	Relieves EOC and Storm Base operations from lodging coordination.	**Base**
Process Improvement	Personnel Tracking	Potelco developed personnel tracking system for all event response personnel.	Improves resource management and documents for billing purposes.	**Base**
System Operability	ROW & Access Roads	Additional ROW clearing and access road work at multiple locations within King and Pierce Counties. Additional work planned in Kitsap County.	Allows more efficient travel along ROW and reduces assessment and restoration time.	**Base**
System Operability	Whidbey Base	Plan developed to open Whidbey Operating Base.	Presence on Island for customer service and may enhance management of restoration efforts.	**Base**

Category	Focus	What's Changed or New?	Benefit	Who
Tools/Equip	GPS	Purchased 200 GPS units to be stocked in Storm Bases for damage assessors, crew coordinators and/or foreign crews.	Improves assessment and response time.	**Base**
Tools/Equip	Storm Bags	New bags stocked and managed by materials management for Storm Bases.	Provides required tools for damage assessors and crew coordinators; streamlines process of restocking bags post event.	**Base**
Tools/Equip	Damage Assessment Hand Held	Piloting hand held computers for loading damage assessment information. Anticipate pilot in Pierce and North King for 2007-08 season.	Based on pilot, anticipate reduction in time to obtain quality damage assessment information from field.	**Base**
Customer Communication	Escalated Call Process	Designated employee at each operating base as point person for obtaining restoration information for use by CRM's, Major Accounts/BAS, escalated calls, etc.	Formalizes process for obtaining needed customer or restoration information from storm bases without burdening those directly involved in restoration.	**CAC**
Customer Communication	Customer Communications Program Manager	New position to coordinate communications between Corporate Communications and Call Center.	Improved and consistent customer messaging.	**CAC**
Customer Communication	Agents at Home	Agents at Home staffed to 30 (from 14 previously)	Improved customer service in early hours of event.	**CAC**
Process Improvement	Bothell Emergency Center	Created Call Center "EOC" for managing customer service staffing, etc.	Duty teams assigned to manage staffing and customer service levels.	**CAC**
Process Improvement	Helicopters, Flaggers	Added helicopter and flagging resources. Out of State flaggers exempted from WA State Certification	Added resources.	**EOC**
Customer Communication	Web Portal	***In process:*** development of a Web-based tool for non-call center personnel to process outage calls.	Reduces time and streamlines process to provide customer service.	**PSE**
Customer Communication	Customer Education	Major Accounts/Business Account Services educating customers on KEMA report, post-storm initiatives, etc.	Customers better educated on electric service and PSE's response and recovery activities.	**PSE**
Customer Communication	PSE.com	Service Alert link for simultaneous posting on PSE.com and PSE web (intranet); Outage map to be posed to PSE.com	Improved customer messaging.	**PSE**

Category	Focus	What's Changed or New?	Benefit	Who
Customer Communication	Customer Emergency Preparedness Card	Wallet card to be distributed with October bills to all customers.	Vehicle to message personal preparedness and easy access to PSE 1-888 number to report emergencies and other local agencies for assistance.	**PSE**
Interagency Coord	Memorandum of Understanding with State EMD	***In process (expected completion 11/15/07)*** documenting concept of operations between PSE, State EMD, WS DOT, WSP, CTED and UTC.	Documents PSE's role in providing State information on status of system and State's role in assisting PSE with HOV lane exemptions, expediting state border crossings for foreign crews, etc.	**PSE**
Interagency Coord	EOC Liaisons	New emergency response role defined and staffed for County and State EOC's.	Provides point of contact for interagency coordination during event.	**PSE**
Interagency Coord	County Pre Winter Storm Meetings	Meetings hosted by PSE in 7 counties with County emergency management, public works, and first responders.	Share contact information and PSE's plan for event response and restoration.	**PSE**
Process Improvement	Storm Levels	Levels 0-3 identified with varying response actions associated with each. 3 = major (e.g. December 2006 windstorm) ***(See attachment)***	Sets expectation for level of response; documented in Corporate Emergency Response Plan.	**PSE**
Process Improvement	Transmission Restoration Prioritization	Formalized process for activating the transmission restoration prioritization team; dedicated space and resources sited in ESO.	Streamlines process for siting, sourcing and establishing responsibilities for prioritizing transmission restoration.	**PSE**
Process Improvement	Logistics	RFP for selection of logistics vendor to support local area coordination sites and staging areas. (expect selection by end of October 2007)	One call for logistics support (mobile offices, tents, sanitation, water, food, heat, generation, etc.)	**PSE**
Process Improvement	Corporate Emergency Response Plan (Vol. I and II)	Adding storm level descriptions, checklists, additional detail for materials, and critical facility restoration priorities	Improved plan documents for use in event response.	**PSE**
System Operability	Vegetation Management	Additional vegetation management at areas of concern across the service territory.	Removes specific vegetation issues that could cause outages during storm events.	**PSE**

Category	Focus	What's Changed or New?	Benefit	Who
System Operability	System Hardening	Identifying opportunities to make the electric system more resilient to storm events, and improve ability to access the system so repairs can be performed when necessary. Areas of focus include ROW clearing, access roads, system hardening, and identification of exceptionally critical facilities.	Provides long range plan for infrastructure improvements.	PSE
Process Improvement	Enhanced Storm Base Handoff	Enhances existing storm base handoff process.	Enhances Regional storm base ability to quickly gain an understanding of system damage, resources in the field and resources needed.	SO
Process Improvement	911 Call Taking	Doubling capacity for "911" call taking in System Operations	Improves service for life/safety emergency response.	SO
System Operability	Self Protection Clearances	Developed new process for enhancing use of self-protection clearance procedures to include adding a designated Regional contact at system operations to manage only self-protection clearance calls.	Reduces bottleneck and congestion into System Operations from field for switching and clearances.	SO
System Operability	Local Area Coordination Clearance Procedures	Developed new process for enhancing use of local area coordination clearance procedures to include reduced use of I #'s and broader area clearances.	Reduces bottleneck and congestion into System Operations from field for switching and clearances.	SO
System Operability	System Operations Staffing	Developed a staffing plan that aligns field and system operations staffing levels during peak restoration periods and rest periods.	Reduces bottleneck and congestion into System Operations from field for switching and clearances.	SO
Tools/Equip	Radio /Channels/Frequencies	Added 2 additional channels; 1 in King; 1 in Whatcom County	Reduces bottleneck and congestion into System Operations from field for switching and clearances.	SO
Tools/Equip	System Operation Consoles	Increased number of workstations.	Reduces bottleneck and congestion into System Operations from field for switching and clearances.	SO
Tools/Equip	Business Account Services - Phone Line	Installed new "1-800" line for business account services. (In addition to existing line for Major Accounts)	Eases access to system supervisor and/or EOC for schools, hospitals, water/wastewater plants, etc. to obtain outage restoration information.	SO

PUGET SOUND ENERGY

EVENT CATEGORIES

Levels	Electric Criteria	Gas Criteria	Level of Response	Operations Actions
Level 0 - Normal	Nominal conditions across system	Nominal conditions across system	Normal daily response activity.	Normal operations.
Level 1 – Regional	Event localized to individual geographic areas; resources within region adequate for response.	Localized event managed with PSE regional resources.	Operations base(s) open; coordination with system operations or gas control. Gas Planning Strategy Center open for gas emergencies.	EOC not opened. Internal resources utilized. Some use of employees with ER assignments.
Level 2 – Significant	Multiple regions affected; requires resources from other PSE regions and/or outside PSE service territory.	Multiple PSE regions affected; requires resources to be allocated to other PSE regions.	EOC open; multiple operating bases and may activate local area coordination. Employees with emergency response assignments mobilized.	EOC opened. Additional contractor resources needed; some from bordering states. Moderate to extensive use of employees with ER assignments. Windshield assessment utilized. Complete assessment within 24-36 hrs. Local Area Coordination possible.
Level 3 – Major	Most or all regions affected; maximum level response required; need extensive resources from outside area.	Most or all PSE regions affected; may request operator qualified resources from outside PSE.	EOC open; most or all operating bases open; external logistics support may be employed; full corporate response to support restoration efforts.	EOC opened. Resources obtained from outside of region. Full utilization of employees with ER assignments. Local area coordination implemented. Windshield assessment utilized; complete assessment within 48-72hrs.

See Page 2 for Event Triggers and Criteria

EVENT TRIGGERS and CRITERIA

Levels	Declared by	When	Triggers	Criteria
Level 0 - Normal	System Supervisor	At event end, when returning to normal operations, as final Storm Declaration is issued.	All operating bases are deemed to be "closed" or returning to non-storm work.	
Level 1 – Regional	System Supervisor	Following storm forecast by National Weather Service or, when issuing Storm Declaration.	Operations base(s) opened for storm restoration work.	EOC is not open.
Level 2 – Significant	System Supervisor	Following severe storm forecast by National Weather Service or, when operating base(s) and the EOC are opened.	Several operating bases and the EOC are open. Additional crews are required from within northwest region.	EOC is open. Multi-day restoration. Resources obtained from WA/OR/CA/ ID/MT.
Level 3 – Major	System Supervisor	Following major storm forecast by National Weather Service or, most or all operating bases and the EOC are open.	Most or all operating bases and the EOC are open. Additional crews are required from beyond the northwest region. External logistics support required. Full corporate response is required to support restoration efforts.	EOC open. Extended restoration timeline. Resources obtained from beyond WA/OR/CA/ID/MT. Full utilization of employees with ER assignments.

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Storm Base Expectations for 2007-08

- "Own it"
- Storm Levels (1, 2, or 3) will be declared *(see attachment).*
- "Windshield" assessment in each region within 24 hours.
    - Goal: area specific estimated restoration times within 48-72 hours of event subsiding.
- Focus on critical facility restoration prioritization (lists in Volume II).
- Create restoration plan – document it & communicate it.
- Commitment to estimated restoration times communicated to customers.
- Operations conference calls 2X/day (suggested at shift changes):
    - EOC to establish after opening.
    - Participants to include EOC Director/Manager, Potelco base managers and PSE EFR supervisors.
    - Provide best available information & refine as new information available.
- Track resources (crews, assessors, servicemen, etc.)
- Establish local area coordination as needed to enhance restoration and customer communications.
- Open Whidbey Operating Base as a storm board as appropriate.
- Utilize escalated call process.

PUGET SOUND ENERGY
The Energy To Do Great Things

Emergency Operations Center
Orientation
2007-08 Storm Season

Agenda

- Introductions *(name and EOC role)*
- Mission and Measures of Success
- Facility Overview
- EOC "Opening"
- New for 2007-08 Season
- Resources
- Q & A

Mission:

Develop and implement a customer centered outage restoration process, scalable to any size emergency event.

Measures of Success 2007-08 Season:

- Customer outage restoration estimates are available and communicated.
- We commit to meeting all outage restoration times as communicated to our customers.
- All restoration times are communicated: General within 24 hours;
- Specific estimates for customers in all areas within 48-72 hours of event declaration.

EOC Facility Overview

- EOC Main Room
- EMS / Radio Room
- EOC Conference Room
- Kitchen
- Transmission Restoration Team
- Load Office
- System Operations
- 911 Call Takers

Opening the EOC-Aides

- EOC Manager/Director Packets
- Administrative Support *Quick Reference Guides*
- Volume II

Initial Actions

- Get status report from System Supervisor
- Open phones
- Send initial "EOC OPEN" Update
- Open CLX & run updates
- Set schedules for…
  - EOC 4-hour Updates (Internal and External)
  - Shift change
  - Operations Conference Calls (2 X's/day)
  - Communications/Customer Service Conference Calls (4 X's/day)
- Notify 2nd EOC shift personnel

Operations
Conference Call Agenda *(Rev. 10-5-07)*
SCHEDULE INITIATED BY EOC
(Calls tentatively scheduled at 06:30 and 14:30 (or close to shift changes at bases))

Subject	Responsibility	Est. Time
Weather update	EOC	1 min.
Storm Base Reports • # outages • Subs out • Transmission out • Estimated overall damage (% of area not yet assessed) • # crews working and on-site • # crews en route/time expected • Resources needed??? (damage assessment, CLX, tree line crews, flaggers, materials, etc.) • Restoration plan • Staffing plan: shift change (who and when)	Potelco Base Manager & EFR Supervisor	5 min/base
Storm Characterization – for customer communications	All	1 min.
Priority Issues	All	3 min.

Call bridge to be established for each call by Admin. Support

PUGET SOUND ENERGY

Corporate Communications/
Customer Service
Conference Call Agenda *(Rev. 10-5-07)*
SCHEDULE INITIATED BY EOC
(Calls tentatively scheduled at 10:00 am, 4:00 pm, 3:00 am & [illegible])

Overview	2 min.
Weather	1 min.
Base Highlights	3 min.
Access Center Highlights	3 min.
Community Highlights	3 min.
Media	3 min.
Special Priority Issues (15 minutes total)	2 min.

"Continuous/Permanent" Call Bridge Established:
425-456-2500 or 81-2500 or 1-888-228-0484
Meeting ID: 2525
Password: 44444

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Where to find forms…

- Public Folder…
- "EmergencyOpsCtr"
  - EOC Duty Roster
  - Conference Call Agendas (and who should be notified for call)
  - EOC Update Form
  - Misc. Forms

PUGET SOUND ENERGY

New for 2007-08 (handouts)

Process Improvements…

- Early storm restoration estimates
- Enhanced storm base handoff
- Storm Levels *(1-yellow, 2-orange, 3-red)*
- Training *(DA, CCC, CLX, 911, Dispatchers, Drivers, Lodging Coordinators)*
- Damage assessment strategy
- Local area coordination *("pods")*
- Transmission restoration prioritization

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More process improvements…

- Logistics
- Lodging coordination
- 911 call taking
- CERP – Volume I and II
- Add'l helicopter and flagging contracts
- Personnel tracking
- Bothell emergency operations center

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Tool & Equipment…

- Radio channels/frequencies *(S. King, Whatcom)*
- System Operations – added consoles
- GPS *(200 units)*
- Storm bags
- 2nd 1-800 line for Major Accounts
- Damage assessment hand-held – pilot

PUGET SOUND ENERGY

Interagency Coordination...

- Utility Road Clearing Task Force
- MOU with State Emergency Management Division
  - HOV Lane Exemption
  - State Border Crossings
- EOC liaisons – counties and State
- County pre-winter storm meetings

PUGET SOUND ENERGY

System Operability...

- Whidbey Operating Base
- ROW & access roads
- Vegetation management
- System hardening
- Self protection clearances
- Local Area Coordination clearance procedures
- System operations staffing plan

PUGET SOUND ENERGY

Customer Communication

- Web portal
- Customer education
- Operations base communications narratives
- Escalated call process
- www.pse.com
- Customer emergency preparedness card
- Customer Communications Program Manager
- Agents at home *(30)*

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Miscellaneous...

- Kitsap to operate out of Poulsbo
- New storm board maps
- Increased training and depth for back-up dispatchers
- Checklist for contracting "foreign crews"

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Resources

- Quick Reference Guides
- Volume II
- Employee Contact Lists
- Lodging Coordinator Procedures
- Major Accounts & Business Account Services Reference Manual
- Critical Facility Restoration Priority Lists *(by region)*
- Public Folder: "EmergencyOpsCtr"
- X Drive: "Storm Support"; "Storm Stats"; "EMS Engineering"
- System Supervisor

PUGET SOUND ENERGY

Are we ready????

PUGET SOUND ENERGY


Questions????
Mark Wesolowski
425-462-3962 (office)
425-766-4148 (cell)
Mary Robinson
425-462-3887 (office)
425-766-3888 (cell)
PUGET SOUND ENERGY

Puget Sou[illegible] Energy
2007-08 Storm Season
Plan Enhancements

Rev. 10/[illegible].007

Process Improvements	What's Changed or New?	Benefit
Early Storm Restoration Estimates	Developed process to deliver Regional storm restoration estimates within the first 24 hours of an event.	Enhances customer outage communications.
Enhanced Storm Base Handoff	Enhances existing storm base handoff process.	Enhances Regional storm base ability to quickly gain an understanding of system damage, resources in the field and resources needed.
Storm Levels	Levels 0-3 identified with varying response actions associated with each. 3 = major (e.g. December 2006 windstorm) ***(See attachment)***	Sets expectation for level of response; documented in Corporate Emergency Response Plan.
Training (DA, CLX, Crew Coordinator, 911, Dispatcher, Lodging Coordinator, Driver)	Enhanced training to include skills testing; trained over 150 PSE and Potelco damage assessors.	Skilled, qualified emergency response personnel; increased numbers of trained personnel.
Damage Assessment Strategy	Windshield assessment within first 24 hours; with area specific assessment and restoration times in 48-72 hours.	Timely information to customers on event characterization; estimated restoration times by region or area early in response effort.
Local Area Coordination	Formalized process for establishing, sourcing and supporting local area coordination sites.	Streamlines process for staffing, sourcing and supporting logistics needs in a specific area. Provides a PSE community presence and expedites system restoration.
Transmission Restoration Prioritization	Formalized process for activating the transmission restoration prioritization team; dedicated space and resources sited in ESO.	Streamlines process for siting, sourcing and establishing responsibilities for prioritizing transmission restoration.
Logistics	RFP for selection of logistics vendor to support local area coordination sites and staging areas. (expect selection by end of October 2007)	One call for logistics support (mobile offices, tents, sanitation, water, food, heat, generation, etc.)
Lodging Coordination	New emergency response role defined and staffed.	Relieves EOC and Storm Base operations from lodging coordination.
911 Call Taking	Doubling capacity for "911" call taking in System Operations	Improves service for life/safety emergency response.

Puget Sound Energy
2007-08 Storm Season
Plan Enhancements

Rev. 10/[illegible]007

Process Improvements	What's Changed or New?	Benefit
Corporate Emergency Response Plan (Vol. I and II)	Adding storm level descriptions, checklists, additional detail for materials, and critical facility restoration priorities	Improved plan documents for use in event response.
Helicopters, Flaggers	Added helicopter and flagging resources. Out of State flaggers exempted from WA State Certification	Added resources.
Personnel Tracking	Potelco developed personnel tracking system for all event response personnel.	Improves resource management and documents for billing purposes.
Bothell Emergency Center	Created Call Center "EOC" for managing customer service staffing, etc.	Duty teams assigned to manage staffing and customer service levels.

Puget Sound Energy
2007-08 Storm Season
Plan Enhancements

Rev. 10/[illegible] 2007

Tools & Equipment	What's Changed or New?	Benefit
Radio /Channels/Frequencies	Added 2 additional channels; 1 in King; 1 in Whatcom County	Reduces bottleneck and congestion into System Operations from field for switching and clearances.
System Operation Consoles	Increased number of workstations.	Reduces bottleneck and congestion into System Operations from field for switching and clearances.
GPS	Purchased 200 GPS units to be stocked in Storm Bases for damage assessors, crew coordinators and/or foreign crews.	Improves assessment and response time.
Storm Bags	New bags stocked and managed by materials management for Storm Bases.	Provides required tools for damage assessors and crew coordinators; streamlines process of restocking bags post event.
Business Account Services - Phone Line	Installed new "1-800" line for top major accounts.	Eases access to system supervisor and/or EOC for schools, hospitals, water/wastewater plants, etc. to obtain outage restoration information.
Damage Assessment Hand Held	Piloting hand held computers for loading damage assessment information. Anticipate pilot in Pierce and North King for 2007-08 season.	Based on pilot, anticipate reduction in time to obtain quality damage assessment information from field.

Puget Sou[illegible]d Energy
2007-08 Storm Season
Plan Enhancements

Interagency Coordination	What's Changed or New?	Benefit
Utility Road Clearing Task Force	***In process (expected completion 11/30/07)*** : formalizing plan for teaming qualified tree crews, Potelco, roads crews for clearing and making safe public roadways.	Coordinated and planned approach to clearing downed wire/trees. Improves road openings.
Memorandum of Understanding with State EMD	***In process (expected completion 11/15/07)*** documenting concept of operations between PSE, State EMD, WS DOT, WSP, CTED and UTC.	Documents PSE's role in providing State information on status of system and State's role in assisting PSE with HOV lane exemptions, expediting state border crossings for foreign crews, etc.
EOC Liaisons	New emergency response role defined and staffed for County and State EOC's.	Provides point of contact for interagency coordination during event.
County Pre Winter Storm Meetings	Meetings hosted by PSE in 7 counties with County emergency management, public works, and first responders.	Share contact information and PSE's plan for event response and restoration.

Puget Sound Energy
2007-08 Storm Season
Plan Enhancements

Rev. 10/[illegible]2007

System Operability	What's Changed or New?	Benefit
Whidbey Base	Plan developed to open Whidbey Operating Base.	Presence on Island for customer service and may enhance management of restoration efforts.
ROW & Access Roads	Additional ROW clearing and access road work at multiple locations within King and Pierce Counties. Additional work planned in Kitsap County.	Allows more efficient travel along ROW and reduces assessment and restoration time.
Vegetation Management	Additional vegetation management at areas of concern across the service territory.	Removes specific vegetation issues that could cause outages during storm events.
System Hardening	Identifying opportunities to make the electric system more resilient to storm events, and improve ability to access the system so repairs can be performed when necessary. Areas of focus include ROW clearing, access roads, system hardening, and identification of exceptionally critical facilities.	Provides long range plan for infrastructure improvements.
Self Protection Clearances	Developed new process for enhancing use of self-protection clearance procedures to include adding a designated Regional contact at system operations to manage only self-protection clearance calls.	Reduces bottleneck and congestion into System Operations from field for switching and clearances.
Local Area Coordination Clearance Procedures	Developed new process for enhancing use of local area coordination clearance procedures to include reduced use of I #'s and broader area clearances.	Reduces bottleneck and congestion into System Operations from field for switching and clearances.
System Operations Staffing Plan	Developed a staffing plan that aligns field and system operations staffing levels during peak restoration periods and rest periods.	Reduces bottleneck and congestion into System Operations from field for switching and clearances.

Puget Sound Energy
2007-08 Storm Season
Plan Enhancements

Customer Communication	What's Changed or New?	Benefit
Web Portal	***In process:*** development of a Web-based tool for non-call center personnel to process outage calls.	Reduces time and streamlines process to provide customer service.
Customer Education	Major Accounts/Business Account Services educating customers on KEMA report, post-storm initiatives, etc.	Customers better educated on electric service and PSE's response and recovery activities.
Operations Base Communications Narratives	Request area specific damage and restoration information from each operating base for use in media and customer messaging.	Improved customer messaging; reduced escalated calls.
Escalated Call Process	Designated employee at each operating base as point person for obtaining restoration information for use by CRM's, Major Accounts/BAS, escalated calls, etc.	Formalizes process for obtaining needed customer or restoration information from storm bases without burdening those directly involved in restoration.
PSE.com	Service Alert link for simultaneous posting on PSE.com and PSE web (intranet); Outage map to be posted to PSE.com	Improved customer messaging.
Customer Emergency Preparedness Card	Wallet card to be distributed with October bills to all customers.	Vehicle to message personal preparedness and easy access to PSE 1-888 number to report emergencies and other local agencies for assistance.
Customer Communications Program Manager	New position to coordinate communications between Corporate Communications and Call Center.	Improved and consistent customer messaging.
Agents at Home	Agents at Home staffed to 30 (from 14 previously)	Improved customer service in early hours of event.

PSE PUGET SOUND ENERGY

EVENT CATEGORIES

Levels	Electric Criteria	Gas Criteria	Level of Response	Operations Actions
Level 0 - Normal	Nominal conditions across system	Nominal conditions across system	Normal daily response activity.	Normal operations.
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Level 2 – Significant	Multiple regions affected; requires resources from other PSE regions and/or outside PSE service territory.	Multiple PSE regions affected; requires resources to be allocated to other PSE regions.	EOC open; multiple operating bases and may activate local area coordination. Employees with emergency response assignments mobilized.	EOC opened. Additional contractor resources needed; some from bordering states. Moderate to extensive use of employees with ER assignments. Windshield assessment utilized. Complete assessment within 24-36 hrs. Local Area Coordination possible.
Level 3 – Major	Most or all regions affected; maximum level response required; need extensive resources from outside area.	Most or all PSE regions affected; may request operator qualified resources from outside PSE.	EOC open; most or all operating bases open; external logistics support may be employed; full corporate response to support restoration efforts.	EOC opened. Resources obtained from outside of region. Full utilization of employees with ER assignments. Local area coordination implemented. Windshield assessment utilized; complete assessment within 48-72hrs.

See Page 2 for Event Triggers and Criteria

EVENT TRIGGERS and CRITERIA

Levels	Declared by	When	Triggers	Criteria
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AGENDA

Fall Storm Leadership Meeting – PSE/Potelco

October 3, 2007
11:00 a.m. – 2:00 p.m.
Summit Conference Room

11:00 a.m. – 11:15 a.m.	**Introductions**	
11:15 a.m. – 11:45 a.m.	**National Weather Service** *Ted Buehner*	
11:45 a.m. – 11:55 a.m.	**Break to Grab Lunch**	
11:55 a.m. – 12:20 p.m.	**Storm Planning - Going Forward** *Bert Valdman* *Greg Zeller* *Mark Soetenga*	
12:20 p.m. – 12:50 p.m.	**Emergency Event Management and Communication Team Update**	
	Operations	*Mary Robinson*
	Communications/Customer Service	*Janet Gaines*
	System Hardening	*Shamish Patel*
	Technology	*Greg Zeller*
12:50 p.m. – 1:20 p.m.	**What's New for 2007-08**	
1:20 p.m. – 1:40 p.m.	**Expectations of Leadership**	
1:40 p.m. - 2:00 p.m.	**Questions???** **Adjourn**	

PSE PUGET SOUND ENERGY

Emergency Event Management and Communication Team

Mission:

Develop and implement a customer centered outage restoration process, scalable to any size emergency event.

Measures of Success 2007-08 Season:

- Customer outage restoration estimates are available and communicated.
- We commit to meeting all outage restoration times as communicated to our customers.
- All restoration times are communicated; General within 24 hours; Specific estimates for customers in all areas within 48-72 hours of event declaration.

Puget Sou[illegible] Energy
2007-08 Storm Season
Plan Enhancements

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Puget Sound Energy
2007-08 Storm Season
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PUGET SOUND ENERGY

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PUGET SOUND ENERGY

Expectations of Storm Leadership for 2007-08

- "Own It".
- Declare Storm Level (1, 2, or 3) *(see attachment).*
- "Windshield" assessment in each region within 24 hours.
- Goal: area specific estimated restoration times within 48-72 hours of event subsiding.
- Commitment to estimated restoration times communicated to customers.
- Operations conference calls 2's/day (suggested at shift changes):
    - EOC to establish after opening.
    - Participants to include EOC Director/Manager, Potelco base managers and Puget Sound Energy Electric First Response supervisors.
    - Provide best available information & refine as new information available.
- Have a restoration plan – document it & communicate it.
- Utilize escalated call process.
- Focus on critical facility restoration prioritization (lists in Volume II).
- Open Whidbey Operating Base as a storm board as appropriate.
- Track resources (crews, assessors, servicemen, etc.)
- Establish local area coordination as needed to enhance restoration and customer communications.

Lodging Coordinator

Provide lodging coordination for regional operating bases, working with the Emergency Operations Center (EOC) to ensure adequate bed capacity for foreign crews and operating/storm base personnel. Manage local lodging arrangements (assign/track personnel and their lodging assignments) throughout emergency event. Coordinate with the EOC to request added lodging locations when additional beds are not available at locations already arranged by the EOC. Coordinate with hotel staff to arrange net additions/reductions in beds as needed throughout event, including providing hotel staff lists of personnel assigned to each facility, number of nights for each room, etc. Work with hotel staff as necessary to resolve lodging issues. Track and provide regular updates to the EOC on lodging utilization throughout the event.

PSE Liaison – County/City EOC(s)

Represent Puget Sound Energy (PSE) at assigned County or City Emergency Operations Centers (EOCs). Serve as liaison and focal point for communications between County EOC staff and PSE. Provide routine updates to County EOC staff on impacts to PSE's energy distribution system(s) and current restoration timelines. Identify key coordination issues between PSE and County (public works, police/fire, roads, parks, transit) DOT or Telco's and facilitate discussions to resolve. Collaborate with the Puget Suond Energy EOC and County Public Information Officers on community messaging. Coordinate with County staff to obtain additional resources if required. Participate in scheduled PSE conference calls. (City EOC's will be staffed on request of the jurisdiction for specific events affecting local areas. These requests are made to the Emergency Planning Manager or Manager Operations Continuity and will be staffed on an as needed basis.) Work schedules may vary, but are anticipated to be a minimum of 12-hour shifts during daytime hours, to be coordinated with the County EOCs.

PSE Liaison – State of WA EOC

Represent Puget Sound Energy at the State of Washington Emergency Operations Center (EOC), located at Camp Murray. Serve as liaison and focal point for communications between State of WA Emergency Management Division (EMD) staff and PSE. Provide routine updates to State of WA EMD staff on impacts to PSE's energy distribution system(s) and current restoration timeline. Identify key coordination issues between PSE and State of WA and facilitate discussions to resolve. Coordinate with appropriate State agencies to obtain temporary rules exemptions where restrictive regulation may adversely affect response efforts. Coordinate with EMD staff to obtain additional resources, as required. Work schedules may vary, but are anticipated to be a minimum of 12-hour shifts during daytime hours, to be coordinated with the State EOC.

PUGET SOUND ENERGY

EVENT CATEGORIES

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Conner, Kathryn

Subject:	Damage Assessor Training
Location:	Kitsap Service Center, 2nd Floor Conf Room
Start:	Tue 8/14/2007 9:00 AM
End:	Tue 8/14/2007 4:00 PM
Show Time As:	Free
Recurrence:	(none)
Meeting Status:	Meeting organizer
Required Attendees:	[redacted]
Optional Attendees:	

This training is mandatory, so please make every effort to attend. All supervisors have been apprised of mandatory storm duty training.

Lunch will be served.

Kitsap Service Center is located at 6522 Kitsap Way, Bremerton, WA.

Conner, Kathryn

ubject:	Damage Assessor Training
ocation:	S. King Service Center, Conf Rooms 1-2-3
Start:	Mon 8/13/2007 9:00 AM
End:	Mon 8/13/2007 4:00 PM
Show Time As:	Free
Recurrence:	(none)
Meeting Status:	Meeting organizer
Required Attendees:	[redacted]
Optional Attendees:	

This training is mandatory, so please make every effort to attend. All supervisors have been apprised of mandatory storm duty training.

Lunch will be served.

e South King Service Center is located at: 6905 S. 228th Street, Kent, WA 98032.

Conner, Kathryn

Subject:	Damage Assessor Training
Location:	Conf EST05E49 - Issaquah - 20 (Restricted Access - Escort Req.)
Start:	Thu 8/9/2007 9:00 AM
End:	Thu 8/9/2007 4:00 PM
Show Time As:	Free
Recurrence:	(none)
Meeting Status:	Meeting organizer
Required Attendees:	[redacted]
Optional Attendees:	

UPDATED: THIS MEETING WILL BE HELD IN THE FORUM - 1ST FLOOR MEETING ROOM IN EST BLDG.

This training is mandatory, so please make every effort to attend. All supervisors have been apprised of mandatory storm duty training.

Lunch will be served.

Conner, Kathryn

`ubject:	Damage Assessor Training
.ocation:	Tacoma Svc Center, Tacoma Conf Room
Start:	Tue 8/7/2007 9:00 AM
End:	Tue 8/7/2007 4:00 PM
Show Time As:	Free
Recurrence:	(none)
Meeting Status:	Meeting organizer
Required Attendees:	[redacted]
Optional Attendees:	

This training is mandatory, so please make every effort to attend. Supervisors have been apprised of this training.

Lunch will be served.

Location for Tacoma Service Center:

'30 South 38 Street
acoma, WA

Conner, Kathryn

Subject: Damage Assessor Training
Location: The Forum, EST Bldg, 1st Floor

Start: Mon 8/6/2007 9:00 AM
End: Mon 8/6/2007 4:00 PM
Show Time As: Free

Recurrence: (none)

Meeting Status: Meeting organizer

Required Attendees: [redacted]

Optional Attendees:

This training is mandatory, so please make every effort to attend. All supervisors have been apprised of mandatory storm duty training.

Lunch will be served.

Conner, Kathryn

Subject: Damage Assessor Training
Location: The Forum, EST Bldg, 1st Floor

Start: Fri 8/3/2007 9:00 AM
End: Fri 8/3/2007 4:00 PM

Recurrence: (none)

Meeting Status: Meeting organizer

Required Attendees: [redacted]

Optional Attendees:

Attendance at this meeting is mandatory, please make every effort to attend. Supervisors have been previously apprised of this required training.

Lunch will be served.

Conner, Kathryn

Subject: Damage Assessor Training
Location: Mt Vernon Conf Room

Start: Tue 7/31/2007 9:00 AM
End: Tue 7/31/2007 5:00 PM
Show Time As: Free

Recurrence: (none)

Meeting Status: Meeting organizer

Required Attendees: [redacted]

Optional Attendees:

Updated: This training class is supposed to run from 9 to 4.

This training is mandatory and supervisors have been apprised of this. Please make every attempt to attend this training. Lunch will be served.

The address for the Mt Vernon office is:

ft. Vernon Customer Construction
1700 E College Way
Mt. Vernon, WA 98273

PUGET SOUND ENERGY
The Energy To Do Great Things

2007 Damage Assessor Training

Mark Wesolowski and Associates

The KEMA Report

- Consultant hired by PSE to review performance during December windstorm
- Performed well restoring power after the record-breaking storm
- No formal or informal means of evaluating how well attendees learned D/A skills
- Basic skill requirements for the D/A do not appear to be formally defined

KEMA Recommendations

- Enhance D/A training through more detailed technical content, extended training time, & qualifications screening
- Revise the D/A process to include specific methods for restoration times and manpower requirements
- Formalize the information requirements and process for D/A's in the field

This Year's Training....

- Covers a lot of the basics for newcomers
- Is a good review for "seasoned" D/A's
- Introduces a new D/A Guide
- Covers the revised D/A form
- Emphasizes the need for detailed materials required lists

Three Parts to the Training

- **Part One:** Duties, Responsibilities, Safety, Flagging, Equipment, Environmental, and Mapping (including a map reading exercise)
- **Part Two:** System Components
- **Part Three:** New D/A Guide, New D/A Form

The Final Test

- A practical application consisting of five scenarios to test your knowledge and skills

Housekeeping Issues

- Sign the roster, but.....
- Cell phones/Blackberries – please turn ringers off and put on "vibrate"
- Please do not handle e-mail and text message while in class
- Breaks – we'll take a couple – keep them short, and we'll be done sooner!
- Lunch – will be provided

THIS JUST IN.....

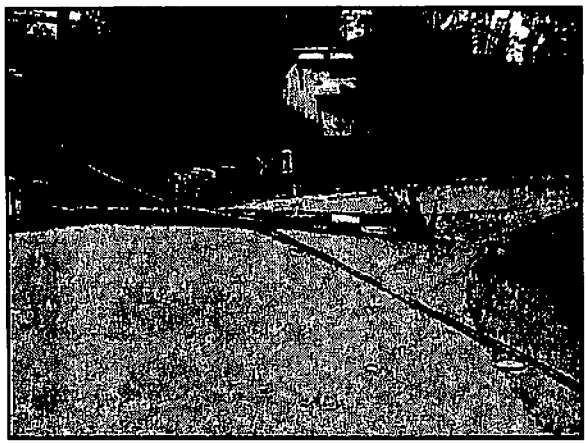
- PSE will conduct a Mock Storm on September 5th
- Will be company-wide
- You might be called out to "damage assess" an area

PART ONE

Duties, Responsibilities, Safety, Flagging, Equipment, Mapping, Environmental

What is Damage Assessment?

- Causes of damage:
  - Wind, floods, ice, earthquake, snow
- Minor events
  - System Operations manages event
  - Damage Assessment handled by EFR
  - EFR may call out Damage Assessors
- Medium to large events
  - Operating Base opens
  - EOC might open
  - Damage Assessment teams deployed

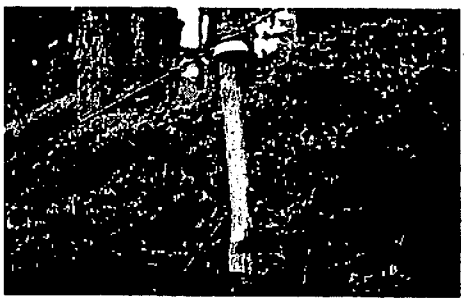


What's left of a pole

(Photo by Jeff Tripp)

The top end.....

(Photo by Jeff Tripp)



Check In/Out

- When called out for Damage Assessment duty, unless directed otherwise, report to the operating base as instructed
- You may first have to pick up a pool car
- Check in at the operating base when you arrive for duty and ***sign in*** on the sign in sheet
- When going home, be sure to let someone at the operating base know and ***sign out***

Damage Assessor Duties

- Reports to the Damage Assessment Coordinator
- May work as a single team or part of a larger area team working with an Area Coordinator
- Storm base will make assignments
- Work as a team member with a Driver

Regarding Drivers

- May or may not have D/A experience
- You are focused on looking for damage;
- Your driver should watch the road
- Outline your expectations of the driver
- (Drivers will have separate training)

Representative of PSE

- You are representing PSE in the field
- Wear your hard hat, vest, and/or other PSE logo'd apparel
- **DO NOT** give estimates on restoration times!!! (Usually these early estimates are not accurate and the customers can become upset)

Working Conditions

- May be working around other crews (city, tree, other utility, etc)
- Long hours in bad weather
- Could be away from home for several days
- Spend many hours on your feet, generally out in the weather

SAFETY FIRST!

- Your number one objective is to stay safe while Damage Assessing!
- If wind picks up, return to operating base
- Required safety equipment:
  - Hard Hat
  - Reflective Vest
  - Safety Glasses

FIELD SAFETY

- **DO NOT CONTACT DOWNED LINES!**
- Stay away from all downed lines
  - Protect yourself
  - Protect the public
  - Mark area (*not* the conductor) with special tape or cones
- Tree wire looks like CATV or phone wire
- If it's not grounded, it's not dead!

REPORTING EMERGENCIES

- Wire down and burning – contact EFR dispatcher – stay on site if necessary
- Medical/Injury – dial 911
- Other (need crew quickly) – contact operating base
  - Pole/low wire in busy road

Field Safety
(continued...)

- Drive properly, follow all traffic laws; You are **NOT** an emergency vehicle
- Use caution when walking through yards – wear your hard hat and vest
- Be aware of the hazards of cold
- Be aware of falling debris and trees
- Poles and trees may appear down, but may move unexpectedly – stay clear!

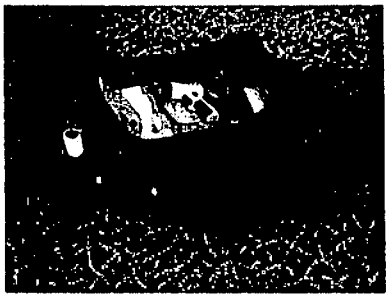
Field Safety
(continued...)

- Watch your footing
- Be aware of traffic; cones can't stop cars
- Be ALERT in work areas
- Never remove or tamper with tags
- Note on the D/A form if upstream fused c/o's are closed and notify operating base

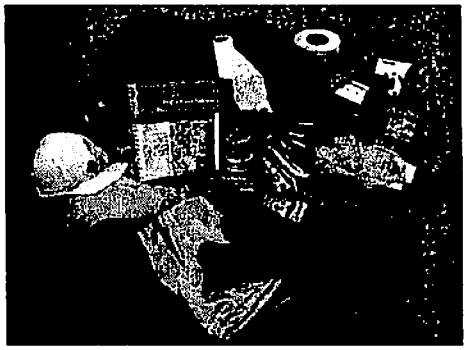
Personal Necessities

- Medication/Prescriptions
- Extra glasses
- Toothbrush
- Money
- Cell Phone/Charger
- Extra Clothing
- Rain Gear
- Water
- Snacks/Food
- **PLAN ON NOT BEING ABLE TO BUY ANYTHING IN THE FIELD!**

A Personal Storm Bag....



Storm Bag Contents.....



Storm Equipment

- PSE will furnish storm bags containing:
  - 3 Cell Flashlight
  - 6 Pack "D" Cell Batteries
  - Battery Operated Strobe Light
  - Spot Light (plug into cigarette lighter only)
  - Roll of Caution Tape
  - 3 Way 12v Outlet
  - Spiral Note Pad
  - Clipboard
  - Circuit Maps and local (Thomas Brothers) maps

Storm Equipment (continued)

- Storm Bag, continued:
  - 12 Pack 3" Yellow Sticky Note Pads
  - Set of 3 Color Ball Point Pens
  - Set of 4 Color Permanent Markers
  - 50 Pack Storm Damage Tags
  - Pad of Damage Assessment Forms
  - Pad of Oil Spill Forms
  - Pad of Pole/Xfmr Replacement Forms
  - And some CCC stuff (tags, forms, etc)
- Storm bag is also used for CCC's

GPS Units

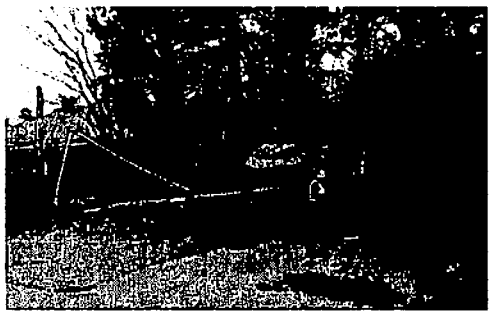
- GPS units may be available at the storm base
- Or if you have one from your department, please bring it.

Return Equipment!

- Take your storm equipment bag and unused supplies back to the storm base
- Return your GPS unit
- You may keep your D/A Guide

On the job....

Photo by Jeff Tripp



Your Mission

- Eyes in the field
- Fill out Damage Assessment forms
- Communicate Damage Assessment info back to storm base:
  - You might be calling the assessment information in – do so from that site
  - Or you might be delivering completed forms to the storm base
  - Report damage frequently

The Operating Base Needs...

- Early and frequent reports ("snapshots") so they can get a handle on the severity and start arranging resources
- To know of any unusual, involved jobs, such as double circuit or very involved corner poles, tree crews needed, etc
- More detail of needed materials for repairs (more on that later)

Where To Start?

- Unless directed otherwise, start at the substation
- Patrol the whole feeder first
- Then patrol laterals

Where Am I?

- Location, Location, Location:
  - Address on a mailbox or house
  - Nearest intersection
  - Notable landmark
  - Pole number or grid number
  - Switch number
  - The more information provided, the better!

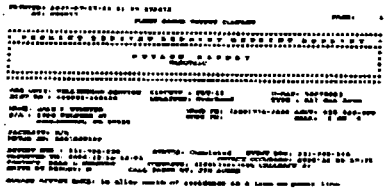
How To Access Site?

- Easy to get to, on a street or road?
- Or:
  - Roads washed out?
  - Trees across road?
  - Walk-in location?
  - Any special directions needed?

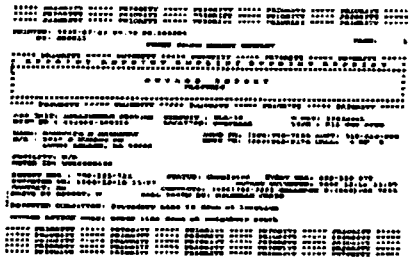
Tree Crews

- Generally lots of tree crews available
- Call in early if obvious a tree crew is needed for access
- Line crews can do some limited tree work

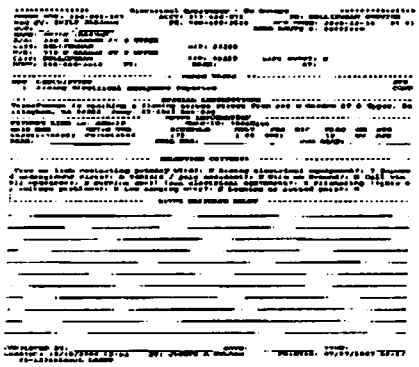
CLX Report



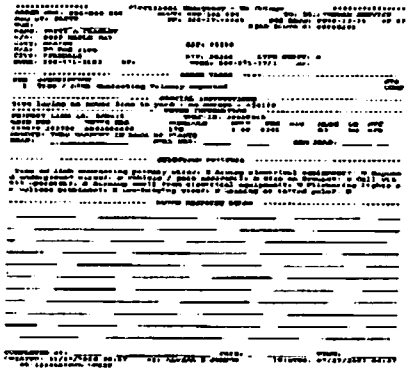
CLX Report



CLX Report



CLX Report



Map Reading Exercise

- Find address on Thomas Brothers map
- (Include page and grid number)
- Determine appropriate circuit map
- Find location on circuit map
- Determine which circuit
- Identify protective device

How About Traffic Control?

- Are flaggers needed?
- If so, how many (two? three?) Consider:
  - Does the road curve?
  - Is there a hill involved?
  - Is there a 3-way or more intersection?

You never know who might show up to be your flagger....

(Photo by Jeff Tripp)

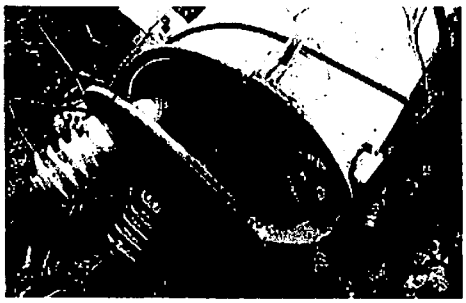
Environmental

- Any oil spilled?
- Transite pipe on pole (riser)?

(either must be reported immediately)

Oil Spill.....

(photo by Jeff Tripp)



- An example of transite pipe is available, wrapped in clear plastic, to see if you are not familiar with what it looks like. Come up and look at it at the break.

BREAK

PART TWO

System Components

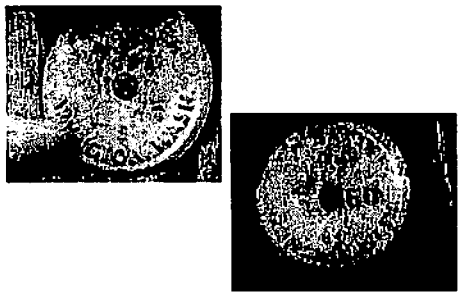
System Components

- Poles
- Crossarms
- Transformers
- Insulators
- Wire
- Switches
- Fuses
- Terminations
- Guy Wires
- Cell Net
- Other Equipment
  - Regulators
  - Reclosers
  - Sectionalizers
  - Line Capacitors

Poles

- Two factors – length and class
- How do I find out the length/class?
  - Look at the pole tag in the pole gain
  - Look at adjacent pole(s)

Pole Tags

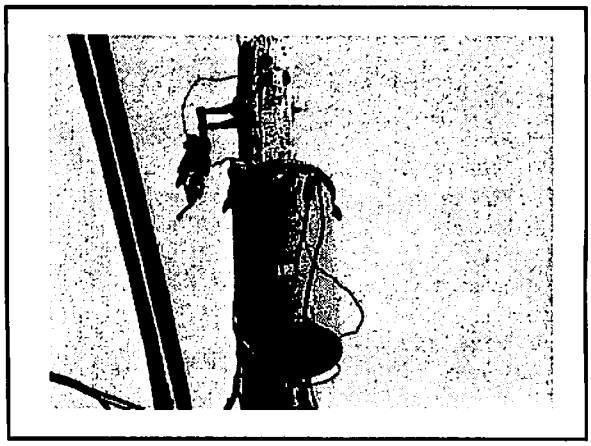


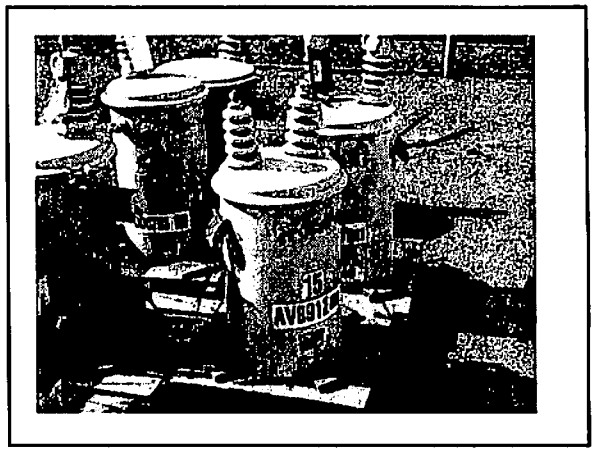
Crossarms

- Distribution Sizes range from 9 – 13 feet
  - 9 foot arms (most common) use flat braces
  - 11 foot arms use "Vee" braces
  - 13 foot arms are used for double circuits
- Fiberglass arms for compact construction
  - Replace older steel short arms with fiberglass arms
- Replace single phase arms with pole top pins and neutral in common position, if possible

Transformers

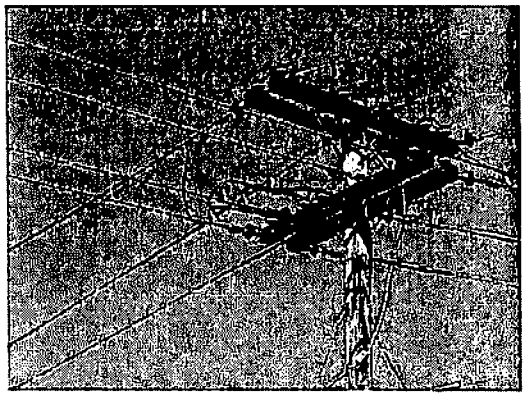
- Single and Two Bushings
- kVA rating on side of xfmr
- In most cases, a single phase xfmr can replace a two bushing xfmr





Insulators

- Insulators on steel (wood) pins
- Dead end type bells
- Rigid clevis
- Strain insulators



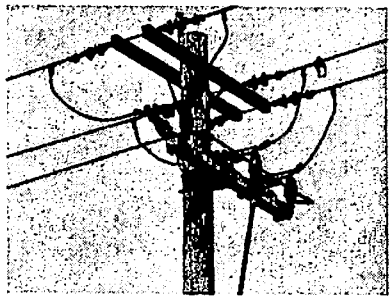
Wire

- Type
  - Copper
  - ACSR
  - AAC (looks like ACSR)
- Size
  - #6 – 4/0 Copper
  - 1/0 – 4/0 and 336 and 397mcm ACSR
- Service Wire
  - Triplex – #2, 1/0, 4/0
- Tree Wire

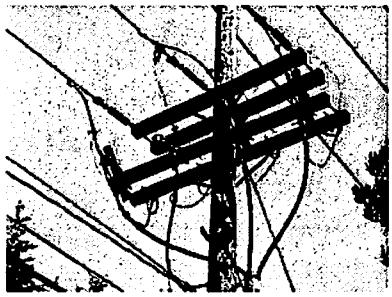
Switches

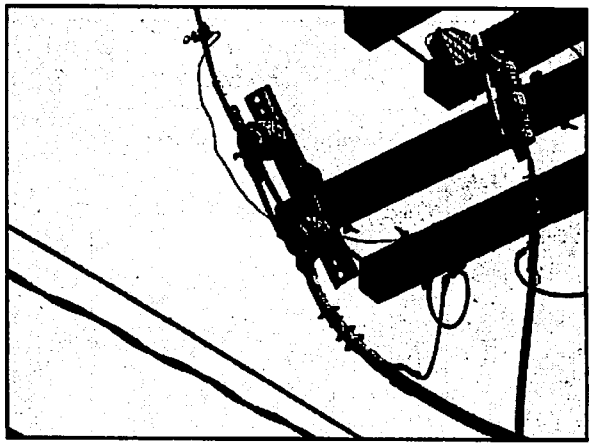
- Gang Operated
  - With operating handle
- Solid Blade Disconnects
  - Load Break or Non-Load Break

Gang Op Switch



Solid Blade Disconnects

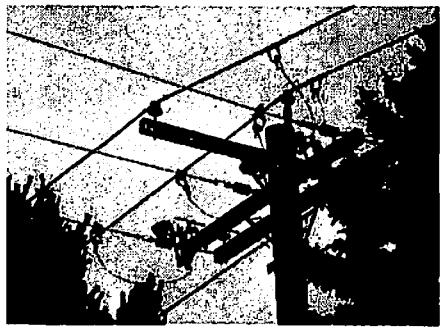




Fuses

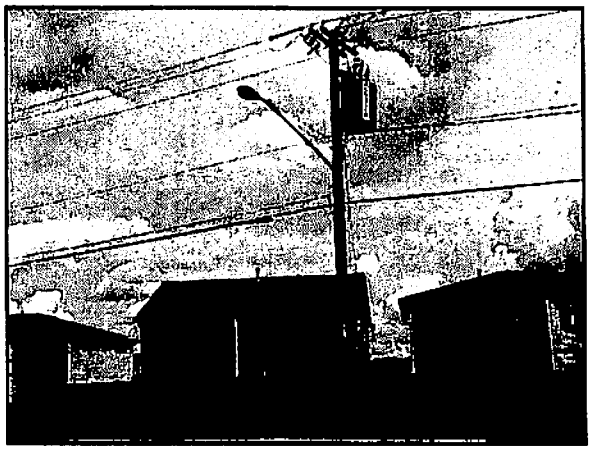
- Three phase taps
- Laterals
- Occasionally fuses are found in the primary feeder, usually with bypass disconnects

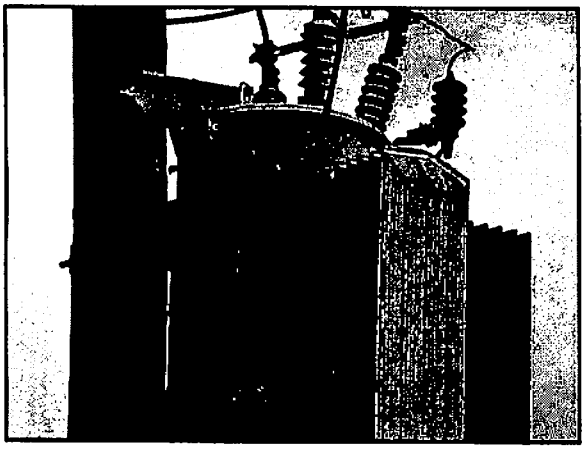
Fused Cut Outs

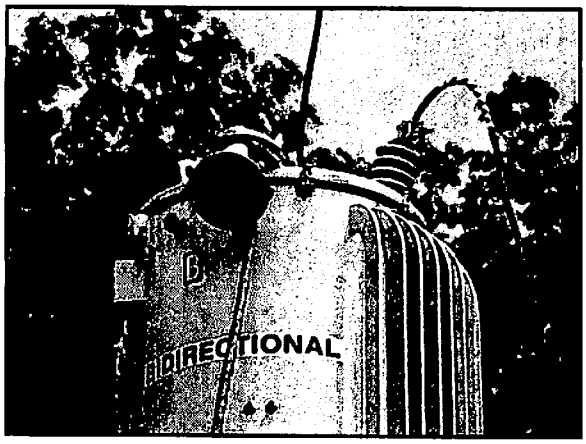


Regulators

- Usually single phase, mounted on poles
- Occasionally platform mounted 3-phase

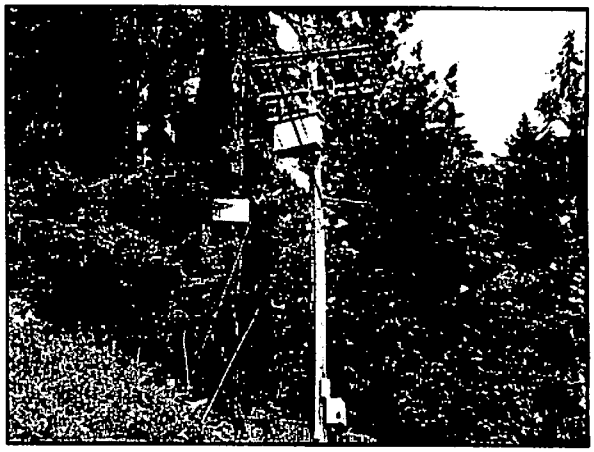






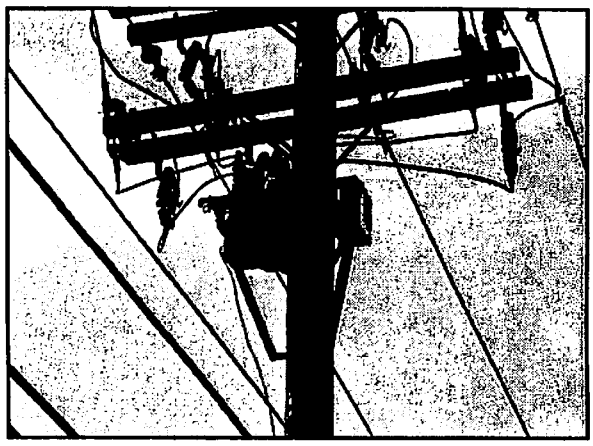
Reclosers

- Two types
  - Oil-filled
  - Vacuum type



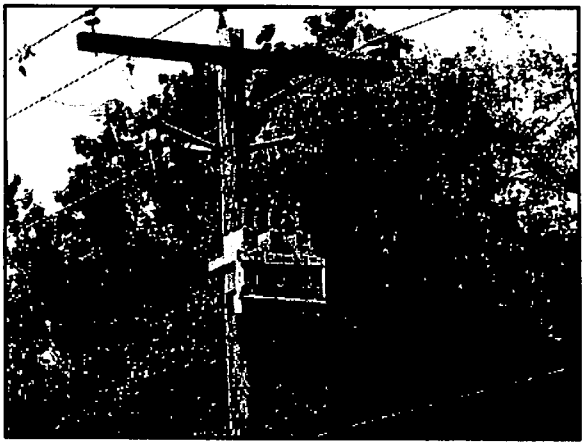
Sectionalizers

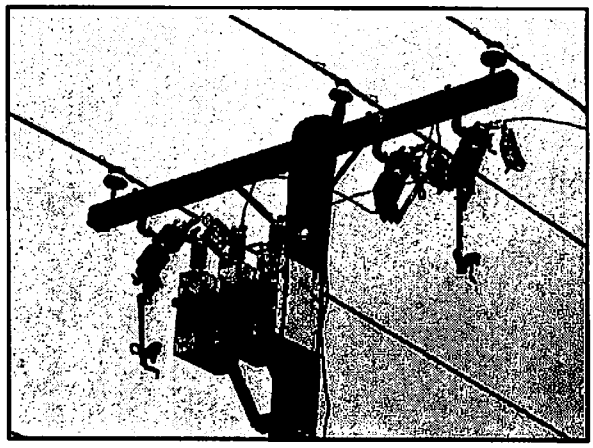
- Looks like a small oil-filled recloser



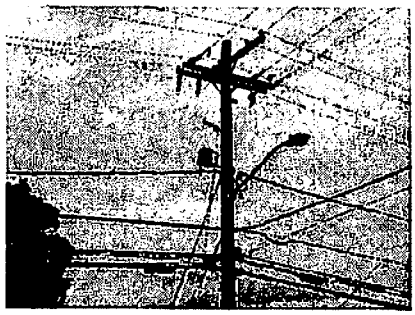
Line Capacitors

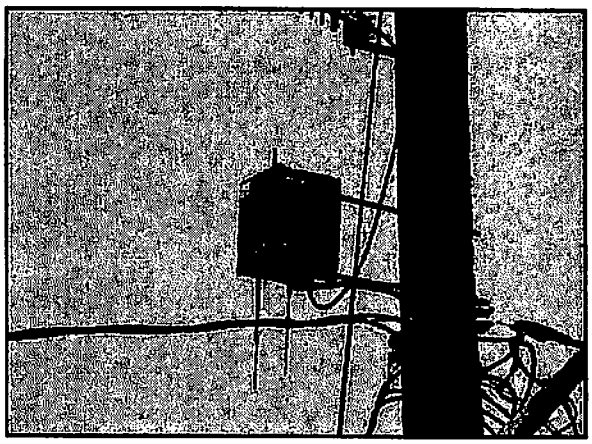
- Square cans mounted in a rack on pole, usually three, with fuses
- If ruptured or leaking, treat as an oil spill





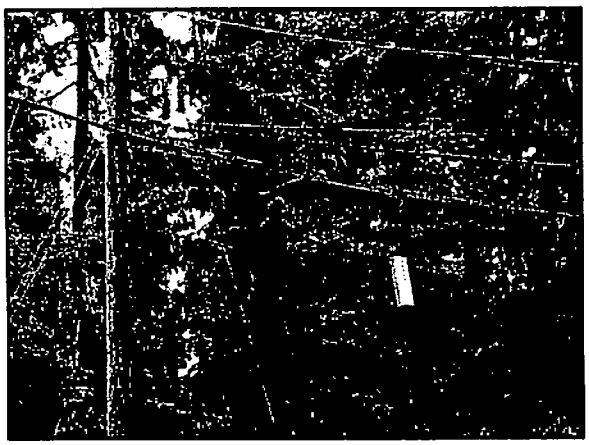
Cell Net





Other Stuff on a Pole

- Telephone
- Cable
- Fiber Optic



What about.....

- Street Lights?
  - Into Light number on pole?
- Cell Net Equipment?
  - Number on box?
- Raptor Protection?
  - Reusable?

- Note these items on D/A form

BREAK FOR LUNCH

PART THREE

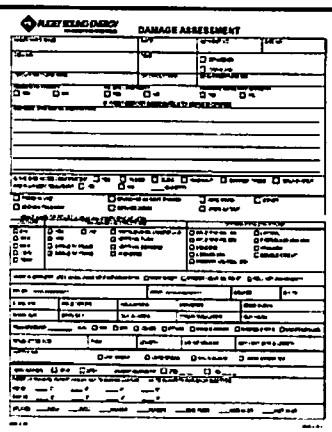
D/A Guide
D/A Form
Final Test

Damage Assessment Guide

- Covers the basics
- Images of system components
- Lists of materials by MID for basic units
  - Storerooms need complete lists of materials
  - Use MID if you can
  - A "pole" gets you a "pole" – nothing else!
  - Use back of D/A form to list materials

Damage Assessment Form

- Revised form
- Easier to use
- A number of folks contributed suggestions
- Review form with students
- Fill out as completely as possible



FINAL EXAM

- Five Scenarios
- Complete a D/A form for each scenario

PUGET SOUND ENERGY

Storm Base Expectations for 2007-08

- "Own it"
- Storm Levels (1, 2, or 3) will be declared *(see attachment).*
- "Windshield" assessment in each region within 24 hours.
    - Goal: area specific estimated restoration times within 48-72 hours of event subsiding.
- Focus on critical facility restoration prioritization (lists in Volume II).
- Create restoration plan – document it & communicate it.
- Commitment to estimated restoration times communicated to customers.
- Operations conference calls 2X/day (suggested at shift changes):
    - EOC to establish after opening.
    - Participants to include EOC Director/Manager, Potelco base managers and PSE EFR supervisors.
    - Provide best available information & refine as new information available.
- Track resources (crews, assessors, servicemen, etc.)
- Establish local area coordination as needed to enhance restoration and customer communications.
- Open Whidbey Operating Base as a storm board as appropriate.
- Utilize escalated call process.

VOLUME 1 2007-2008

CORPORATE EMERGENCY RESPONSE PLAN





PSE PUGET SOUND ENERGY

The Energy To Do Great Things

Emergency Response Roles – Electric

This section describes the positions and job duties at EOC during electric facility failures and positions at Quanta Operating Bases for electric emergency response. The Corporate EOC is headquartered at Eastside Operations – Redmond.

EOC Roles

Work Location	Temporary Job Title	Duties and Responsibilities	Training Expectations
Corporate EOC	EOC Director	The EOC director provides Corporate (strategic) oversight and financial authority to response efforts. Once the EOC is opened, the Director becomes the information focal point for the executive management team and may respond to media inquiries about emergency response activities as needed by Corporate Communications.	Emergency Response Overview; EOC Orientation
	EOC Manager	Coordinates opening of the EOC and determines level of response required for each emergency. Coordinates with Quanta EOC Duty Manager to obtain resources needed for restoration. Balances available resources against system damage and realigns overall efforts when estimated restoration times are significantly skewed between regions. Oversees overall event reporting and ensures periodic detailed reports are issued.	Emergency Response Overview; EOC Orientation
	Quanta EOC Duty Manager	Works with Puget Sound Energy EOC Director and Manager to acquire resources needed for emergency events. Ensures Quanta resources for crews, damage assessors, CLX data entry personnel, etc. are trained and qualified for emergency response functions. Coordinates movement of Quanta regional resources and out-of-area crews that may be required for major events including equipment, fleet, travel and accommodations. Requests additional resources from PSE EOC Manager as required to augment operating base personnel; e.g., damage assessors, crew coordinators, drivers, CLX information specialists, crew supervisors, etc.	Emergency Response Overview; EOC Orientation
	EOC Communications Coordinator	Coordinates with EOC Director and Manager to ensure timely and accurate communications with the media. Coordinates messaging with Operations, Access Center and regional Communications Coordinators to ensure that restoration information is consistent across all communications channels.	Emergency Response Overview

Work Location	Temporary Job Title	Duties and Responsibilities	Training Expectations
Corporate EOC	EMS Analyst	Assesses system damage through electronic sensors located in substations and along major transmission lines (SCADA, EMS, DMS) and provides information. Focuses primarily on providing outage information at the substation and transmission line level. Ensures transmission, substation status information is communicated to storm boards	Emergency Response Overview EMS Training
	I/T Manager	Responsible to provide resolution oversight to reported hardware, application, network or key interface issues. Coordinates with PSE's helpdesk, network, application and desktop personnel to assure failures are quickly resolved or appropriately escalated, ensuring mission-critical technology tools are returned to service a soon as may be practicable.	Emergency Response Overview
	Manager Electric First Response	Works with Quanta EOC Duty Manager, PSE EOC Manager, On-duty System Operations Supervisor and PSE First Response Supervisors. Coordinates company-wide first-response resource allocation including decisions to move first response servicemen out of area, etc.	Emergency Response Overview
	Resource Coordinator	Assists in the allocation and retention of resources as required by field operations including assessors, additional crews, flaggers, etc. Works with Quanta EOC Duty Manager to ensure adequate crew availability and may call out and assign non-Quanta, off-system, out-of-state, and/or mutual assistance utility crews. May also call out specialty contractors (flagging, tree removal, helicopter and environmental, etc.) as required by PSE and Quanta for service restoration. Make arrangements for border crossings, ferry travel, and emergency road openings as required. Tracks foreign and contract crews as they change locations within PSE's service territory.	Emergency Response Overview

Work Location	Temporary Job Title	Duties and Responsibilities	Training Expectations
Corporate EOC	Data Specialist	An outage data expert. Familiar with CLX and AMR outage tools. Tracks progression of outages and customer calls; archives history of event at regular intervals. May also perform DDD analysis.	Emergency Response Overview; EOC Orientation
	Administrative Support	Obtains and organizes periodic detailed reports for each impacted area and collates into regular updates for internal audiences such as, customer service, Corp Communications and, external audiences such as, State / County / City EOC's and American Red Cross.	Emergency Response Overview
	911 Call Taker	Answers emergency calls from 911 agencies, police, etc. reporting downed wire, fires, and blocked right-of-ways. Enters reported information into CLX, ensuring priority outage reports are sent to Quanta operating bases.	Emergency Response Overview; 911 Call Taker Training
	On-duty System Operations Supervisor	A regularly staffed PSE position responsible for initiating the emergency response. Also responsible for: Monitoring weather and regularly communicating with PSE staff and Quanta field operations. Notifying Quanta management and EOC duty management to activate emergency response plans. Monitoring emergency event escalation, restoration efforts and overall recovery of the electric system.	Emergency Response Overview

Operating Base Roles

These functions are performed by Quanta and/or PSE employees:

Work Location	Temporary Job Title	Duties and Responsibilities	Training Expectations
Quanta Operating Base	Storm Manager	Directs or manages area storm operations, emergency response assignments, assessment, and restoration. Primary contact person with EOC, System Operations, Substations, Transmission, and Access Center. Assesses needs for additional resources, coordinating with EOC for external resources and assistance as required. Coordinates with the Damage Coordinator, Crew Coordinator and EOC to prioritize restoration activities.	Emergency Response Overview; CLX Outage Management
	First Response Supervisor	Provides support for Quanta Operating Base Manager as required. Supervises and monitors local area first responders (servicemen) and electric dispatchers to ensure adequate response. Reassigns first responders for service restoration and damage assessment as appropriate. Provides Corporate EOC with information as requested. May act as Operating Base Manager for shift coverage as require	Emergency Response Overview; CLX Outage Management
	Storm Board Coordinator	Reports to the Quanta Storm Manager. Analyzes outages and tracks needed repairs and location of assigned resources. Receives information from servicemen, CLX, 911 call-takers, damage assessors and others on location. Packages damage information by area for efficient restoration. Reviews / prioritizes response to emergencies reported via 911 agencies.	Emergency Response Overview; CLX Outage Management

Work Location	Temporary Job Title	Duties and Responsibilities	Training Expectations
Quanta Operating Base	Storm Board Analyst	Assists the Support Storm Board to coordinate and prioritize restoration and identify circuits. Provides DDD and EMS expertise as required; e.g., sub-circuiting outages for CLX. Assists CLX data entry process to ensure customer system updated accurately and timely. Works with Damage Coordinator to determine damage assessment needs and coordinate damage assessors for the designated area.	Emergency Response Overview; CLX Outage Management; DDD and or EMS
	Storm Board Assistant	Provides support to Storm Board coordinator. Reviews available outage information and records emergency. Assists in prioritizing work and communicates assignments to damage assessors, electric dispatcher and crew coordinator. Updates Storm Board and ensures CLX reflects current status. Assists with analysis and prioritizing of emergencies reported via 911 agencies.	Emergency Response Overview
	Damage Assessment Coordinator	Reports to the Quanta Storm Manager Oversees and coordinates the damage assessment and restoration prioritization for the operating base. Manages and assigns qualified personnel to damage assessment duties. Ensures the Storm Boards are updated and that CLX updates are consistent, timely and accurate. Assists in prioritizing restoration efforts. Communicates status and locations of assessment teams within the area. Coordinates with Storm Board management to prioritize restoration activities	Emergency Response Overview; CLX Outage Management; Damage Assessment Training
	Damage Assessor	Reports to the Damage Assessment Coordinator. Assesses system damage in designated areas. Records damage and material needs and relays the information to the Storm Board.	Emergency Response Overview; Damage Assessor Training

Work Location	Temporary Job Title	Duties and Responsibilities	Training Expectations
Quanta Operating Base	Crew Coordinator (General Foreman)	Reports to the Quanta Storm Manager. Oversees the line crew restoration effort throughout the event. Ensures field resources are deployed efficiently for safe and timely restoration. Coordinates with the Emergency Response Manager and Damage Coordinator to prioritize restoration.	Emergency Response Overview
	Service Dispatcher	Reports to PSE First Response Supervisor. Dispatches PSE Servicemen and Quanta two-person emergency crews to 911 calls, critical switching, patrolling, and secondary service restoration. May work with some autonomy early in event and later works in close coordination with storm board staff as event escalates and overall event management shifts to the storm board coordinator.	Emergency Response Overview; CLX Outage Management
	CLX Specialist	Updates CLX Outage Management information system regularly throughout the emergency to ensure prompt, accurate information to the Access Center and EOC.	Emergency Response Overview; CLX Outage Management
	Area Coordinator	From a remote location, using assigned resources, manages all restoration activity (damage assessment, restoration prioritization and related crew assignments) to restore extensively damaged areas. Assigned areas may be defined electrically, such as all circuits from specific substations or geographically using landmark boundaries.	Emergency Response Overview
	Contract Crew Coordinator	Reports to the Crew Coordinator (GF). Leads crews to damaged areas and works ahead of crews to see that effective restoration methods are being followed, material and other needs are met. Ensures "foreign" contract crew personnel are informed of required safety, construction and switching practice information.	Emergency Response Overview; Contract Crew Coordinator Training, First Aid

Work Location	Temporary Job Title	Duties and Responsibilities	Training Expectations
Quanta Operating Base	Communications Coordinator	Works closely with local operating base management throughout the emergency to ensure that critical customer loads (e.g., healthcare, area shelter locations, etc.) are appropriately identified and prioritized for restoration. Monitors outages impacting Major and Business Accounts as well as specific customer groups or areas. Coordinates with the Media Representative in the EOC (or, corporate communications when the EOC is not open) to ensure that notifications and updates provided locally are consistent with messages issued through Corporate Communications and the Access Center. Responds to specific customer inquiries from major account or key business customers (e.g., schools, healthcare facilities, grocery store chains, etc.). Works with the Major Account Representative(s) in the EOC to coordinate major and key customer response. Provides information to local media, municipalities, and county emergency response departments (when the EOC is not open) on damage assessment and outage restoration efforts.	Emergency Response Overview
	Driver	Safely operates vehicle while Damage Assessor visually assesses and records circuit damage	Driver Training
	Make-it-Safe	Dispatched to locations where primary wire is reported to be down. Ensures site safety until qualified electrical workers are on-scene.	Emergency Response Overview; Make it Safe Training

PUGET SOUND ENERGY

For Internal Use Only

Local Area Coordination Plan

Key Words

Restoration

Purpose

The purpose of this document is to formalize the ad hoc practice used for several years in establishing local area coordination sites for restoration activities.

Discussion

It has been a long-standing practice of Puget Sound Energy to establish local area coordination sites to assist with restoration activities during events where the magnitude of damage and crew work activity may overwhelm an open operating base. The functions performed at a local area coordination site are a sub-set of the storm base functions and are managed by a smaller team of qualified and experienced emergency response personnel. The purpose of this document is to institutionalize and document the considerations used in opening a local area coordination center, as well as to provide details for staffing, site selection and a checklist for resource needs and logistics.

Definitions

Local Area Coordination Site: A geographic sub-set of an operating base area of responsibility for the restoration of electrical service following a major emergency event. Functions performed by staff at a local area coordination center include communicating real time restoration activities to appropriate parties, managing all crew activities within the area assigned, analyzing and creating restoration strategies, coordinating with the Load Office, System Operations, the EOC and Operating Base. Materials used and any temporary repairs made in the area assigned are tracked and documented.

Procedures

Who	Does what
EOC and Operating Base	▪ Determine when and where to open a Local Area Coordination Site taking into consideration the following: o Status of completion of damage assessment in region o Knowledge of system damage (collecting area damage assessment from operating base manager and dispatcher) o Crew resource availability o Material availability o Qualified site management personnel availability o Weather forecast o Transportation challenges

Who	Does what
Operating Base	▪ Determines sites for establishing Local Area Coordination. ▪ Assigns crews and crew work packets to Local Area Coordination Site Manager. ▪ Communicates to the EOC site location and estimated time work will be transferred to Site Manager.
EOC	▪ Provides logistics support assistance to Operating Base to establish Local Area Coordination Site (e.g., resources, materials, facility needs – tents, sanitation facilities, generator power, portable offices, computers, phones, maps, etc.). ▪ Receives information directly from Site Manager at Local Area Coordination Site and/or Operating Base Manager.
Site Manager	▪ Manages resources at Local Area Coordination Site. ▪ Communicates with the Operating Base and EOC. ▪ Assigns team responsibilities: o System Coordinator: coordinate system restoration, communicate with Load Office, System Operations and Operating Base. May include responsibility for switching and clearances for area assigned. o Material Coordinator: distribute, procure and account for material usage. o Community Relations Manager: responsible for communicating with community in area and local media. o Logistics Coordinator: coordinate all facility needs. o Administration Support: provide all administrative support, including providing updates for CLX data entry at the Operating Base.

REFERENCES:

Appendix A: Local Area Coordination Site Location
Appendix B: Local Area Coordination Staffing Plan
Appendix C: Local Area Coordination Logistics - Checklist

Version	Draft SMP-04
Revision date	10 October 2007

Local Area Coordination APPENDIX A

Site Locations – DRAFT 10/10/2007

(NOTE: Location sites not owned by PSE – will need authorization by property owners for use as outage event staging areas.)

NORTHERN

Whatcom County

- Nugent's Corner Area - Lawrence Road (Highway 9) and Mt. Baker Highway - Church Parking Lot at intersection of Hadley and Lawrence Roads.
- Ferndale Area - Grandview and Portal Way (off I-5) - Salishan Parkway goes into business park (vast parking area).
- Grandview & Vista - Grange Hall.
- Lynden/Birch Bay Area - Outlet Mall off I-5.
- Lynden/Sumas Area - Verizon Service Base (used to be PSE Service Base) - at intersection of Badger Road and Depot Road.

Skagit County

- Conway Exit off I-5 - Shell Station - owner Gary Fidler (plenty of parking -graveled area across from station and one north of station).
- Conway Exit off I-5 - Graveled property that is west of the Shell Station at Conway - talked to State Hwy Dept Manager, Kim Glass, and he said property is owned by Seattle residents (brothers) who have allowed contractors in the past to utilize the property for staging projects. Mr. Glass didn't have their names, but I'm going to work through our Real Estate Dept to find the owners and contact them as soon as possible.
- Lower Baker Area - Large compound - discussed with Ron Twiner (Mgr Hydro Services North - cell 661-2280) and he'll will work with us on specific area.
- Alger Area - Alger Community Center - just off I-5.
- Lake Cavanaugh Area (because of communication issues may need it's own site) - Boat Launch has large parking area.
- Big Lake and South Skagit Hwy - County Park and Ride at the intersection of SR9 and South Skagit Hwy (never seems to be used that much).
- Big Lake and Little Mountain Area - Boat Launch on West Big Lake Blvd (would cover Big Lake, Little Mountain Area).

Site Locations continued...

- Anacortes Area - Burrows Bay Substation - in Anacortes - gives ability to cover Fidalgo and Guemes Island

Island County

- County Road Dept Shop - Supervisor Myron Gabelein - Location SR 525, Langley - working through Ray Trzynka, Corporate Communications, at this time due to sensitive issues for Whidbey Island.

- Brooks Hill Substation - addr 3450 Brooks Hill Rd., Langley - use for pole storage and other material - this is approximately 3 miles from the County Road Dept Shop.

- Green Bank Substation - right off Hwy 525 located midway between north and south end of Whidbey Island - large grassy area in back of the substation.

NORTH KING

RENTON:
Shuffleton - PSE
Lake Washington Boulevard N & NE Park Drive

MERCER ISLAND:
Shopping Center - South End
SE 68 ST & 84 Ave SE

BELLEVUE:
Factoria - PSE
13230 SE 32 ST

KIRKLAND:(Juanita/Finn Hill)
Bastyr University - Athletic Fields
NE 145 ST & Juanita Drive NE

REDMOND:
Redmond - PSE
18150 Redmond Way

REDMOND:
King County Marymoor Park
NE 65 ST & 176 Ave NE

WOODINVILLE:
Shopping Center - (behind)
Woodinville-Duvall Rd NE & Avondale Rd NE

Site Locations continued...

ISSAQUAH:
Lake Sammamish State Park
NW Sammamish Rd & 15th Place NW

SAMMAMISH:
South Sammamish Park & Ride
SE 30 ST & 228 Ave SE

DUVALL:
Shopping Center
NE Big Rock Rd & Carnation-Duvall Rd NE

CARNATION:
Tolt McDonald Park
NE 40 ST & Fall City-Carnation Rd NE

SNOQUALMIE:
Centennial Park
SE Park St & Meadowbrook Slough

Kittitas County

South Cle Elum toward Easton
Cle Elum Sub with adjacent pole yard and city park
Jack and Main St S
Cle Elum WA 98922

Roslyn/Ronald/Cle Elum area
Cascade sub adjacent to BPA ROW and CleElum High School
1980 SR 903
Cle elum Wa 98922

Kittitas area (owner/operators Steve and Brenda Hart)
Exit 115 mini mart (gas station)
I-90 interchange
Kittitas 98924
(Brenda is a PSE employee and I have not yet had chance to get permission)

Easton
Parkside Cafe (adjacent parking lot gas station camping sites)
2560 Sparks Rd
Easton Wa 98925
(permission has not been requested)

Site Locations continued...

SOUTH KING

Enumclaw Line Headquarters
44720 – 244the Ave SE

Berrydale Substation
6905 – S. 228th
24810 – 156th Ave SE, Kent

Kent
South King Service Center
6905 – S. 228th St., Kent

SOUTHERN

Pierce County
White River Transmission Station
2111 – 169th Ave E, Sumner

Frederickson Transmission Station
Tacoma Industrial Park (E. of Spanaway, Spanaway

Orting Substation
504 Calistoga Ave, Orting

Kapowsin Substation
14321 Kapowsin Highway E, Kapowsin

Gravelly Lake Substation
8304 Washington Blvd., Lakewood

Thurston County
Yelm Substation
Railroad & Middle Streets, Yelm

Blumaer Substation
Hodgedon & Garfield St., Tenino

Rochester Substation
Intersection of Sargent Rd. & Township Rd.,
(183rd Ave SW), Rochester

Griffin Substation
6230 – 41st Avenue NW 9@ Steamboat Island Rd), Olympia

Site Locations continued...

Luhr Beach Substation
46th Ave NE & Meridian, Olympia

Saint Clair Substation
9512 Pacific Highway SE, Lacey

WESTERN

The Operating Base
Pt. Townsend Area

Kingston/Hansville Area
Mall area parking lot
Hwy. 104 & Hansville Rd.

Poulsbo Area
Poulsbo Operating Base with large staging area cross Hwy. 3
22884 Ryen Dr NW, Poulsbo

Bainbridge Area
Murden Cove Substation
9560 Sportsman Club Road, Bainbridge Island

Bremerton Area: Kitsap Operating Base
6522 Kitsap Way, Bremerton

Pt. Orchard Area
Saint Clair Substation, Large area outside the Substation
9512 Pacific Highway SE, Lacey

Local Area Coordination APPENDIX B

Staffing Plan

Names of PSE employees and retirees have been identified to possess the skills and experience to staff each of the following positions at a Local Area Coordination Site.

The Appendix B with names is protected for internal use only and may be found in the PSE EOC in Volume II of the Corporate Emergency Response Plan.

Local Area Coordination APPENDIX C

Site Checklist

Checklist Item	Completed ?	Notes/Who/Location
Site Location		
Staffing:		
Site Manager	_____	_____
System Coordinator	_____	_____
Material Coordinator	_____	_____
Community Relations	_____	_____
Logistics Coordinator	_____	_____
Admin. Support	_____	_____
Logistics:		
Porta Potties		
Security		
Tent		
Trailer		
Showers		
Food		
Water		
Supplies:		
Company Radio(s)		
First Aid Kit(s)		
Storm Bags		
White Boards/Pens		
Generator		
Fuel		
Extension Cord(s)		
Heater		
Lights		
Tables/Chairs		
Phones/Chargers		
Laptop		
Misc. Office Supplies		
Circuit Maps		
Material		

Rev. 10 October 2007

Rec. # 22 & 25 **Local Area Coordination Clearance Procedures**

Rev. 9/27/07

In designated areas where teams have been assigned to place a more localized focus to enhance restoration efforts, the following process enhancements are recommended.

- To maintain continuity of information, coordination and collaboration it is recommended that when possible, a dedicated system operator be assigned to work with the area coordination and restoration team/s. (Likely the Day Operator) To maintain continuity, key stakeholder schedules will need to be synchronized accordingly. (Staff up during productive hours and staff down during rest periods)
- Broader area clearances will be issued on the feeder system where possible. This should allow multiple crews to work under one clearance holder more frequently.
- Self-protection clearances will be encouraged on radial fed system where eligible.

Transmission Restoration Team

Key Words

Transmission Outage

Purpose

The purpose of this document is to formalize a process of centralizing all transmission restoration and prioritization of that restoration when major damage has occurred to the transmission system during a weather-related or other event. This plan covers the restoration of all of PSE's 115Kv and 230Kv high voltage transmission lines.

Discussion

Puget Sound Energy restores facilities so that the greatest numbers of customers are back in service in the least amount of time; however, in events with significant damage to the transmission system, restoration of transmission must be coordinated with the Load Office, System Operations and the Operating Bases to ensure stability of the system. During the December 2006 major windstorm, transmission restoration decisions were centralized out of the EOC by a team called the "T-Pod". In after action reviews it was determined that the creation of such a transmission restoration team was a best practice that should be incorporated into PSE's corporate emergency response plans, particularly for major events where there are significant transmission outages.

Definitions

Transmission Only Line Outages: transmission only line outages have no customers out on line; however may be critical for restoration for system stability.

Procedures

Who	Does what
Load Office	▪ When transmission outages company-wide are 5 or fewer, control all transmission patrol and repair, coordinating with the Operating Base.
EOC and Load Office	▪ When transmission outages are significant, the EOC is open and the Load Office requests assistance, the EOC will assign an individual to the EOC to work as a Transmission Liaison.
Transmission Liaison	▪ Responsible to maintain communications between the Load Office and the Operating Bases, coordinate priorities for repair, and keep the Load Office and EOC apprised of restoration progress and estimated restoration times. ▪ Coordinate and communicate with the EOC "EMS Engineer" who is also in communications with the Operating Bases, providing information on transmission restoration plans and estimates.
EOC Manager, Load Office Manager and Service Provider EOC Manager	▪ When the Transmission Liaison requests assistance, meet and determine if the Transmission Restoration Team should be activated. ▪ Identify and notify team members from both PSE and Service Provider.

Who	Does what
Transmission Restoration Team (TRT)	▪ Activate team activities in designated location at Eastside System Operations (10/2007 – training room in basement, above Load Office; old EOC location). ▪ Staff the team 24X7 until deactivation with qualified transmission experienced operations employees, and at least 1 full time administrative assistant. ▪ Assign roles. ▪ Maintain communication with the Operating Base(s) as to the status of the system repairs and the priority of the repairs. (This allows the operating bases to direct distribution crew repairs to the substation circuits that will be energized first.) Communication may be via telephone, email or other. Options may include IT based solutions such as monitors at the Operating Bases and the EOC that show the status of the transmission system, which lines are out, affected substations, status of repairs and estimated completion of repairs. ▪ Work closely with the EOC EMS engineers the Load Office to track all outages and repairs to the system. Responsible to maintain the priority of repairs and to schedule all damage assessments of the transmission system. ▪ NOTE: Prioritization of lines to be restored continues to be the responsibility of the Load Office, supported by the EOC EMS engineers.
Operating Base	▪ Establish contact person for the transmission system with responsibility to maintain contact with the TRT. ▪ Transfer control of transmission repair to the Transmission Restoration Team. (TRT) ▪ Reassign working crews and damage assessment teams to the TRT. (Operating bases will not conduct any repairs on the transmission system once the TRT is activated and will relinquish control of any crews on current repairs.)

REFERENCES:

Load Office Procedure: Transmission Only Line Outages – No Customer Outages. Patrol & Repair (dated February 26, 2007)

RESOURCE REQUIREMENTS FOR SITING TRANSMISSION RESTORATION TEAM (TRT):

- Dedicated space for up to 8 people
- Access to the EOC EMS Engineers
- System wide storm T-Line map board
- Phones – 4 minimum
- Computers – 3 minimum
- Dedicated printer
- Fax machine
- GPS coordinate mapping programs on terminals
- Radio with multiple channels to talk to helicopter patrols

Version	Draft SMP-05
Revision date	10 October 2007
Revision date	06 November 2007

8.4.1-A

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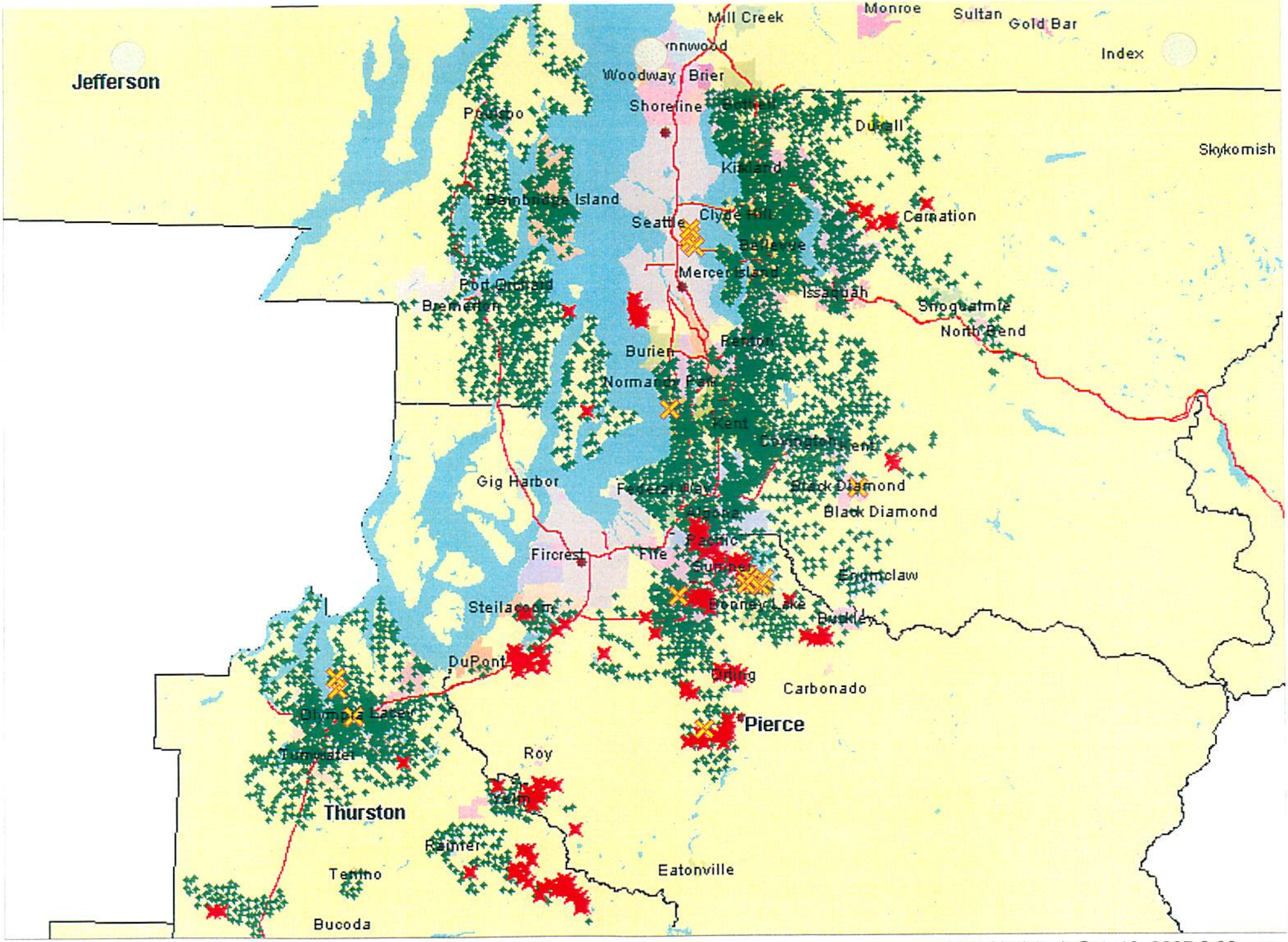
Latest Updates

KING and KIRO TV feature PSE storm preparations

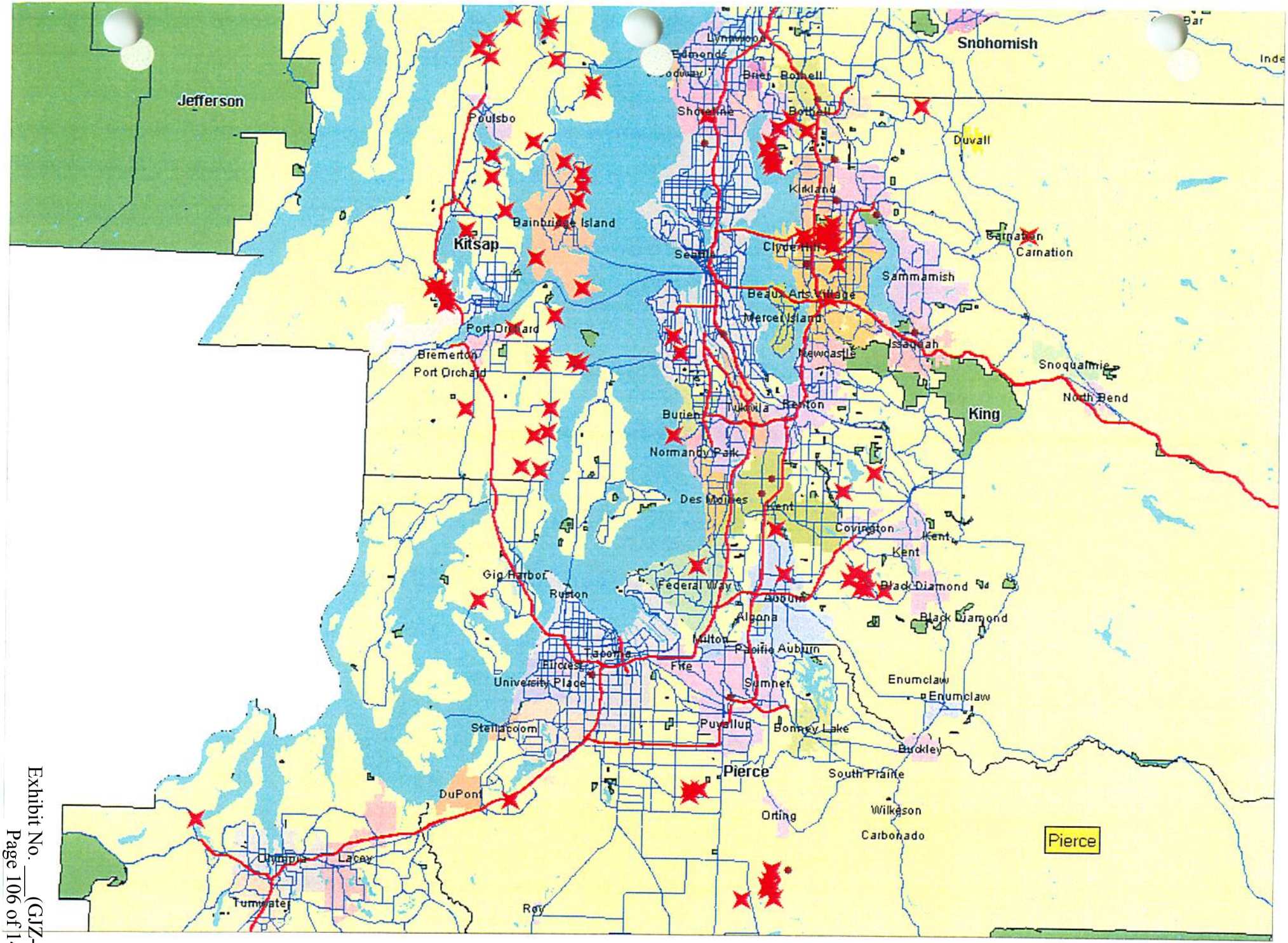
Watch video clips of news coverage: "PSE gets ready for the big wind storm" on KING-5 and "First big storm headed our way" on KIRO.

Service alert update 5 p.m. Oct. 18

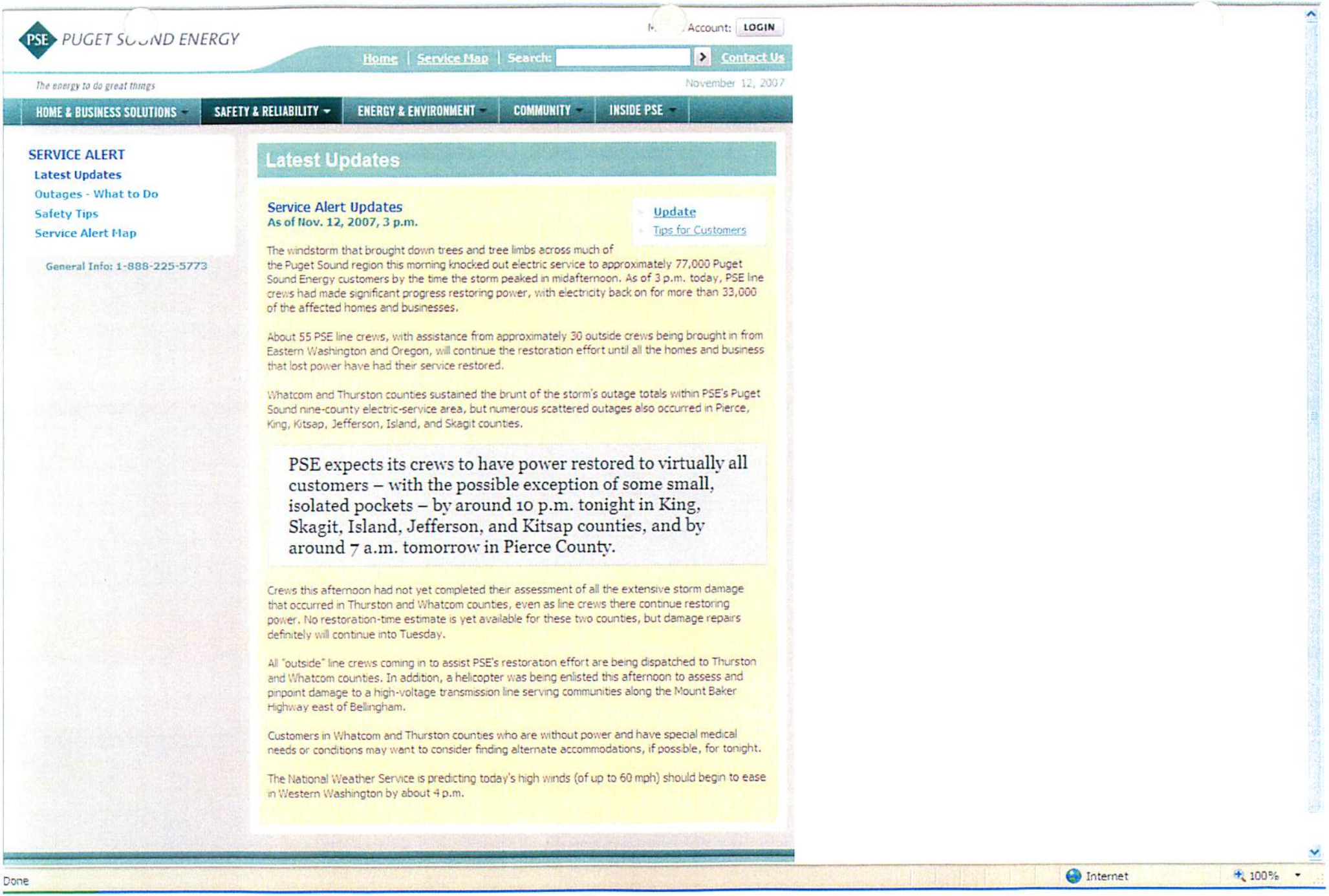
- Puget Sound Energy is experiencing scattered power outages affecting thousands of customers in parts of Thurston, Pierce, King, Kitsap, and Island counties as a result of the strong winds hitting Western Washington.
- PSE crews have been in the field restoring power to several thousand customers since this morning, but with strong winds still blowing, new outages continue to occur and no estimate is available at this time on the total number of PSE customers who've lost power.
- Depending on how long the storm lasts and the extent of damage it causes, it is not possible yet to provide an accurate estimate of how long it will take to restore all our customers' service.
- PSE has approximately 80 line crews, together with about 50 tree crews and a full complement of damage-assessment crews, working to restore customers' power. In addition, another 35 to 40 outside line crews are available, if needed, to assist with power-restoration work.
- Within PSE's nine-county electric service area, gusty winds first hit south Puget Sound around midday today, causing scattered outages in Thurston and east Pierce County. Since then, the high winds have moved northward, with scattered outages now occurring in King and Kitsap counties.
- Anyone who encounters a downed power line should stay well clear of the line and call their electric utility. Always assume a downed line is still energized and dangerous.
- Anyone who is without power and has a medical condition for which no electric service is a concern should consider finding alternate accommodations for tonight.



Map Updated: Oct. 18, 2007 2:30 p.m.



Map Updated: Oct. 19, 2007 11:30 a.m.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November 12, 2007
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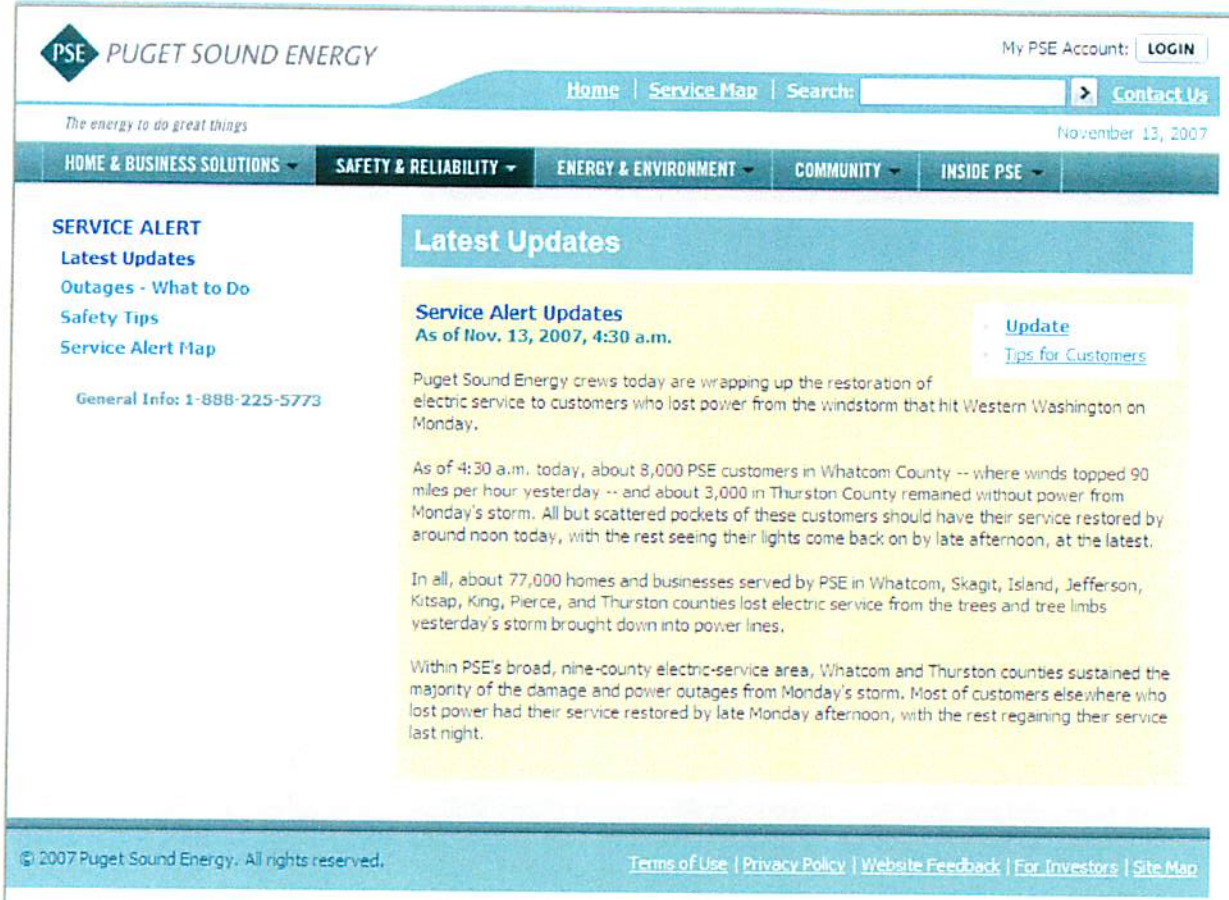
Latest Updates
Service Alert Updates
As of Nov. 12, 2007, 3 p.m.
Update
Tips for Customers
The windstorm that brought down trees and tree limbs across much of the Puget Sound region this morning knocked out electric service to approximately 77,000 Puget Sound Energy customers by the time the storm peaked in midafternoon. As of 3 p.m. today, PSE line crews had made significant progress restoring power, with electricity back on for more than 33,000 of the affected homes and businesses.
About 55 PSE line crews, with assistance from approximately 30 outside crews being brought in from Eastern Washington and Oregon, will continue the restoration effort until all the homes and business that lost power have had their service restored.
Whatcom and Thurston counties sustained the brunt of the storm's outage totals within PSE's Puget Sound nine-county electric-service area, but numerous scattered outages also occurred in Pierce, King, Kitsap, Jefferson, Island, and Skagit counties.
PSE expects its crews to have power restored to virtually all customers – with the possible exception of some small, isolated pockets – by around 10 p.m. tonight in King, Skagit, Island, Jefferson, and Kitsap counties, and by around 7 a.m. tomorrow in Pierce County.
Crews this afternoon had not yet completed their assessment of all the extensive storm damage that occurred in Thurston and Whatcom counties, even as line crews there continue restoring power. No restoration-time estimate is yet available for these two counties, but damage repairs definitely will continue into Tuesday.
All "outside" line crews coming in to assist PSE's restoration effort are being dispatched to Thurston and Whatcom counties. In addition, a helicopter was being enlisted this afternoon to assess and pinpoint damage to a high-voltage transmission line serving communities along the Mount Baker Highway east of Bellingham.
Customers in Whatcom and Thurston counties who are without power and have special medical needs or conditions may want to consider finding alternate accommodations, if possible, for tonight.
The National Weather Service is predicting today's high winds (of up to 60 mph) should begin to ease in Western Washington by about 4 p.m.
Done
Internet
100%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November 13, 2007
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Safety Tips
Service Alert Map
General Info: 1-888-225-5773
Latest Updates
Service Alert Updates
As of Nov. 13, 2007, 4:30 a.m.
Update
Tips for Customers
Puget Sound Energy crews today are wrapping up the restoration of electric service to customers who lost power from the windstorm that hit Western Washington on Monday.
As of 4:30 a.m. today, about 8,000 PSE customers in Whatcom County -- where winds topped 90 miles per hour yesterday -- and about 3,000 in Thurston County remained without power from Monday's storm. All but scattered pockets of these customers should have their service restored by around noon today, with the rest seeing their lights come back on by late afternoon, at the latest.
In all, about 77,000 homes and businesses served by PSE in Whatcom, Skagit, Island, Jefferson, Kitsap, King, Pierce, and Thurston counties lost electric service from the trees and tree limbs yesterday's storm brought down into power lines.
Within PSE's broad, nine-county electric-service area, Whatcom and Thurston counties sustained the majority of the damage and power outages from Monday's storm. Most of customers elsewhere who lost power had their service restored by late Monday afternoon, with the rest regaining their service last night.
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- Latest Updates
- Outages - What to Do
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PSE Service Alert: Service Alert Map

PSE Service Area and County Restoration Map

This map displays the status of PSE's electrical distribution system as of 7 a.m. Mon., Nov. 13.

Legend: Map Symbols

with service

without service

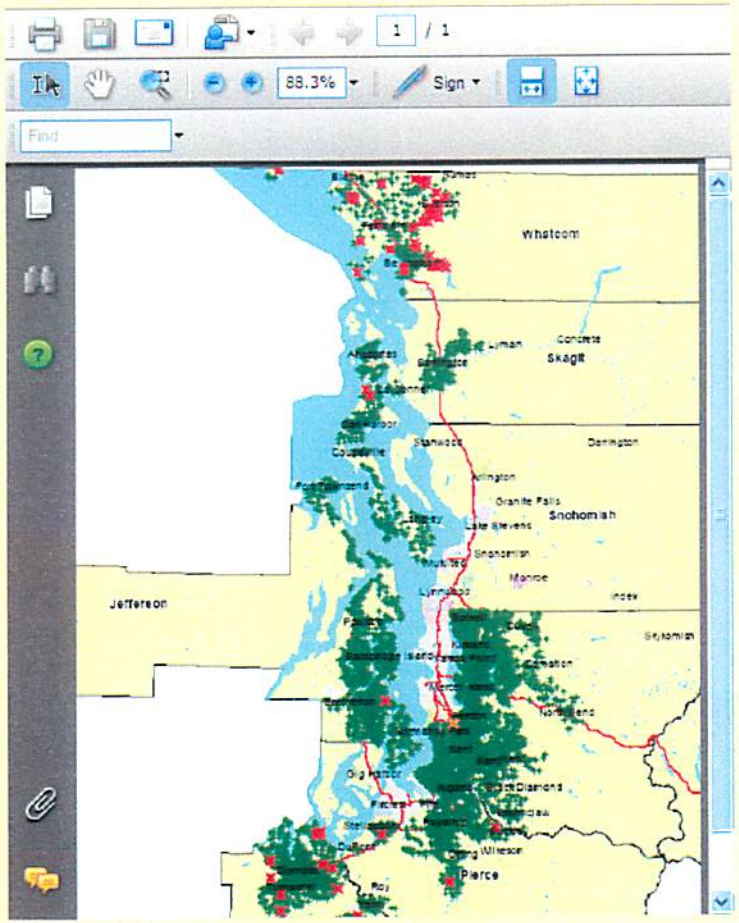

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Exhibit No. ___(GJZ-9)
Page 109 of 146

PUGET SOUND ENERGY

Corporate Communications
Windstorm Update – 4:30 a.m. Tuesday, Nov. 12, 2007

Puget Sound Energy crews today are wrapping up the restoration of electric service to customers who lost power from the windstorm that hit Western Washington on Monday.

As of 4:30 a.m. today, about 8,000 PSE customers in Whatcom County and about 3,000 in Thurston County remained without power from Monday's storm. All but scattered pockets of these customers should have their service restored by around noon today, with the rest seeing their lights come back on by late afternoon, at the latest.

In all, about 77,000 homes and businesses served by PSE in Whatcom, Skagit, Island, Jefferson, Kitsap, King, Pierce, and Thurston counties lost electric service from the trees and tree limbs yesterday's storm brought down into power lines.

Within PSE's broad, nine-county electric-service area, Whatcom and Thurston counties sustained the majority of the damage and power outages from Monday's storm. Most of customers elsewhere who lost power had their service restored by late Monday afternoon, with the rest regaining their service last night.

komo 4!

November 12, 2007

Another potent windstorm strikes Western Washington

By Scott Sistek

What's New: High Wind warning issued for Puget Sound area; Wind Advisory issued for Southwestern Washington. Updated a few peak wind gusts.

A second strong windstorm of the season is rolling through Western Washington this morning, bringing a dose of heavy rain and very gusty winds to most of the region.

Thousands of customers were already without power by 7 a.m., and a driver in Redmond was hospitalized when a tree crashed down onto his truck near the intersection of Novelty Hill Road and 206th Avenue.

A truck that was struck by a falling tree during a wind gust Monday morning is seen on Novelty Hill Road in Redmond, Wash. The driver was hospitalized.

Seattle City Light reports about 4,000 customers without power in the Burien area, Snohomish PUD says about 1,400 customers have lost power, and Puget Sound Energy says they have scattered outages in Whatcom, Skagit, Kitsap and King counties.

The wind will be the largest impact with this storm, with gusts expected as high as 70 mph along the coast and 60 mph Northwest Interior, and perhaps as high as 50-60 mph in the Puget Sound area.

HIGH WIND WARNINGS are in effect for all of Western Washington, with the exception of Southwestern Washington, which is under a lesser WIND ADVISORY. (A high wind warning means wind gusts over 58 mph are possible. A wind advisory is for gusts over 40 mph). The warning is in effect from now until 1 p.m. for the coast and north interior, and from 10 a.m. to 4 p.m. for the greater Puget Sound area.

Here's some peak gusts already this morning as of 7 a.m., with the storm still offshore:

- Destruction Island: 75 mph
- Tatoosh Island: 73 mph
- Oak Harbor: 62 mph
- Hoquiam: 61 mph
- Bellingham: 55 mph
- Friday Harbor: 58 mph
- Alki Beach: 55 mph
- Hoquiam: 54 mph
- Forks: 52 mph
- Tacoma: 45 mph
- Seattle: 41 mph
- Everett: 39 mph

What's The Timeline? -- New as of Monday morning

As usual with windstorms, the coast gets the wind first, then the Northwest Interior (basically a box from Everett west to Port Townsend, stretching north to the Canadian border, including San Juan, Whidbey, and Camano Islands.), then finally the Puget Sound region.

The strongest winds are already under way along the coast and North Interior as the storm begins to pass by to our northwest. Peak wind gusts are expected to last there until midday or early afternoon. For the coast, we could see wind gusts as high as 70 mph.

For the Northwest Interior, strong winds are expected to continue through midday to perhaps another push in the late morning when the storm passes to the north.

Gusty winds were also already occurring in the Puget Sound area this morning, but this was not the main event as of 6 a.m. A stronger push of wind is expected somewhere in the vicinity of 10 a.m. when the storm passes to our north and the storm's cold front swings through.

The really strong winds won't last long as the storm is moving pretty quickly, but we could see a solid 2-3 hours of wind gusts approaching 60 mph later this morning.

Those winds would be strong enough to cause power outages, knock over trees and make driving across the 520 Bridge oh so fun. In October's storm, the 520 Bridge managed to stay open despite occasional gusts over 50 mph, while the Hood Canal Bridge did have to close for several hours. We could see a repeat of that on Monday -- and this time the 520 bridge could close.

Final note here for our Canadian readers -- while our High Wind Watch ends at the border due to jurisdictional procedures, (i.e., it's up to the Canadian forecasters to issue warnings for their side), this storm is expected to make for strong, gusty winds across southern Vancouver Island and the greater Vancouver area too. Vancouver's version of the National Weather Service (Environment Canada) is calling for wind gusts up to 55 mph (90 km/h) Monday morning.

The Meteorological Lowdown:

A strong area of low pressure is tracking toward north-central Vancouver Island on Monday. This is close to a classic wind storm pattern for us. (If we were to call it a "text book" case, we would want it going ashore either near Neah Bay or along the southern tip of Vancouver Island).

Nonetheless, while the storm is expected to go ashore farther to the north, it is fairly strong and that strength will make up for some of the energy lost to it being farther away.

Buoy reports also have the storm perhaps a bit stronger than the forecasting models think it is, so that's why the High Wind Warning was expanded overnight to include the Puget Sound area. Central pressure of the storm could be in the 968-972mb range by the time it makes landfall on Vancouver Island later this morning.

The storm also now looks to come ashore even farther north than it did on Sunday morning -- the north-central tip of Vancouver Island as opposed to Central Vancouver Island. But on the flipside, as we mentioned, the models have the storm stronger when it comes inland, and the buoys say it could even be a touch stronger than the models.

For us, the fact that the storm will be stronger but farther away will counter-balance each other, so our forecasted wind speeds are still the same. This does probably mean that central Vancouver Island and southern B.C. inland areas (like Vancouver and Whistler) will get stronger winds.

How Does This Storm Compare?

(This will be updated later Monday morning when we get more data. Below is from Sunday night.)

It's nowhere near the December of 2006 storm, but it could be in the realm of the storm that hit a few weeks ago in mid-October. That was a 980mb storm, but it came ashore a lot closer to our area. Our big historical windstorms have had central pressures in the 955-970mb range, and have come in much closer to our area.

Note that in the October storm, the far northern areas were somewhat spared from the winds we were expecting, because the storm came in farther south. The Monday storm has a more classical path, so I would actually expect the forecasted wind speeds across that entire

region this time. Also, we're not expecting much in the way of east wind through the Cascade foothills this time, as this storm doesn't seem to have a classic east-west set up for winds.

(As an aside, those of you who read my Friday forecast talking about a huge storm in the Pacific for Monday on par with a Category 3 hurricane -- that disappeared from the models the next day, so was an apparent model error. This storm is not related.)

Don't Forget The Rain

Aside from the wind, Monday will be very wet as well as the front brings a good dose of rainfall along for the ride. It's not quite cold enough for mountain pass snow Monday -- snow levels will be around 4,500 feet -- but snow levels do drop to 2,500-3,000 feet Monday night and Tuesday. We won't have much moisture by then, but could make for a little snow in the passes.

Where Do We Go From Here?

Winds will gradually decrease through Monday evening and night, as rain changes to showers, then decrease. We actually calm down quite a bit for Tuesday with showers in the morning then tapering off for the afternoon.

Long range forecasts show a return to generally wet and breezy conditions through the end of the week. The storms will pack a good dose of rain, but not as much wind -- jut the usual 20-30 mph stuff. The wettest periods appear to be Wednesday evening/night; Thursday evening/night; and during the day on next Saturday. In between, we'll see scattered showers. High temperatures through the period will be around 50.

komo 4 !

November 13, 2007

Power restored to most customers

SEATTLE -- One day after a storm with winds gusting to nearly 100 mph blew through Western Washington, crews had restored power to all but about 11,000 customers.

Puget Sound Energy said most of those still without power were in Whatcom and Thurston Counties, and line crews hoped to have electricity flowing to most of those homes by noon today.

A PSE spokesman said a main transmission line near the town of Glacier in east Whatcom County is down and crews have to build a road to get repair equipment into the area.

Linnette Engler sent in this photo of wind-blown power lines in Bellingham

At the storm's peak midday, about 100,000 people had lost power.

The Rainier School District and Ocean Beach School District cancelled classes Tuesday because of power outages, and in Whatcom County the Meridian School District had to close Reither Primary School and Ten Mile Creek Elementary School.

While the main Puget Sound area was mostly spared the worst, the coast and Northwestern Interior sections of the state had the strongest winds since the December 2006 windstorm.

Clallam Bay reported a gust to 92 mph, while Bellingham had an official gust to 74 mph, and an unofficial gust of 97 mph from a trained spotter six miles northeast of the city (that might have been a localized effect.) Anacortes recorded a gust to 73 mph, while on the coast, wind gusts were between 70 and 79 mph, including 71 mph at Hoquiam.

Here are some peak overall storm gusts.

- Bellingham (trained spotter, but unofficial): 97 mph
- Clallam Bay: 92 mph
- Lake Lawrence: 84 mph
- Tatoosh Island: 78 mph
- Destruction Island: 75 mph
- Bellingham (official): 74 mph (then 71 again at 10 a.m.)
- Anacortes: 73 mph
- Hoquiam: 71 mph (they've hit over 70 a few times)
- Oak Harbor: 70 mph
- Smith Island: 68 mph
- Westport: 67 mph
- East Strait of Juan De Fuca Buoy: 64 mph
- Friday Harbor: 63 mph
- Ferndale: 62 mph
- Port Angeles: 58 mph (early Monday a.m.)
- Point Robinson: 57 mph
- Forks: 57 mph (last observation before power outage at 6 a.m.)

- Seattle (Alki Beach): 55 mph
- Hoquiam: 54 mph
- La Conner: 53 mph
- Tacoma: 53 mph
- Forks: 52 mph
- Seattle (Magnolia): 51 mph
- Orcas Island: 48 mph
- Seattle (Sea-Tac): 47 mph
- Olympia: 46 mph
- Everett: 39 mph

The Meteorological Lowdown:

A strong area of low pressure of at least 967mb made landfall along the northern tip of Vancouver Island around 8 a.m. Monday. This was close to a classic wind storm pattern for us. (If we were to call it a "text book" case, we would want it going ashore either near Neah Bay or along the southern tip of Vancouver Island).

Nonetheless, while the storm went ashore farther to the north, it was fairly strong and that strength made up for some of the energy lost to it being farther away.

That 967mb report came from Solander Island, off the northwest coast of Vancouver Island and near the storm's center. (They also had wind gusts to 79 mph).

The storm's path allowed for strong south winds along the coast, and strong southeast winds along the northern interior. The Olympic Mountains protect the main Puget Sound area from those southeast winds, but usually that area gets the wind when the storm's center passes due north and the associated cold front opens the chute for the due south winds to race toward the low.

However, in this case, the front was aligned to where it allowed some of the building wind surge to push through via the Strait of Juan de Fuca. That alleviated some of the pressure difference so when the front passed through the Puget Sound region, we didn't have as much of a surge left.

We still had wind gusts into the 40-45 mph range (Spots near Puget Sound were over 50 mph) but not as much as we had feared. (The storm making landfall father to the north also helped let Puget Sound region off the hook.)

Southern British Columbia did get hit hard by the storm, as they were closer to the storm's landfall. Gusts around the greater Vancouver area were in the 55-60 mph range.

How Does This Storm Compare?

This storm's central pressure was on par with the December 2006 storm and actually stronger than the Inauguration Day storm of 1993. However, it made landfall much farther north, and that spared the Puget Sound area the bulk of the wind.

This storm was the strongest storm to hit the coast and Northern Interior since the December 2006 storm. In fact, Bellingham, Friday Harbor and Hoquiam had stronger winds with this storm than the December '06 storm.

KING5

November 13, 2007

Cleanup begins after wind storm hits Northwest

SEATTLE — The cleanup continues this morning after Monday's windstorm knocked out power to thousands around Western Washington.

At the height of the Veterans Day windstorm, winds gusting from 70-95 mph blew trees and branches onto power lines and cut electricity to nearly 85,000 homes and businesses, from the Canadian border all the way south to Vancouver, Wash.

While the storm wasn't as bad as last December's windstorm, it caused a fair amount of damage. In the town of Rainier, high winds blew off part of the roof of a store. In Yelm, winds shattered a barn, and several large trees were uprooted.

Puget Sound Energy reports 11,000 customers are still without power Tuesday morning - 9,000 in Whatcom County and 2,000 in Thurston County. PSE says most of its customers should be back online by noon.

Clallam County has 12,000 without power, but they're expected to also be back up by midday. In other areas, power isn't expected to get back up until Tuesday night.

School closures and delays

Some schools were closed or delayed Tuesday due to damage from Monday's wind storm.

All schools in the Rainier School District in Thurston County are closed because of power problems. In the Ocean Beach District, all schools will now be closed.

The Yelm School District is running two hours late. There's no morning pre-school, no skill center and no out-of-district transportation.

High winds clocked at 97 mph

The National Weather Service said the strongest gust of wind it recorded was 97 mph along the Mount Baker Highway east of Bellingham about 9 a.m. Winds at Bellingham International Airport, about 80 miles north of Seattle, gusted to 74 mph.

A weather station at Bellingham Cold Storage, on Bellingham Bay, recorded a gust of 84 mph. Sustained winds were around 45 mph, and wind speeds alone broke several windows.

Other wind gusts reported by the National Weather Service about noon included 71 mph at Hoquiam, 62 at the Whidbey Island Naval Air Station near Oak Harbor, 56 at Friday Harbor, 55 at Quillayute on the Olympic Peninsula, 53 at McChord Air Force Base near Tacoma, 48 at La Center, 46 in Kelso, 45 at Burlington, and 41 at Olympia and Seattle-Tacoma International Airport.

Widespread power outages

One of the earliest power outages was before dawn around Monroe, where about 8,000 customers lost power for a time after three substations went off line, said Neil Neroutsos, a spokesman for the Snohomish County Public Utility District.

That problem was resolved fairly quickly, but later storm-related problems cut power to about 1,400 customers in the Lake Stevens area, Neroutsos said.

The region's largest utility, Puget Sound Energy, had roughly 37,000 customers in the dark at various times in nine counties, with Whatcom and Thurston counties hit the hardest, spokeswoman Christina Mills said.

More than 15,000 customers were without electricity in the Grays Harbor County Public Utility District, spokeswoman Liz Anderson reported.

At least 9,300 Cowlitz County PUD customers also lost power, along with 8,000 in the Clallam County PUD, utility officials said.

Seattle City Light reported nearly 3,900 customers lost power in the Burien area because of a failure in a feeder line.

Eastern Washington also had problems. Spokane-based Avista Utililties said about 1,140 customers lost power in Eastern Washington and northern Idaho from wind-related power outages.

Windy weather was blamed for outages that hit about 2,000 homes and businesses north of Vancouver, Wash., mostly in and around Yacolt, Amboy and Ridgefield, said Mick Shutt, a spokesman for the Clark County Public Utility District.

Snow in the Cascades

The Weather Service issued a snow advisory for the Cascade mountain passes, with the possibility of four to eight inches falling near Steven's Pass Monday night.

Snoqualmie Pass east of Seattle had wet snow and slush on a 20-mile stretch of Interstate 90 from the summit to Easton, transportation officials said.

Additional snow removal crews were summoned to keep the road clear for holiday traffic.

Oregon

High winds also cut power to tens of thousands of Oregonians Monday including about 15,000 on the north coast and up to 35,000 at a time inland, mostly in Marion, Washington, Clackamas and western Multnomah counties.

Portland General Electric said outages in its area were as high as 35,000 at midday as service was restored to some areas but then failed elsewhere as a powerful Pacific frontal system moved through the area.

About 300 crewmen were working on restoring service.

By late afternoon about 16,000 PGE customers remained without electricity.

The urban science of wind

The wind storm provided the first test of a network of 23 sensors placed atop light poles in Downtown Seattle that use the sound of the wind to measure wind speed and direction.

The wind bounces off buildings and goes all over the place. Now, these microenvironments can be measured.

"We had some winds at 22-23 miles an hour. Parts of Downtown never got above five (miles an hour), because the wind, once it gets into the urban canyons, breaks up and goes every which way," said Bob Royer, director of the Urban Canyons Program.

In this case, the system is providing interesting weather information. But, that data could also prove critical to predicting what direction a plume of hazardous material or even radiation from a terror attack might travel.

PENINSULA DAILY NEWS
Your Peninsula. Your Newspaper.
November 13, 2007

Jefferson weathers 60-mph winds

By Jeff Chew, Peninsula Daily News

Power was expected to be restored to all areas of East Jefferson County today after wind gusts of up to 60 mph hammered the area on Monday.

The early-morning storm knocked trees into power and fiber optic lines and disrupted service from Brinnon to Discovery Bay and Port Townsend.

Some of OlyPen's DSL customers remained off-line Monday evening.

Other Internet and cell phone services for OlyPen's 10,000 customers in Jefferson and Clallam counties were restored Monday afternoon, said Dana Dyksterhuis, a Qwest spokeswoman in Seattle.

The storm had sent a tree onto power lines and a fiber optic cable at Eaglemount Road on state Highway 20 near Discovery Bay, crippling Qwest's long-distance and digital service across the North Olympic Peninsula.

Qwest repair crews had to wait until utility workers could clear electric lines at the site Monday morning.

They were working to splice the fiber optic line Monday afternoon.

Puget Sound Energy spokeswoman Dorothy Bracken said that electricity was expected to be fully restored to 13 east county locations this morning.

1,300 lost power

"As of 2 p.m. [Monday] there were 1,300 customers without power in Jefferson County," Bracken said.

"Most [locations] have been scattered - where trees or tree branches hit power lines."

Although she did not know which communities were hit hardest, Bracken estimated that the largest number of customers affected in any individual area was about 100.

"What's labor intensive is going from location to location to make the repairs," she said.

A total of 77,000 Puget Sound-area customers were affected by the windstorm she said.

The good news is, according to weather forecaster Brad Coleman, "This event's done. We've taken all the warnings down."

"But it is probably pretty safe to say that the gusts were up to 60 mph in Eastern Jefferson County," said Coleman, with the National Weather Service in Seattle.

Dyksterhuis said trees felled some of the company's fiber optic lines, which also affected cell phone service.

Many people found they had dial tones, she said, but could not dial through, as a result of the tree-damaged lines.

She explained that the broken fiber lines diminished the Qwest system's capacity to handle increasing calls.

Lt. Clint Casebolt, State Patrol spokesman, said the law enforcement agency reported trees down so that Department of Transportation crews could clear highways and roads.

Reports of fallen trees came before 6 a.m., especially between Brinnon and Quilcene and on state Highway 19.

Gardiner and Discovery Bay were also hit, but fewer trees fell there, he said, adding, "It was all cleaned up by noon."

Port Townsend Police Detective Jason Greenspane said that several fallen trees were reported around the city, with power lines knocked down at 49th Street near Cook Avenue.

"Several partially blocking trees have been removed," he said Monday afternoon.

A roof was partially blown off an unoccupied former thrift store building on Upper Sims Way adjacent to First Federal Savings & Loan.

Greenspane also reported wind-whipped waves early Monday that crashed up against the bulkheads on the downtown waterfront, but resulted in no significant damage.

THE BELLINGHAM HERALD
November 13, 2007

Ferocious winds create howling havoc

By KIRA MILLAGE

Fall winds whipped through Whatcom County Monday morning, knocking down trees, taking out utility lines and giving many residents a case of déjà vu.

The first major windstorm of the season came a few days shy of the anniversary of the Nov. 15, 2006, windstorm that uprooted trees, caused two buildings to catch fire and knocked out power to large areas across the county.

Wind speeds peaked Monday between 8 and 9 a.m., with the National Weather Service reporting gusts of 97 mph on Mount Baker Highway and 74 mph at Bellingham International Airport. A weather station at Bellingham Cold Storage, on Bellingham Bay, recorded a southwest gust of 84 mph. Sustained winds were about 45 mph.

The winds and falling trees closed roads and took out dozens of power lines. Puget Sound Energy had 15,000 Whatcom County customers without power as of 4:30 p.m. It was unclear

how many homes overall lost power at some point Monday. Outages were reported across the county.

"Of our eight counties in Western Washington, Whatcom and Thurston where hardest hit" in terms of number of customers losing power, PSE spokeswoman Dorothy Bracken said.

PSE crews were working through the night to restore power. Most customers should have power restored by daybreak today, she said. Some remote spots might not have power until about noon today.

Some roads might still be closed today as well. Whatcom County Public Works couldn't clear many areas Monday because they were waiting for PSE to clear downed power lines first.

During the peak of the storm, Samish Way-area resident Stanley Emert and his wife received a surprise while sitting in their kitchen eating breakfast. About the top third of a nearby 130-foot tree landed on the carport, porch and roof of their mobile home.

Emert, who moved there about six weeks ago, said they were also without power for several hours, but the house is still habitable.

"This is quite a welcome," the 85-year-old said with a laugh.

Many residents escaped Monday's storm without tree or power damage, but wind speeds alone broke several windows.

Bellingham resident Cathy Leahy had a skylight blow off her kitchen roof in the windstorm. She wasn't too worried or upset — until the wind started dying down and the rain picked up.

"It's raining in my house," she said while trying to mop up the water. "I should probably call the window guys now."

Boats in local marinas received minor damage in the wind, but a small motorboat partially sank about 3 p.m. in Lake Whatcom off a dock near the corner of Lake Whatcom Boulevard and Morgan Street. Firefighters with Whatcom County Fire District No. 2 surrounded the boat with an absorbent boom to isolate gasoline seeping from the boat.

THE NEWS TRIBUNE
November 13, 2007

South Sound spared heavy damage Winds down trees, power lines

By STACEY MULICK

You shouldn't have as hard a time today keeping your hat on or your umbrella under control.

The forecast calls for partly sunny skies with a chance of showers and winds between 10 and 15 mph.

That'll be a relief after Monday's blustery weather knocked down power lines and trees, leaving thousands in the dark.

Nearly 85,000 lost power throughout Western Washington on Monday thanks to winds that gusted to more than 70 mph in some spots. Whatcom, Snohomish and Thurston counties appeared to be among the hardest hit.

At its peak, Puget Sound Energy had roughly 77,000 customers without electricity in nine counties, including Pierce, King and Thurston. The outages in Pierce County occurred in Lakewood, Fife and southern unincorporated areas of the county.

As of 7 p.m. Monday, the utility still had 573 customers in Pierce County without electricity. Power was expected to be restored to them by 7 a.m. today, Puget Sound Energy spokeswoman Dorothy Bracken said.

Seattle City Light reported nearly 3,900 customers without power in the Burien area because of a failure in a feeder line, and more than 100 without power in Seattle for other reasons.

Most of Tacoma Power's customers survived the windstorm unscathed. The utility reported only small outages in pockets throughout its area. At one point in the afternoon, 30 to 40 customers were without power, spokeswoman Sonja Hall said.

"We fared really well so far, so we are pleased with that," she said.

At the height of the storm around noon, the National Weather Service recorded wind gusts of 71 mph at Hoquiam, Grays Harbor County; 68 mph in Bellingham; 62 mph at the Whidbey Island Naval Air Station near Oak Harbor; 56 mph at Friday Harbor, San Juan County; 55 mph at Quillayute on the Olympic Peninsula; 53 mph at McChord Air Force Base; 48 mph at La Center, Clark County; and 41 mph at Olympia and at Sea-Tac Airport.

Snoqualmie Pass had wet snow on a 20-mile stretch of Interstate 90 from the summit to Easton, transportation officials said.

November 13, 2007

High winds cut power to more than 13,000 in Washington state

SEATTLE -- Utility crews remained busy Tuesday following windstorms that brought hurricane-force winds to parts of Washington state and cut electricity to more than 130,000 homes and businesses.

The worst of the damage, including cars and houses hit by falling trees and windows shattered by wind, and the bulk of the power outages Monday were west of the Cascade Range, especially along the coast and in the northwest part of the state.

The strongest gusts of wind reported by the National Weather Service and other weather observers were 119 mph at Camp Muir at the 10,100-foot level of Mount Rainier; 98 on Rattlesnake Mountain, west of the Tri-Cities; 97 along State Route 542, the Mount Baker Highway, east of Bellingham; 92 at Sekiu and Clallam Bay on the northern Olympic Peninsula west of Port Angeles, and 84 mph at a business on Bellingham Bay.

Most of the electrical outages were repaired by midnight.

The region's largest utility, Puget Sound Energy, had roughly 77,000 homes and businesses in the dark at various times in its nine-county service area.

By early Tuesday, spokeswoman Dorothy Bracken said, the number was down to 11,000 customers, including 9,000 in Whatcom County, which includes Bellingham, and 2,000 in Thurston County, which includes the state capital of Olympia. She said the vast majority would likely have their lights back on by noon.

About 17,000 customers lost power in the Clallam County Public Utility District, which covers the northern part of the Olympic Peninsula. In the neighboring Grays Harbor County PUD, on the coast, more than 15,000 were in the dark.

Internet and cellular telephone service to about 10,000 customers in Clallam and Jefferson counties was lost for hours after a tree was blown onto power lines and a fiber optic cable on State Route 20 near Discovery Bay, south of Port Townsend, Qwest telecommunications officials said.

Other electrical outages affected about 10,000 customers each in the Snohomish and Cowlitz county PUDs, 4,000 in the Seattle City Light service area and 2,000 in the Clark County PUD.

East of the mountains, Avista Utilities had about 1,140 customers without power in Eastern Washington and northern Idaho and Pacific Power had more than 2,100

The storm also caused a 10-acre brush fire that took 30 firefighters from five agencies about two hours to control in Wapato. Fire officials said the fire started when high winds snapped a tree limb that knocked a power line to the ground.

Blowing dust that cut visibility to near zero was likely a factor in the rollover of a tractor-trailer rig carrying fertilizer on U.S. Highway 97 south of Toppenish, the State Patrol reported, and also resulted in workers at the Hanford nuclear reservation being sent home early Monday afternoon.

THE BELLINGHAM HERALD

November 12, 2007

Overnight storm blamed for power outages

By ANDY CAMPBELL

An overnight storm has caused outages in Blaine, Lynden and scattered areas in Bellingham this morning, and high winds are expected to continue today.

A Puget Sound Energy spokeswoman said an entire circuit in Lynden was cut, leaving more than 700 without power. She said it is the most widespread outage in Whatcom County this morning, and those people should get power back within the next few hours.

PSE also reported scattered outages around Whatcom, Skagit and King Counties, and KING-TV said three substations near Monroe are off line, cutting off power for about 8,000 utility customers.

The National Weather Service is warning of high winds today on the Washington coast and other parts of Western Washington, including the Puget Sound area. A spokesman said peak winds are hitting 60 to 65 mph, with a sustained wind of 45 mph that will last throughout the morning.

Winds should die down midday, he said.

Forecasters say a front blowing through the rest of the state is packing winds of 30 to 40 mph with gusts to 60. That's enough to knock trees into power lines.

Seattle Post-Intelligencer

More than 20,000 power outages in Western Washington

SEATTLE -- High winds blowing through Western Washington knocked out power this morning for more than 20,000 utility customers.

Three substations went off line near Monroe, putting about 8,000 customers in the dark for a time. A spokesman, Neil Neroutsos (ner-OOT'-soh), says that problem has been resolved. But storm-related outages have cut power to about 1,400 customers in the Lake Stevens area.

Puget Sound Energy reports 9,000 to 10,000 outages in Whatcom, Skagit, Island, Kitsap and King counties.

Seattle City Light reports nearly 3,900 customers without power in the Burien area because of a failure in a feeder line.

KING 5

October 19, 2007

Windstorm tests improvements to PSE

By GLENN FARLEY

DUVALL - The first major winter windstorm that swept through Puget Sound Thursday had power crews scrambling to restore power.

It was the first test of big improvements made to Puget Sound Energy's vegetation management system after last December's big windstorm, which left some customers without power for up to 10 days.

This year, the utility increased its budget for clearing trees away from power lines by an additional $2 million - $12 million total, for what is called "vegetation management."

"It is all tree related outages that occurred yesterday. So anything that keeps a tree limb or a tree clear of the power line is well worth the effort," Bracken said.

By early this Friday evening, Puget Sound Energy still had 9,000 people without power, mostly in north and south King County and Kitsap County. Snohomish County PUD had 7,500 customers out and Tacoma Power was almost fully restored with 250 customers out. Seattle City Light had no outages.

Crews have been out day and night getting the power back on. A map of PSE's power outages shows 160,000 customers out at the peak late Thursday afternoon. But in December of 2006, power was out everywhere it seemed. It was a much stronger storm, but also occurred later in the year when there were fewer leaves on trees like Cottonwoods.

A map from back then shows 700,000 customers in the dark, for as long as nine and 10 days.

"It was the most devastating storm we've ever experienced in our history," said Dorothy Bracken, a spokesperson for PSE.

The utility is at work replacing more power poles, and has designated zones, like Woodinville and Whidbey island, planning to put in back up power lines to keep the juice flowing

"We've also identified some hot spots, where we feel the some of the parts of the utility system need to be strengthened," Bracken said.

THE NEWS TRIBUNE

October 19, 2007

Wind takes trees, power

By IAN DEMSKY

If you're reading this, you survived the first storm of the fall. Luckily, the casualties Thursday were mainly trees, power lines, after-school activities and commutes. The only report of serious injury came from Kent, where a 60- to 75-foot cottonwood tree snapped in high winds and fell on a woman at shopping center just after 2 p.m.

KIRO 7 Eyewitness News reported a power line fell on a school bus in Maple Valley, causing it to be evacuated. And the Hood Canal Bridge linking the Kitsap and Olympia peninsulas closed for nearly three hours due to strong winds.

Weather watchers assure us the worst is over and today will be a bit yucky, but not nearly as severe.

"You'll see some showers and maybe a few thunderstorms as some cold air moves in," said Tim Roche, of Weather Underground forecasting service. "Other than that, it shouldn't be too bad."

What we saw Thursday were the remains of a tropical cyclone, he said, "but this thing that's coming in tomorrow is more your typical winter Pacific storm."

Tens of thousands in Pierce County lost power, but crews brought those numbers down quickly and continued to work late into the night. Figures weren't available from Puget Sound Energy, but Tacoma Power reported that at the worst point, 23,000 customers were without power.

As of 6 p.m. Thursday, the National Weather Service reported the day's highest sustained wind at Sea-Tac Airport was 39 mph, and the highest gust was 53 mph.

The highest gust reported by early evening was 62 mph in Spanaway, said Weather Service meteorologist Carl Cerniglia.

A plea to residents to be prepared with emergency supplies of food, water, batteries and other necessities was issued Wednesday by Gov. Chris Gregoire, who said state emergency management was on alert.

Before the storm hit, Puget Sound Energy crews were trimming trees away from power lines. Officials noted that many trees still had a full load of wind-catching leaves, making them vulnerable to being blown down or losing branches. The utility, which struggled to restore power to 700,000 homes and businesses in December, is spending an extra $2 million on tree trimming, spokeswoman Martha Monfried said.

WHIDBEY NEWS-TIMES
October 20, 2007

Wind whips Whidbey Island

By Nathan Whalen

As the result of Thursday's first storm of the season, more than 15,000 homes on Whidbey Island lost power due to the high speed winds that buffeted the area that afternoon.

However, as of noon Friday, power had been restored to all but three homes on the island, according to Puget Sound Energy.

Winds reached speeds close to 50 miles per hour, according to information from the Naval Pacific Meteorology and Oceanography Detachment Whidbey.

The fall windstorm apparently spared the area from any significant damage.

Marv Koorn, chief of North Whidbey Fire and Rescue, said firefighters responded to only one call — a downed tree on Silver Lake Road.

"We had it pretty easy," Koorn said.

The high winds did prompt the cancellation of Thursday's swim meet between Oak Harbor and Everett. The Everett swimmers didn't make the trip to Whidbey Island.

On Central Whidbey, firefighters responded to nine calls during the windstorm. Central Whidbey Fire and Rescue Chief Joe Biller said that all those calls were to remove fallen trees that had blocked roads or driveways or had fallen into power lines.

He said that one lady in the Lagoon Point area nearly had to be relocated due to the power outage because she is on oxygen. Fortunately power was restored before she needed to be moved.

High winds wreaked havoc on Whidbey Island last year. Those winds caused numerous power outages, some lasting for days, and snarled traffic during the winter months.

8.4.1-C

From: Lofstrom, Daniel J
Sent: Sunday, November 11, 2007 7:03 PM
To: Storm Declaration - list -; System Managers Report - list -
Subject: High Wind Watch
National Weather Service has issued a High Wind Watch for Monday morning.....

URGENT - WEATHER MESSAGE...CORRECTED
NATIONAL WEATHER SERVICE SEATTLE WA
358 PM PST SUN NOV 11 2007

.A 992 MB LOW APPROXIMATELY 700 NM WEST OF NORTH BEND OREGON WILL MOVE NORTHEAST TONIGHT AND DEEPEN. BY LATE MONDAY MORNING THE LOW WILL
MOVE INTO THE MIDDLE OF VANCOUVER ISLAND WITH A CENTRAL PRESSURE NEAR 982 MB. THE LOW WILL CONTINUE TO MOVE NORTHEAST MONDAY AFTERNOON. THE FRONT ASSOCIATED WITH THE LOW WILL REACH THE WASHINGTON COAST MONDAY MORNING AND MOVE THROUGH THE INTERIOR OF WESTERN WASHINGTON LATE IN THE MORNING. STRONG WINDS ARE EXPECTED AHEAD AND WITH THE FRONT ALONG THE COAST AND OVER THE NORTHWEST INTERIOR WITH STRONG WINDS POSSIBLE OVER THE REMAINDER OF THE LOWLAND WITH AND JUST AFTER THE FRONT.

WAZ504-505-507>509-511-512-120815-
/O.NEW.KSEW.HW.A.0006.071112T1200Z-071113T0000Z/
SOUTHWEST INTERIOR-EAST PUGET SOUND LOWLANDS-EVERETT AND VICINITY-SEATTLE/BREMERTON AREA-TACOMA AREA-HOOD CANAL AREA-
LOWER CHEHALIS VALLEY AREA-
358 PM PST SUN NOV 11 2007

...HIGH WIND WATCH IN EFFECT FROM LATE TONIGHT THROUGH MONDAY AFTERNOON..

THE NATIONAL WEATHER SERVICE IN SEATTLE HAS ISSUED A HIGH WIND WATCH...WHICH IS IN EFFECT FROM LATE TONIGHT THROUGH MONDAY AFTERNOON.

A DEVELOPING STORM SYSTEM OVER THE EASTERN PACIFIC WILL STRENGTHEN TONIGHT AND MONDAY MORNING AS IT MOVES NORTHEAST.

THE FRONT ASSOCIATED WITH THIS LOW IS EXPECTED TO MOVE THROUGH THE AREA LATE MONDAY MORNING WITH STRONG SURFACE PRESSURE RISES BEHIND THE FRONT. SOUTH WINDS OF 30 TO 40 MPH WITH GUSTS TO 60 MPH ARE POSSIBLE WITH AND JUST BEHIND THE FRONT. THE HIGH WINDS ARE NOT EXPECTED TO LAST VERY LONG. AT THIS TIME IT LOOKS LIKE THE STRONGEST WINDS WILL BE IN A THREE HOUR WINDOW BETWEEN 10 AM AND 4 PM MONDAY. WINDS WILL DIMINISH SIGNIFICANTLY AFTER 4 PM.

HIGH WINDS CAN TOPPLE TREES...DOWN POWER LINES...AND DAMAGE SOME STRUCTURES. POWER OUTAGES WILL BE POSSIBLE WITH WINDS THIS STRONG.

HIGH WIND WATCH MEANS THERE IS THE POTENTIAL FOR A HAZARDOUS HIGH WIND EVENT. CONTINUE TO MONITOR THE LATEST FORECASTS FROM THE NATIONAL WEATHER SERVICE.

$$

FELTON
WEATHER.GOV/SEATTLE

PUGET SOUND ENERGY

Emergency Operations Center UPDATE – for External Distribution

This report is provided for the following audiences:
State, County and City Emergency Management Division Staff
Regional Jurisdiction EOC's
Community Trade and Economic Development
Red Cross
Department of Transportation
Other Agencies

EOC e-mail: PSEEOC@pse.com
EOC FAX: 81-4450 or (425) 453-4450
(Revised 10/2007)

Event Name:	Lingering Ling *(remnants of Tropical Storm Ling Ling)*
Time and Date of this Update:	18:00 10/18/2007
Date and Time of Storm Event:	08:00 10/18/2007
Time Puget Sound Energy (PSE) EOC Opened:	14:15 10/18/2007
Time PSE EOC Closed:	

EOC Manager:	Don Yuen
EOC Director:	Jan Senk

Event Overview:

(Describe major problem areas, status of workforce working and en-route, etc.)

Puget Sound Energy is experiencing scattered power outages affecting thousands of customers in parts of Thurston, Pierce, King, Kitsap, and Island counties as a result of the strong winds hitting Western Washington.

PSE crews have been in the field restoring power to several thousand customers since this morning, but with strong winds still blowing, new outages continue to occur and no estimate is available at this time on the total number of PSE customers who've lost power.

Depending on how long the winds continue and the extent of damage it causes, it is not possible yet to provide an estimate of service restoration. We anticipate some restoration information tomorrow morning after assessment is complete.

PSE has approximately 60 line crews, together with about 19 tree crews and a full complement of damage-assessment crews, working to restore customers' power. In addition, another 7 line crews are in transit with others available as needed.

Incident Action Plan:

(System restoration plan at this time; e.g., priority restoration areas.)

We are calling crews in from Eastern Washington and Oregon to assist our restoration efforts. Crews will work through the night along with damage assessors to continue to restore service. Estimated restoration times by areas will be provided when assessment is complete. We anticipate having regional restoration information by mid day tomorrow.

System Status:

Region	Transmission Circuits Out	Substations Out	Distribution Circuits Out	No. Line & Tree Crews	# Cust. Out	Estimated Restoration Date/Time (if known)
Whatcom	0	0	0	9	64	
Skagit	0	0	1	9	2,957	
Island	3	3	10	1	5,171	
N. King	4	2	1	11	6,038	
S. King	2	1	10	14	9,656	
Pierce	4	0	3	8	10,166	
Thurston/ Lewis	1	1	3	11	11,158	
Pt. Townsend	0	0	0	0	206	
Poulsbo/ Kitsap	1	3	8	13	26,561	
Vashon	0	0	0	3	3,018	
Kittitas	0	0	0	0	0	
Totals	15	10	36	79	74,996	

PUGET SOUND ENERGY

Emergency Operations Center UPDATE – for External Distribution

This report is provided for the following audiences:

State, County and City Emergency Management Division Staff
Regional Jurisdiction EOC's
Community Trade and Economic Development
Red Cross
Department of Transportation
Other Agencies

EOC e-mail: PSEEOC@pse.com
EOC FAX: 81-4450 or (425) 453-4450
(Revised 10/2007)

Event Name:	Veteran's Day Storm
Time and Date of this Update:	11/12/07 20:00
Date and Time of Storm Event:	11/12/07 4:30 AM
Time Puget Sound Energy (PSE) EOC Opened:	11/12/07 8:00 AM
Time PSE EOC Closed:	

EOC Manager:	Shamish Patel
EOC Director:	Booga Gilbertson and Harry Shapiro

Event Overview:

Corporate Communications
Windstorm Update – 8:00 p.m. Monday, Nov. 12, 2007

The windstorm that brought down trees and tree limbs across much of the Puget Sound region this morning knocked out electric service to approximately 77,000 Puget Sound Energy customers by the time the storm peaked in midafternoon. As of 8:00 p.m. today, PSE line crews had made significant progress restoring power, with electricity back on for more than two-thirds – about 55,000 – of the affected homes and businesses.

PSE crews have power restored to virtually all customers – with the possible exception of some small, isolated pockets – in King and Pierce Counties. Over the next several hours, we expect to complete most restoration activities in Skagit, Island, Kitsap, and Jefferson Counties.

In Whatcom County, most customers should have their power by daybreak tomorrow, though final restoration work may last until about noon. In Thurston County, the majority of affected PSE customers also should have their electric service back by daybreak, with final restoration work expected to continue until late Tuesday afternoon.

As PSE crews outside of Whatcom and Thurston counties complete their restoration efforts, they are being dispatched to Thurston and Whatcom counties to speed the restoration of customers' power.

Customers in Whatcom and Thurston counties who are without power and have special medical needs or conditions may want to consider finding alternate accommodations, if possible, for tonight.

Incident Action Plan:

Please see below table for an overview of the number of crews working in the field, and for estimated restoration times. All Storm Bases still open expect to complete restoration activities either with personnel already at the storm base, or with additional crews that are either traveling into the area, or being released as other storm bases close.

System Status:

Region	Transmission Circuits Out	Substations Out	Distribution Circuits Out	No. Line & Tree Crews	# Cust. Out	Estimated Restoration Date/Time (if known)
Whatcom	3	2	3	17	12,092	80% by 08:00 11/13
Skagit			1	7	509	11/12 24:00
Island				5	19	11/12 24:00
N. King	1			10	74	Closed
S. King				0	83	Closed
Pierce				9	243	Closed
Thurston/ Lewis	2		7	17	11,686	70% by 08:00 11/13
Pt. Townsend				11	594	11/13 02:00
Poulsbo/ Kitsap				2	28	11/13 02:00
Vashon				1	3	
Kittitas				0		
Totals	6	2	11	79	25,341	

Levels	Description	Electric Criteria	Gas Criteria	Level of Response	Customer Service, Corporate Communications, Community and Government Relations Actions
Green	Level 0 – Normal	Nominal conditions across system	Nominal conditions across system	Normal daily response activity.	Areas work with System Operations leadership to manage customer issues or needs.
Yellow	Level 1 - Regional	Event localized to individual geographic areas; resources within region adequate for response.	Localized event managed with regional resources.	Operations base(s) open; coordination with system operations or gas control. Gas Planning Strategy Center open for gas emergencies.	Operating bases will assign a "communications lead" as required to be a central point of contact for customer or community information. These individuals have past storm room experience, and the ability to find the information without disturbing storm base operations management who are focused on restoration. Logistics to support the process include the establishment of the Bothell Emergency Center (PSE's Call Center) with a formal escalation process and specifically trained personnel on point to manage customer calls, and the identifcation of qualified staff for PSe corporate headquarters. PSE's Industrial, major business customer and school/hospitals account representatives will work out of the EOC and gather information from System Operations.
Orange	Level 2 – Significant	Multiple regions affected; requires resources from other PSE regions and/or outside PSE service territory.	Multiple regions affected; requires resources to be allocated to other PSE regions.	EOC open; multiple operating bases and may activate local area coordination. Employees with emergency response assignments mobilized.	Operating bases will assign a "communications lead" as required to be a central point of contact for customer or community information. These individuals have past storm room experience, and the ability to find the information without disturbing storm base operations management who are focused on restoration. Logistics to support the process include the establishment of the Bothell Emergency Center (PSE's Call Center) with a formal escalation process and specifically trained personnel on point to manage customer calls, and the identifcation of qualified staff for PSe corporate headquarters. PSE's Industrial, major business customer and school/hospitals account representatives will work out of the EOC and gather information from System Operations.
Red	Level 3 - Major	Most or all regions affected; maximum level response required; need extensive resources from outside area.	Most or all regions affected; may request operator qualified resources from outside PSE.	EOC open; most or all operating bases open; external logistics support may be employed; full corporate response to support restoration efforts.	Operating bases will assign a "communications lead" as required to be a central point of contact for customer or community information. Depending on the volume of escalation in a major event, Base Operations may provide a point person in the Call Center to assist with information gathering. Officers of PSE have been provided emergency response roles for "major" events, including a group identified to support escalated calls at the Call Center. PSE's Industrial, major business customer and school/hospitals account representatives will work out of the EOC and gather information from System Operations.

PUGET SOUND ENERGY

Operations
Conference Call Agenda *(Rev. 10-5-07)*

SCHEDULE INITIATED BY EOC

(Calls tentatively scheduled at 06:30 and 14:30 (or close to shift changes at bases)

Subject	***Responsibility***	***Est. Time***
Weather Update	EOC	1 min.
Storm Base Reports ▪ # outages ▪ Subs out ▪ Transmission out ▪ Estimated overall damage *(% of area hit; % assessed)* ▪ # crews working and on-site ▪ # crews en route/time expected ▪ Resources needed??? *(damage assessment, CLX, tree/line crews, flaggers, materials, etc.)* ▪ Restoration plan ▪ Staffing plan; *shift change (who and when)*	Potelco Base Manager & EFR Supervisor	5 min/base
Storm Characterization – *for customer communications*	All	3 min.
Priority Issues	All	3 min.

Lodging Coordinator

Provide lodging coordination for regional operating bases, working with the Emergency Operations Center (EOC) to ensure adequate bed capacity for foreign crews and operating/storm base personnel. Manage local lodging arrangements (assign/track personnel and their lodging assignments) throughout emergency event. Coordinate with the EOC to request added lodging locations when additional beds are not available at locations already arranged by the EOC. Coordinate with hotel staff to arrange net additions/reductions in beds as needed throughout event, including providing hotel staff lists of personnel assigned to each facility, number of nights for each room, etc. Work with hotel staff as necessary to resolve lodging issues. Track and provide regular updates to the EOC on lodging utilization throughout the event.

PSE Liaison – County/City EOC(s)

Represent Puget Sound Energy (PSE) at assigned County or City Emergency Operations Centers (EOCs). Serve as liaison and focal point for communications between County EOC staff and PSE. Provide routine updates to County EOC staff on impacts to PSE's energy distribution system(s) and current restoration timelines. Identify key coordination issues between PSE and County (public works, police/fire, roads, parks, transit) DOT or Telco's and facilitate discussions to resolve. Collaborate with the Puget Suond Energy EOC and County Public Information Officers on community messaging. Coordinate with County staff to obtain additional resources if required. Participate in scheduled PSE conference calls. (City EOC's will be staffed on request of the jurisdiction for specific events affecting local areas. These requests are made to the Emergency Planning Manager or Manager Operations Continuity and will be staffed on an as needed basis.) Work schedules may vary, but are anticipated to be a minimum of 12-hour shifts during daytime hours, to be coordinated with the County EOCs.

PSE Liaison – State of WA EOC

Represent Puget Sound Energy at the State of Washington Emergency Operations Center (EOC), located at Camp Murray. Serve as liaison and focal point for communications between State of WA Emergency Management Division (EMD) staff and PSE. Provide routine updates to State of WA EMD staff on impacts to PSE's energy distribution system(s) and current restoration timeline. Identify key coordination issues between PSE and State of WA and facilitate discussions to resolve. Coordinate with appropriate State agencies to obtain temporary rules exemptions where restrictive regulation may adversely affect response efforts. Coordinate with EMD staff to obtain additional resources, as required. Work schedules may vary, but are anticipated to be a minimum of 12-hour shifts during daytime hours, to be coordinated with the State EOC.

PUGET SOUND ENERGY

PURCHASING EMERGENCY RESPONSE MANUAL

In the event of a Seasonal Storm or Major Disaster, such as fire, earthquake, or major storm, organized interaction between Purchasing and Material Distribution and Planning personnel will be crucial.

Organized interaction will assure that required material is issued to recovery crews in an expeditious manner.

Confidential

Updated: October 26, 2007

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Dale Brokaw
(Office)

EMERGENCY PURCHASES MATRIX

Material requested by MDP to route to Purchasing

Emergency or Storm Name:

In the yellow columns A - E: MDP enters their requests for materials needed for an Emergency or Storm Recovery. MDP enters a priority ranking number (1-5).

MDP sends this spreadsheet to the Manager of Purchasing or designee.

Since the material needed is for an emergency this spreadsheet is in lieu of a multi-line SAP purchase requisiton to expedite the sourcing process.

MID	Quantity Requested by MDP	Special instructions to purchasing from MDP	Date MDP created request	MDP Priority # 1 - 5	Assign to Buyer No.

Legend Below

MDP priority ranking number (1-5).

1) Needed ASAP - Next flight out (e.g. special air forwarding). Or via ground, same day truck, via local supplier's truck, local cartage company, or dedicated truck.

2) Required next day - AM Delivery (delivery by 8:00 AM preferred) via Air or truck (LTL or FTL ground shipment).

3) Required within 3 days - two or three day air service. Or via ground (LTL, FTL, or package delivery) from a West Coast supplier.

   If an expedited FTL (out-of-state) truck shipment is required, such as for overhead XFR's, request a two driver truck.

4) Required within 3 to 5 days - Regular ground freight, package delivery, LTL, or FTL (out of state).

5) Replenishment item - regular lead-times are adequate using regular shipping method (typically selected by supplier).

MDP can insert a buyer number if they request a specific buyer they want to source a designated Line Item (Optional)

Rec #	Major Recommendation	Recommendation Source
A	**Emergency Response Planning and Structure**	
1	Enhance PSE employees emergency response planning and execution capability (add 1-2 FTE's to Operations Continuity to support storm plan improvement recommendations)	Storm Team
2	**Enhance emergency response training**	KEMA 4.1
	a) damage assessor training	
	b) contract crew coordinator training	
	c) 911 call taker training	
	d) CLX training	
	e) Lodging coordinator training - new 2007/08	
	f) County/State EOC liaison training - new 2007/08	
3	Clarify ownership of emergency response responsibilities	KEMA 4.1
4	Expand PSE participation in County EOCs	KEMA 4.1
5	Develop succession plan for key positions	KEMA 4.1
6	Stock additional radios for foreign crews at storm bases	Internal Debrief
7	Increased radio frequency channels	Other Int. Debrief
8	Increase radio capacity	Visioning
9	Provide additional cell phones that will work when power supplies are out	Visioning
10	Stock adequate quantities of storm bags in operating bases	Internal Debrief
11	Develop checklist for staging areas	Internal Debrief
12	Develop checklist for foreign crew contracting: materials, equipment, etc.)	Internal Debrief
13	Develop plan for opening Whidbey Operating Base as appropriate: (staffing & triggers)	Internal Debrief
14	Formalize role of lodging coordinators in plan	Internal Debrief
15	Develop a storm categorization methodology and tailor aspects of the CERP to the various levels of storms.	KEMA 5.1
16	Build a storm database that tracks damage and restoration	KEMA 5.1
17	Document historical damage by area	KEMA 5.1
18	Develop initial process for early storm restoration estimates	KEMA 5.1
19	Develop process for early storm restoration estimates	KEMA 5.1
20	Increase the number of trained system operators to improve switching times	Visioning
21	Reinforce management support for employee participation in storm restoration.	Visioning
22	Identify and train additional qualified and skilled employees for key emergency response roles including damage assessors, crew coordinators, dispatchers, system operators, data entry, customer service representatives, and community representatives.	Visioning
23	Provide more circuit map books to Operations Bases	Other Int. Debrief
24	Provide more PSE all-wheel drive SUV's	Other Int. Debrief
25	Assemble a list of electrical contractors who can do weather head or homeowner emergency type of work to not leave customers hanging on weekends or holidays in future	Other Int. Debrief
26	Provide Company issued gear (hats/coats, etc) for all employees working storm	Other Int. Debrief

Rec #	Major Recommendation	Recommendation Source
27	Develop plan for fueling equipment when emergencies make it difficult to get gas	Other Int. Debrief
28	For accountability, hire local people to work in their communities (don't make someone drive to Bremerton to do damage assessment who lives in Puyallup	Customer Focus Groups
B	**Emergency Restoration Execution**	
1	Enhance Damage Assessor training	KEMA 6.1
2	Revise DA process for estimating restoration and crew requirements	KEMA 6.1
3	Formalize field DA process to produce more consistent and actionable information	KEMA 6.1
4	Enhance PSE DA support capability	Team
5	Benchmark DA process best practices	Team
6	Streamline safety orientations for foreign crews	Internal Debrief
7	Expand use of GPS for crews, damage assessors, crew coordinators	Internal Debrief
8	Enhance 911 call taker training and process to triage 911 calls	Internal Debrief
9	Develop plan to deploy additional helicopters for patrolling, damage assessment	Internal Debrief
10	Develop strategy to increase # of qualified flaggers available	Internal Debrief
11	Pursue WA State flagging certification exemption	Internal Debrief
12	Formalize "utility road clearing task force" with DOT, County/City Roads, PSE, Potelco and Asplundh	Governor's AAR
13	Request HOV lane exemption from State Patrol	Governor's AAR
14	Work with State EMD to obtain Governor's Declaration of Disaster	Governor's AAR
15	Review operating base management process	KEMA 7.1
16	Establish emergency restoration perfomance metrics	KEMA 7.1
17	Clarify emergency response roles of PSE and SP	KEMA 7.1
18	**Formalize local area coordination and transmission restoration priority activities.**	KEMA 7.2
19	Formalize and document local area coordination	KEMA 7.2
20	Develop Local Area Coordination Plan	KEMA 7.2
21	Establish triggers to launch Local Area Coordination	KEMA 7.2
22	Develop Local Area Coordination clearance procedures	KEMA 7.2
23	Develop process for triggering "transmission restoration priority teams" including communications to field and operations bases	Internal Debrief
24	Investigate increasing use of self-protected clearance to relieve system operations congestion	Visioning
25	Investigate using a qualified local area crew coordinator to call in clearances for multiple crews	Visioning
C	**External Communications**	
1	**Create an integrated corporate and local communication strategy that is scalable to storm severity.**	KEMA 8.1
2	~~Staff County and State EOC's~~	Governor's AAR
3	Make use of local media and enlist them as partners with a public service perspective.	Visioning
4	Identify local media outlets in advance.	Visioning
5	Send out electronic messages directly from the EOC to media channels.	Visioning
6	Develop culture of openly presenting the picture and setting reasonable outage length estimates, especially in the larger events.	Visioning
7	Proactively build pre-storm relationships with local media and elected officials.	Visioning
8	Provide early, broad estimates of restoration times for customers.	Visioning
9	Provide outage dashboard presentations to cities/counties during storm event (source: CRM debriefing)	Other Int. Debrief
10	Continually update map on pse website showing the progress of work crews	Customer Focus Groups
11	Provide a web-accessible tool for customers to enter an address to get the latest news	Customer Focus Groups
12	Provide ability for customers to send damage information to PSE	Customer Focus Groups

Rec #	Major Recommendation	Recommendation Source
13	Help build community networks to disseminate information through fire stations or put up signs in neighborhoods	Customer Focus Groups
14	Develop a "winter storm warning" best tips magnet for customers to put on refrigerators	Customer Focus Groups
15	Inform customers what substation they depend on and use that when speaking through the media as an efficient way of communicating which areas are up and timelines for others	Customer Focus Groups
16	Assist in setting up local shelters	Customer Focus Groups
17	Use local radio to communicate with customers	Customer Focus Groups
18	Provide outage information and estimated restore times from day 1 in local areas	Customer Focus Groups
19	Post PSE flyers and PSE representatives at police or fire stations	Customer Focus Groups
20	Supply PSE brochures on weather heads and storm restoration flyers in crew trucks	Other Int. Debrief
21	Establish times that PSE representative will be on local radio shows to take call-in questions	Customer Focus Groups
D	**Customer Service**	
1	**Formalize a customer escalated call process.**	KEMA 9.1
2	Formalize a customer call/contact escalation process that does not distract resources from restoration efforts and provides a path for communicating to and from field operations and EOC.	Visioning
3	**Use local carrier phone network in front of CLX/IVRU to enhance call-taking capacity and capabilities.**	KEMA 9.2
4	Increase PSE call taking capacity for varying magnitude of storms	Visioning
5	Develop a system that calls customer numbers with updates on a daily basis	Customer Focus Groups
6	Provide an automated call number to put in your phone number to get a progress report and or a nightly call back	Customer Focus Groups
7	Expand call handling to better accommodate requests for specific information and to more fully collect customer comments	Customer Focus Groups
8	Figure out a way to "deputize" the public to help (i.e.: cut trees, etc) for true community partnership	Customer Focus Groups
9	Cut rates or reimburse public for inconvenience because PSE wouldn't give restoration times	Customer Focus Groups
10	Train most employees as reserves to help call center in disaster so they are prepared in advance of storm	Customer Focus Groups
11	At beginning of phone tree, begin by asking if a customer needs to immediately speak with a representative to press zero now (before long phone message)	Customer Focus Groups
12	Provide a voice mail option so you don't have to wait on hold and can get a call back in two hours	Customer Focus Groups
13	Offer low-cost financing for generator operation and maintenance	Customer Focus Groups
14	State on the call center line the state where the call center is located	Customer Focus Groups
E	**Emergency Response - Information Systems**	
1	**Establish enterprise-level technology, data and integration architecture for outage management related processes.**	KEMA 10.1
2	**Develop end-to-end information and business process flows for outage management and emergency restoration processes.**	KEMA 10.2
3	**Enhance existing technology and systems to close functionality gaps and with the strategy of migrating them toward the final architecture.**	KEMA 10.3
4	Accelerate expansion of SCADA coverage and distribution automation	KEMA 10.3
5	Bridge functionality gaps of Cellnet AMI system	KEMA 10.3
6	Integrate low-cost technology (GPS, digital cameras)	KEMA 10.3
7	**Deploy new systems to close the functionality gaps and build out the outage management architecture.**	KEMA 10.4
8	Select and implement an OMS	KEMA 10.4
9	Select and implement a GIS	KEMA 10.4
10	Implement an electronic storm board	KEMA 10.4
11	Select and implement automated switching and restoration workflow tools	KEMA 10.4
12	**Develop a phased implementation plan for outage management related information system and processes.**	KEMA 10.5

Rec #	Major Recommendation	Recommendation Source
13	Identify and implement interim high-value IT enhancements to existing systems	KEMA 10.5
14	Implement key element of final architecture	KEMA 10.5
15	Use commercially available technology to improve restoration estimates and communications.	Visioning
16	Implement an outage management system	Visioning
17	Enhance current AMR technology to provide connectivity with the OMS and better outage information.	Visioning
18	Develop electronic storm boards tied to AMR, OMS, and mobile work force.	Visioning
19	Automatically interface SCADA into the electronic storm board.	Visioning
20	Increase distribution automation and SCADA	Visioning
21	Develop capability to provide restoration information for individual customers.	Visioning
22	Develop an automated Emergency Operations Center report with real-time data	Visioning
23	Develop capability to translate outage data into relevant information for customers	Visioning
24	Develop ability to tie multiple outages to one event.	Visioning
25	Develop ability to flag key or critical service customers.	Visioning
26	Document, track, prioritize and schedule service orders for secondary lines.	Visioning
27	Incorporate damage assessment and repair information into a system that would assist with material acquisition and dispersion	Visioning
28	Implement a system to document, track, and prioritize 911 calls for improved response time.	Visioning
29	Provide simplified screens for infrequent users of the emergency response tools.	Visioning
30	Allow electronic entry when re-energizing a line and completing the job.	Visioning
31	Allow damage assessment information to be input directly into a laptop in the field.	Visioning
32	Use interactive video feed from Damage Assessors in the field to report specific damage.	Visioning
F	**Service Provider Emergency Response Contract and Processes**	
1	**Refine the ESERSC contract to add the planning, training, communication and evaluation roles necessary to plan for and implement major restoration efforts.**	KEMA 11.1
2	Identify restoration priorities for each operating base	KEMA 11.1
3	Clarify in ESERSC the required communications between EOC and Operations Bases	KEMA 11.1
4	Define SP and PSE roles in the ESERSC to support the CERP	KEMA 11.1
5	Develop SP emergency restoration metrics in the ESERSC	KEMA 11.1
6	Identify information needs for outage restoration estimates	KEMA 11.1
7	Enhance restoration planning, training, and drills.	KEMA 11.1
8	Include restoration planning, training, and drills in ESERSC	KEMA 11.1
9	Identify specific logistics responsibilities	KEMA 11.1
10	Develop a process to exchange lessons learned	KEMA 11.1
G	**Logistics and Support Services**	
1	**Enhance logistics to better support the number of crews supporting the restoration.**	KEMA 12.1
2	Document logistics support processes	KEMA 12.1
3	Build a formal logistics process map	KEMA 12.1
4	Incorporate logistics support into CERP	KEMA 12.1
5	Identify EOC party responsible for logistics	KEMA 12.1
6	Identify Operations Bases party responsible for logistics	KEMA 12.1
7	Ensure vendor update process is adequate	KEMA 12.1
8	**Document material management policies and processes created to support storm levels.**	KEMA 12.2
9	Document processes to procure materials on short lead time basis	KEMA 12.2
10	Review storm material stocking levels	KEMA 12.2
11	Arrange to store critical materials on site as vendor stock	KEMA 12.2
12	Prearrange expedited shipping	KEMA 12.2
13	Develop plan for resourcing local area coordination centers (trailers, tents, heat, PC's, light, etc.)	Internal Debrief
H	**Infrastructure Conditions**	

Rec #	Major Recommendation	Recommendation Source
1	**Enhance PSE's transmission vegetation management policy and standards for ROW width.**	KEMA 13.1
2	Foster change in public perception and regulatory policy	KEMA 13.1
3	Map the transmission system problem areas	KEMA 13.1
4	Develop a plan to expand ROWs in hard hit areas	KEMA 13.1
5	Expand TreeWatch to hard hit areas	KEMA 13.1
6	Increase vegetation management in hard hit areas b4 2007-08	KEMA 13.1
7	Increase vegetation management in hard hit areas	KEMA 13.1
8	Ensure access to cross country ROWs b4 2007-08	KEMA 13.1
9	Ensure access to cross country ROWs	KEMA 13.1
10		
	Aggressively develop and maintain cross country transmission access roads.	KEMA 13.2
11	Catalog all existing access roads	KEMA 13.2
12	Develop and fund an access road program	KEMA 13.2
13	Coordinate access road and veg mgt programs	KEMA 13.2
14		
	Evaluate hardening opportunities for both transmission and distribution.	KEMA 13.3
15	**Conduct a system hardening study to determine:**	KEMA 13.3
16	Additional opportunities for UG	KEMA 13.3
17	Use of different towers in hard hit areas	KEMA 13.3
18	Review materials and design standards to match weather	KEMA 13.3
19		
	Locate transmission lines underground	Customer Focus Groups
20		
	Increase tree-trimming	Customer Focus Groups

Outside Right-of-Way Tree Risk Along Electrical Transmission Lines

Siegfried Guggenmoos and Thomas E. Sullivan

Abstract—**For power transmission systems compliant with safety codes and reliability standards there remains a risk of tree-caused interruptions from the in-fall of trees from outside the right-of-way. This paper reports on the quantification of tree exposure outside National Grid's transmission corridors and examines the variables impacting the risk of a line contact by trees. Correlations between the variables and National Grid's tree-caused interruption experience were tested. Regression analysis was applied to a calculated risk factor and the annual interruption frequency.**

Two mitigation approaches are compared for cost and efficacy in improving line security. One is based on a regulator suggested use of minimum right-of-way width, while the other is site specific, based on specific site risk versus the voltage class mean risk.

Index Terms— **Power transmission lines, power transmission reliability, prediction methods, reliability management, reliability modeling, tree failure, tree risk, vegetation.**

I. Nomenclature

Utility forest: the land base supporting tree growth, which could now or in the future interfere with the transmission or distribution of electricity.

Clear width: the distance from the outside conductor to the tree boles at the forest edge.

Danger tree: any tree which, on failure, is capable of interfering with the safe, reliable transmission of electricity.

Hazard tree: a danger tree that has both a target and a noticeable defect that increases the likelihood of failure.

II. Introduction

THE possibility of a cascading outage event impacting millions of people is a feature intrinsic to the transmission system. The risk of such an event has increased over the last 20 years for several reasons. Foremost among these are that the addition of new lines has all but ceased and transmission systems originally designed to optimize system security on a state or provincial level are now commonly deployed in regional transmission organizations and involved in inter-regional electricity flows. The effect is, there is little or no redundant capacity to tap when a line fails, and lines connecting to other systems, originally designed to protect local systems, are now heavily used for the import/export of electricity.

Trees are a major concern in transmission system reliability. This is powerfully illustrated by the fact that tree-conductor contact (flashover to a tree) was the root cause of these cascading outage events: July 2, 1996 on western grid, 2.2 million customers affected [1]; August 10, 1996 on western grid, 7.5 million customers affected [2]; August 14, 2003 on northeast grid, 50 million customers affected [3]; September 28, 2003 in-tertie-line between Switzerland and Italy, 60 million customers affected [4].

This history and the August 2003 northeast blackout specifically, have brought considerable scrutiny to utility vegetation management. While it was removed from the final report, one of the questions raised by regulators examining transmission company vegetation management programs following the 2003 blackout was whether there ought to be mandated right-of-way widths based on line voltage [5][6]. We demonstrate by work performed on the National Grid transmission system that while such a requirement may increase line security, it constitutes a very inefficient use of resources. Similar or greater gains in reliability can be achieved for substantially less cost with a program responsive to specific field conditions of above average tree risk.

III. Background Conditions

National Grid owns transmission facilities in New York, Massachusetts, Rhode Island, New Hampshire and Vermont. The lines are located on approximately 7,360 kilometers (4,600 miles) of rights-of-way; 2240 km (1,400 mi) in New England (NE) and 5120 km (3,200 mi) in New York (NY), respectively. Most of these rights-of-way are fully cleared. The rights-of-way contain from one to several circuits, with a voltage range from 69 kV to 345 kV AC and 450 kV DC.

National Grid's vegetation management program has been operated under the centralized control of the Transmission Forestry Department since 1993. The vegetation management program has focused on bringing order and control to vegetation within the rights-of-way (the floor) while removing hazard

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trees from the sides. Reliability of the system has been improved and by a concerted effort to push maintenance operations to the early stages of tree succession, cost efficiencies have been gained. Outage data indicates that tree-caused interruption incidents are due to the failure of trees outside the right-of-way. The incidence of tree-conductor conflicts arising from trees within the right-of-way is virtually non-existent at less than one per year with occurrence restricted to the lower transmission voltages (69 kV and 115 kV).

National Grid's experience is what would be expected for a transmission company compliant with the National Electric Safety Code (NESC) and good utility practice. The NESC requires transmission companies to consider line sag, line swing, flashover and tree growth to maintain adequate clearance between conductors and tree parts so as to avoid any phase-to-ground or phase-to-phase faults. A further focus on right-of-way floor vegetation offers National Grid minimal opportunity for further improvements in system reliability. If National Grid is to achieve a meaningful reduction in tree-caused service interruptions, it needs to better understand the variables affecting off right-of-way tree risk.

The Transmission Forestry Department at National Grid undertook a risk assessment study focused on quantifying the size and characteristics of the utility forest outside the electric utility right-of-way. The goal of the Transmission Forestry Department is to minimize tree-caused interruptions, balanced against financial resources, to improve overall system reliability as measured by number of tree caused incidents and loss of supply to customers. Within this goal, there is a particular focus on higher voltage transmission lines (230 & 345 kV) where National Grid seeks a management plan that results in no tree-caused outages due to the major impact the loss of such a line could have and the associated risk of system instability. This goal is consistent with the reliability standards emerging in response to the 2003 northeast blackout. The project was designed to provide the Transmission Forestry Department the data required to quantify the current level of tree risk and thereafter to develop and assess the cost of a range of mitigation options.

IV. Methods

The project involved a number of phases. The key aspects can be summarized as the random selection of 400 right-of-way points where the percent of treed edge, right-of-way characteristics such as line height, tree height, clear width and adjacent forest characteristics were collected. The percent of forested edge was derived from aerial photographs within National Grid's GIS. Aerial photographs were available for 377 of the 400 random sample points. Literature on major storm damage to trees was researched to assess tree failure modes and identify what species represent the largest risk to transmission service in the US northeast. Weather events from 1950 through 2003 were compiled by county, to determine the frequency of tree damaging events. The frequency of tree damaging weather events and the specifics of tree species vulnerabilities are not presented in this article.

The fieldwork collected data on 131 sample points in New England (NE) and 178 points in New York (NY). Some of the 400 random sampling points could not be used, as there was no adjacent forest. There was no 69 kV sampled in NY. For the forest data, which identified the tree species, measured the diameter at breast height (dbh) of trees falling within a BAF10 prism sample and identified the cover type, over 22,000 records were generated.

Field data collection occurred from January 2004 through mid-July. Due to the timing of data collection and that National Grid experiences peak loads in response to air conditioning demand, the vast majority of the measured line heights do not reflect a maximum sag condition.

Analysis involved the use of the Optimal Clear Width Calculator [7] (OCWC), which through triangulation determined whether off right-of-way trees were capable of interfering (danger trees) with the transmission system, and provided a measure of the extent of the risk. In this way distinctions could be made between the total tree exposure and the tree exposure comprised of trees tall enough to strike a conductor on failure, thereby constituting a current risk to the transmission system. Also assessed and analyzed were forest cover types, species composition, and the incidence of emergent (dominant) trees. Data on forest cover types and species composition are not presented in this article with one exception relevant to emergent (dominant) trees. The measured variables of line height, tree height, clear width and the derived tree risk are examined in relation to the history of tree-caused outage incidents.

The quantification of a particular vulnerability, that of forest stands where a tree species is emergent (dominant) above the general tree canopy (co-dominant), was an identified focus of the study. Trees emergent to the canopy are more susceptible to lightning strikes; wind; wet snow and ice stress loadings and, therefore, are more susceptible to failure.

V. Results

In both NE and NY White Pine was the predominant current emergent species, occurring along 12.4% and 8.5% respectively, of the right-of-way edge. The risk posed by emergent trees has the potential to expand substantially over the next 30 years, especially in the NY service area, as the amount of the utility forest containing White Pine is 20.4% in NE and 27.2% in NY.

A. Utility Forest Beyond the Right-of-Way

Total current tree exposure was determined from the size of the utility forest times the tree density. One of the variables necessary to estimate the size of the utility forest is a measure of length or the extent of treed (forested) edge. The other, the measure of depth was derived by triangulation using mean tree height, line height and clear width.

The percent of treed right-of-way edge is 77.46 ± 3.1 in NE

and 61.83 ± 2.93 in NY. The total treed right-of-way edge is 3456 ± 138 km (2160 ± 86 mi) in NE and 6336 ± 300 km (3960 ± 188 mi) in NY. The land base for the utility forest beyond the right-of-way is 1390 ha (3447 acres) in NE and 2108 ha (5227 acres) in NY. Not all of the treed edge is a current liability. The utility forest component with current potential for tree-conductor conflicts is 1931 km of right-of-way edge of 4621 km (1,207 miles of 2,888) in NE and 2488 km of right-of-way edge of 10,246 km (1,555 miles of 6,404) in NY.

Tree density was found to be 491 ± 15 trees per ha (198 ± 6 trees per acre) (Table I). Using this finding, the total danger tree exposure was calculated to be 642,874 trees in NE and 795,770 in NY at the estimated maximum conductor sag position. At the maximum conductor sag position the number of danger trees per kilometer of right-of-way edge is 148 (236 mi^{-1}) in NE and 77 (123 mi^{-1}) in NY. Annual mortality was derived using stand data for the closest permanent sample plots (Allegheny Forest in Pennsylvania) used in the Forest Vegetation Simulator (FVS) [8] in a mortality modeling algorithm [7]. Hazard tree development based on the derived annual mortality rate is 1.9 (3 mi^{-1}) trees in NE and 1.3 (2 mi^{-1}) trees in NY per kilometer of right-of-way edge. If the average number of hazard trees identified and removed on an annual basis falls below the expected mortality, then it is likely that there is an increasing but as yet unrecognized population of hazard trees. Over time, this unrecognized hazard will become susceptible to failure under progressively less stress loading [9].

TABLE I
TREE DENSITY BY OPERATING AREA (TREES/HECTARE)

	Trees Per hectare	Trees Per hectare (>10 cm dbh)
NE	1218 ± 149	491 ± 25
NY	1074 ± 92	489 ± 20
All	1131 ± 82	491 ± 15

Fig. 1 provides the size of National Grid's off right-of-way utility forest in both hectares and trees per km. The hectares of utility forest are derived from the number of hectares per km times the number of km for the voltage class. The data in Fig. 1 provides National Grid with measures of the scale of the undertaking if the risk associated with trees beyond the right-of-way is to be managed.

Variable means were compared by voltage class within each operating area (Student-Newman-Keuls, p=0.05). Fig. 2 shows the mean clear width, with the associated confidence interval. Letters above the bars provide the results of significance tests. Means for NE are tested independent of NY means. The data for NE shows an overlap in the clear width for 115 kV, 230 kV and 345 kV lines and there is no significant difference. The data indicates that while right-of-way widths and thereby, clear widths are greater for higher voltage lines, significant differences in mean clear widths occur only relative to the lowest voltage class.

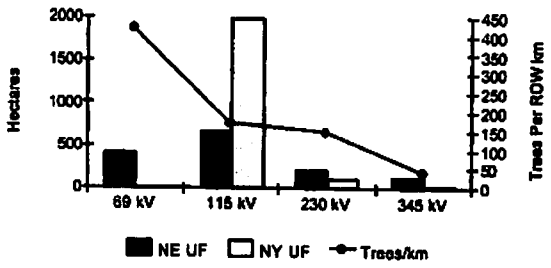

Fig. 1. Utility Forest Beyond ROW

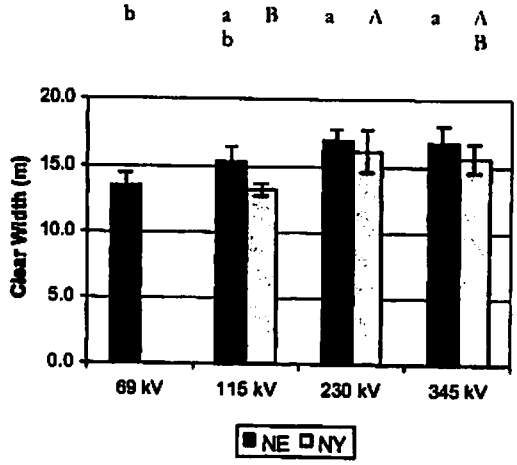

Fig. 2. National Grid Transmission Clear Width

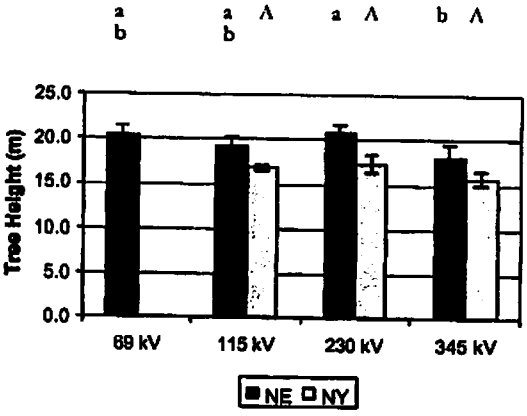

Fig. 3. Mean Tree Height

One would not expect significant differences in mean tree height between voltage classes as the choice of line voltage installed is based on needs independent of tree height along the route (Fig. 3).

There is a clear trend of increasing line height for higher

voltages in NE and the 345 kV lines in NY were found to have a significantly greater ground clearance (Fig. 4).

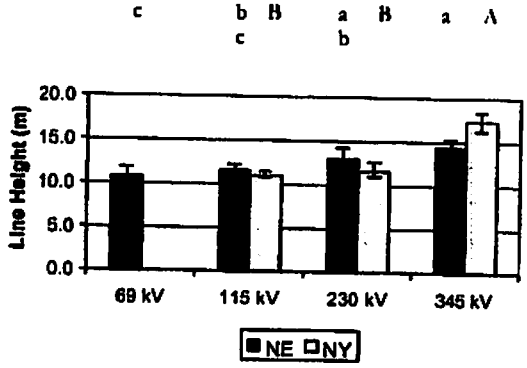

Fig. 4. Mean Line Height

Examining where significant differences between means for line height, tree height and clear width occur, it is difficult to assess the extent of difference in risk exposure and whether such differences would yield significantly different interru ption incidents between voltage classes.

TABLE 2
AVERAGE TREE RISK FACTOR (%) AT FOUND SAG

	NE	NY
All voltages	5.99	4.98
69 kV	10.28 a	-
115 kV	6.02 b	6.19 A
230 kV	3.78 bc	2.30 B
345 kV	2.12 c	0.19 B

The use of the Risk Factor (RF) generated by the OCWC reduces these three variables plus tree density to one value. The RF (Table 2, Fig. 5) shows a very orderly decrease in tree risk with increasing voltage. These differences, however, are not large enough to provide a distinct risk profile for each voltage class (Table 2).

The correlation between variables and voltage class was determined. The correlation between voltage class and the variables of clear width (r=0.1669), line height (r=0.2705) and Risk Factor (r=0.2934) (Fig. 5) were significant. There was no significance found for the correlation of voltage class to tree height (-0.0592) and trees per acre (-0.0048). The correlations confirm expectations. Higher voltage lines are constructed with greater ground clearance within wider right-of-ways. The magnitude and need for electrical load arises independent of forest characteristics such as tree height and density.

Tree-caused interruption experience was examined. In NE nine years of data was available while NY had only 4 years of data. Of the 72 incidents recorded, 97% occurred on the 69 kV and 115 kV circuits. The remaining 3% occurred on 230 kV in NE. There were no tree incidents on NE 345 kV, NY 230 kV and NY 345 kV lines.

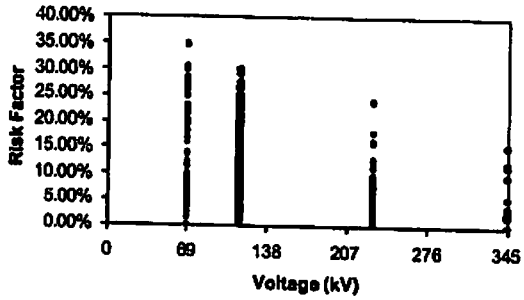

Fig. 5. Scatter Diagram Risk Factor vs. Voltage

VI. DISCUSSION

A. Variable Correlation to Outage Experience

National Grid's objective for this study was to gain insight into mitigating tree-caused service interruptions arising from tree failures outside the right-of-way. This requires both a means to rate the current vulnerability of a specific line or location to tree-caused interruptions and to reasonably predict interruption frequency after treatment. National Grid has used the OCWC to assess current and future tree risk. Tree risk after treatment had not been correlated to interruption frequency.

The magnitude of the voltage class RF means in Table 2 are aligned with National Grid's tree-caused outage experience. To further test the viability of a number of variables as predictors of future transmission system performance the correlation between their means and National Grid's tree-caused interru ption experience was tested. Different time frames of outage history between operating areas, necessitated the tree-caused outage data to be expressed as an annual interruption frequency. The results are presented in Table 3.

TABLE 3
VARIABLE RELATION TO INTERRUPTION EXPERIENCE

Variable (means)	Correlation Coefficient (r)	P(r=0)
Tree Height	0.0833 ns	0.8591
Line Height	-0.6003 ns	0.1541
Clear Width	-0.9128 **	0.0041
Total Tree Exposure	0.8441 *	0.0169
Trees/km ROW Edge	0.5770 ns	0.1750
Risk Factor	0.8124 *	0.0264

ns not significant

Generally, the correlation coefficients in Table 3 meet expectations. Line height and clear width are negatively correlated as increases in these variables reduce the line exposure to

trees. The weak and non-significant correlation of mean tree height to interruption experience is unexpected. However, no data on tree height for actual the outage incidents was provided. It is not known if mean tree heights used in this analysis accurately represent the height of failed trees giving rise to outage incidents.

Measures of the tree exposure, such as total exposure and tree per km of ROW edge, serve to bring some clarity to the magnitude of the danger tree risk and the operational challenges. Of these two variables, only total tree exposure was found to be significantly correlated to the total number of tree-caused incidents (Table 3).

Comparing trees per km of ROW edge to tree-caused interruption frequency, however, fails to consider the length of line per voltage class. To put both the trees and tree incidents on a unit length basis it was necessary to transform the data to yield the number of tree-caused outage incidents per unit line length. In this case the chosen unit is per 1,000 kms. A significant correlation between annual outage incidents per 1000 kms and trees per km of ROW edge exists, with r =0.8691 and P(r=0)=0.0111. The implications are that the number of tree-caused interruptions is directly related to the amount of tree exposure.

RF, which incorporates the variables of line height, tree height, clear width and tree density, was found to have a significant correlation to tree-caused interruptions, with an r-value of 0.8124 (Table 3). Due to regional differences in the extent of tree cover the data was segregated by operating area prior to regression of the RF for annual outage incidents per 1000 kms. Various regression equations were tested, with the Exponential regression form yielding the lowest P in ANOVA (P=0.0035) and the smallest residuals. Regression analysis was undertaken only for the more comprehensive outage data set of NE, yielding (1).

$$F_{AI} = 0.13424751\ 967 \times e^{(40.2108865\ 236 \times RF)} \qquad (1)$$

where F_{AI} is annual interruption frequency and RF is Risk Factor as produced by the Optimal Clear Width Calculator [7].

The annual interruption frequency for 230 kV is 0.22yr^{-1}. An interruption is expected to occur once in 4 to 5 years. No tree-caused outages have been experienced on the 345 kV lines. The 345 kV lines are not devoid of tree risks as indicated by the found RF of 0.0212. If the RF 0.0321 based on maximum conductor sag of the NE 345 kV lines is used, the expectation for tree-caused outages is F_{AI}=0.136659 or 1 incident in 8 years.

B. Mitigation

Although, the RF ratings (Table 2) indicate an operational responsiveness to the adjacent forest conditions, one of the main observations of this work is the wide range of variability in the RF within any given voltage class. An examination of the data for 345 kV lines illustrates the variability in tree risk. There are 83 sample records. Of these, 72 records have a tree RF of 0%. There are 8 records where the RF exceeds 2.5% (Table 4). This led to an examination of the potential impact on line security of addressing only the areas of high tree risk with comparisons of efficacy and costs to a suggested regulatory approach of a specified minimum right-of-way width based on voltage. The strong correlation found between National Grid's interruption experience and mean clear width segregated by voltage class (Table 3), indicates the suggested regulatory approach of specifying a minimum right-of-way width to manage tree-caused outages is supported, on National Grid's transmission system.

TABLE 4
VARIABILITY IN TREE RISK FACTOR FOR 345 KV

Operating Area	Sample Pt. No.	Line No.	Risk Factor (%)
NE	2	303	3.80
NE	8	394	15.46
NE	44	343	12.16
NE	64	394	11.64
NE	99	394	11.81
NE	131	394	3.23
NE	139	315	5.69
NY	37	4	9.69

TABLE 5
TREE FREE CLEAR WIDTH FOR MEAN CONDITIONS

Voltage	Mean Risk Factor (%) At Maximum Sag	Current Mean Clear Width (m)[1]	Tree Free Clear Width (m)[2]	Tree Free Based On Tallest Tree Found Clear Width (m)[3]
69 kV	11.95	13.3	25.5	34.8
115 kV	7.39	14.2	20.3	32.4
230 kV	4.34	16.3	23.6	29.7
345 kV	1.71	15.8	20.3	31.5

[1] For right-of-way width double the clear width and add the distance between outside conductors i.e., for 69 kV = 13.3 X2 + 3.7 = 30.3m
[2] This is the clear width required to achieve tree free on the average line. Lines facing above average tree exposure will not be tree free.
[3] The clear width that would actually achieve a tree free condition based on data of tallest trees found within the samples.

In undertaking this comparison it is necessary to assume what the minimum regulator specified right-of-way width might be. This assumption is made using the data from the National Grid system (Table 5). Using 345 kV lines to explore the merits of the approaches to managing tree risk, a clear width of 20.3 m (67 ft) (Table 5) would make the average 345 kV line tree free. Setting the clear width based on the average condition found for 345 kV lines does not reduce the risk of tree incidents to zero. Based on tallest tree encountered in the sampling a zero tree risk is only achieved at a 31.5 m (104 ft) clear width (Table 5), which equals a right-of-way width of 63 m (208 ft) plus the

distance between outside conductors. Any new tree growth will serve to increase the required clear width. It was assumed that regulators might require all the 345 kV lines to have a minimum clear width of 21.2 m (70 ft). On this basis of this assumption, 89% of National Grid's 345 kV transmission system requires widening. However, 69% of the samples with a clear width of less than 21.2 m, currently have a RF rating of 0%. While the overall improvement in line security of increasing the clear width to 21.2 m from the current 15.8 m (52 ft) (Table 5) is 78%, the majority of this widening (i.e. 69%) will yield no improvement.

Using the RF ratings, a site-specific treatment approach was developed. It is comprised of reducing the tree risk of all spans to the voltage class average RF, which is 1.71% (NE & NY) at estimated maximum sag for 345 kV lines. Only 20% of the samples had a RF above the average. However, the average RF for these anomalous sites is 8.27%, with F_{AI}=3.7336. Increasing clear width, line height or reducing tree height to bring the RF at these sites down to the average will improve overall line security 79% and in so doing, reduce the voltage class average RF to 0.36%. The F_{AI} is shifted to 0.1552 (under normal operating conditions) or an expected tree-caused incident frequency of 1 in 23 years.

Similar analysis of the other voltage classes leads to the same conclusion. On National Grid's transmission system, managing tree risk through the use of minimum clear widths based on voltage class constitutes an inefficient use of resources, costing 30-70% more than using site-specific prescriptions, which reduce the RF to at least the voltage class average.

The use of a tree RF provides a quantifiable approach to managing tree risk. One of the key findings of the work to assess the beyond right of way tree exposure of National Grid's transmission system is that there are areas of anomalous tree risk, substantially higher than the average for the voltage class. This observation is a product of having produced a RF rating for each sample point edge. Because the RF is responsive to the actual field conditions, it identifies where a dedication of resources will yield the greatest return in avoided tree-caused interruptions.

Aspects of this work may be extended to other utilities. For example, given the range of possible variability in tree height and density and, to a lesser extent in clear width and line height, the finding that the economics of a site-specific approach to managing tree risk proves superior to the use of standardized clear widths based on voltage, will hold true. The RF is a measure of tree exposure, while the outage experience provides the information on vegetation failure rates. This work has demonstrated a strong correlation between the RF produced by the OCWC and tree-caused interruptions. The methodology is transferable to other utilities. However, due to differences in tree species and their associated failure rates and modes of failure, the regression equation (1) cannot be expected to be applicable to other utilities, unless they are located in the same geographic area as the National Grid transmission system. For other utilities the relationship between a measure of the tree risk, which reflects local tree conditions, and the tree-caused interruption experience will need to be established.

VII. References

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VIII. Biographies

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