

# AFTER ACTION REPORT

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Feb. 2019 Snow Storm



EUGENE WATER & ELECTRIC BOARD

# Report Contents

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A big thank you to each crew member of the EWEB team. We know how tirelessly you have all been working this storm and appreciate each of you.

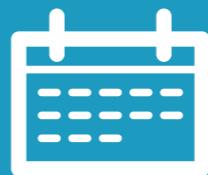
Marcy, EWEB Customer



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# Executive Summary

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This report summarizes the Eugene Water & Electric Board's (EWEB) performance in response to the February 2019 snow storm and the impacts of the storm, both to the community and EWEB's electrical infrastructure.

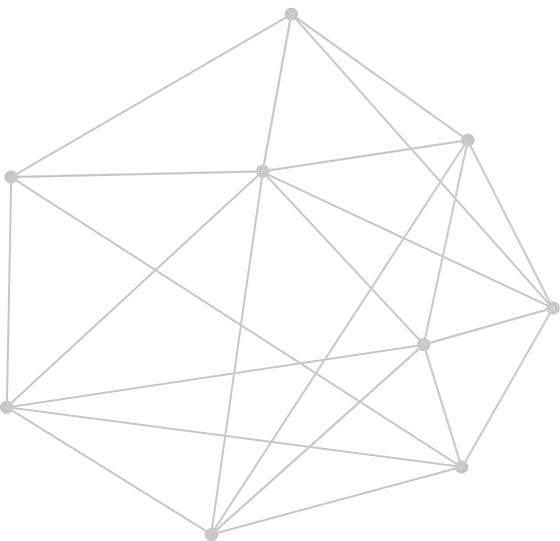
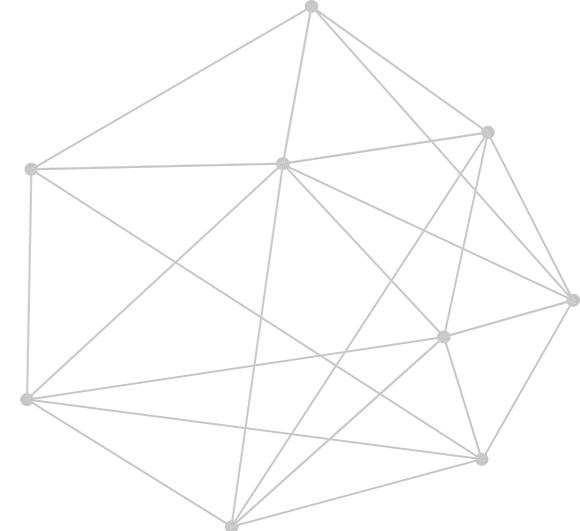
A heavy snowfall in late February 2019 caused devastating damage throughout EWEB's service territory. The storm resulted in 20,000 power outages, affecting more than 15,000 electric services, primarily homes and businesses. EWEB's territory has a population of about 180,000 with 95,000 electric services.

The cost of the restoration effort totaled more than \$3.5 million. Given the likelihood of a presidential declaration of emergency, EWEB is prepared to apply for reimbursement from the Federal Emergency Management Agency (FEMA) to recover a portion of the cost.

Following the 2016 ice storm, EWEB has focused on emergency preparedness and disaster recovery as a strategic priority, with emphasis on enhancing customer trust and confidence in EWEB during disruptive events, such as a large storm. Changes to EWEB's restoration procedures following widespread outages have centered on improving the flow of internal communication, paving the way for efficiency gains in the restoration process, as well as providing customers with relevant and timely information.

Building on the lessons learned from the 2016 ice storm and with the utility's recent focus on emergency preparedness and disaster recovery, EWEB was able to restore power to the majority of customers within nine days with fewer than half the field crews dispatched in the 2016 storm.

The February 2019 snow storm provided an opportunity to implement new or revised processes and procedures, which EWEB will continue to evaluate and refine in the pursuit of providing exceptional customer service during emergency situations.



# Event Overview

The EWEB service territory experienced widespread power outages due to uncharacteristic snowfall starting late in the evening Feb. 24, 2019.

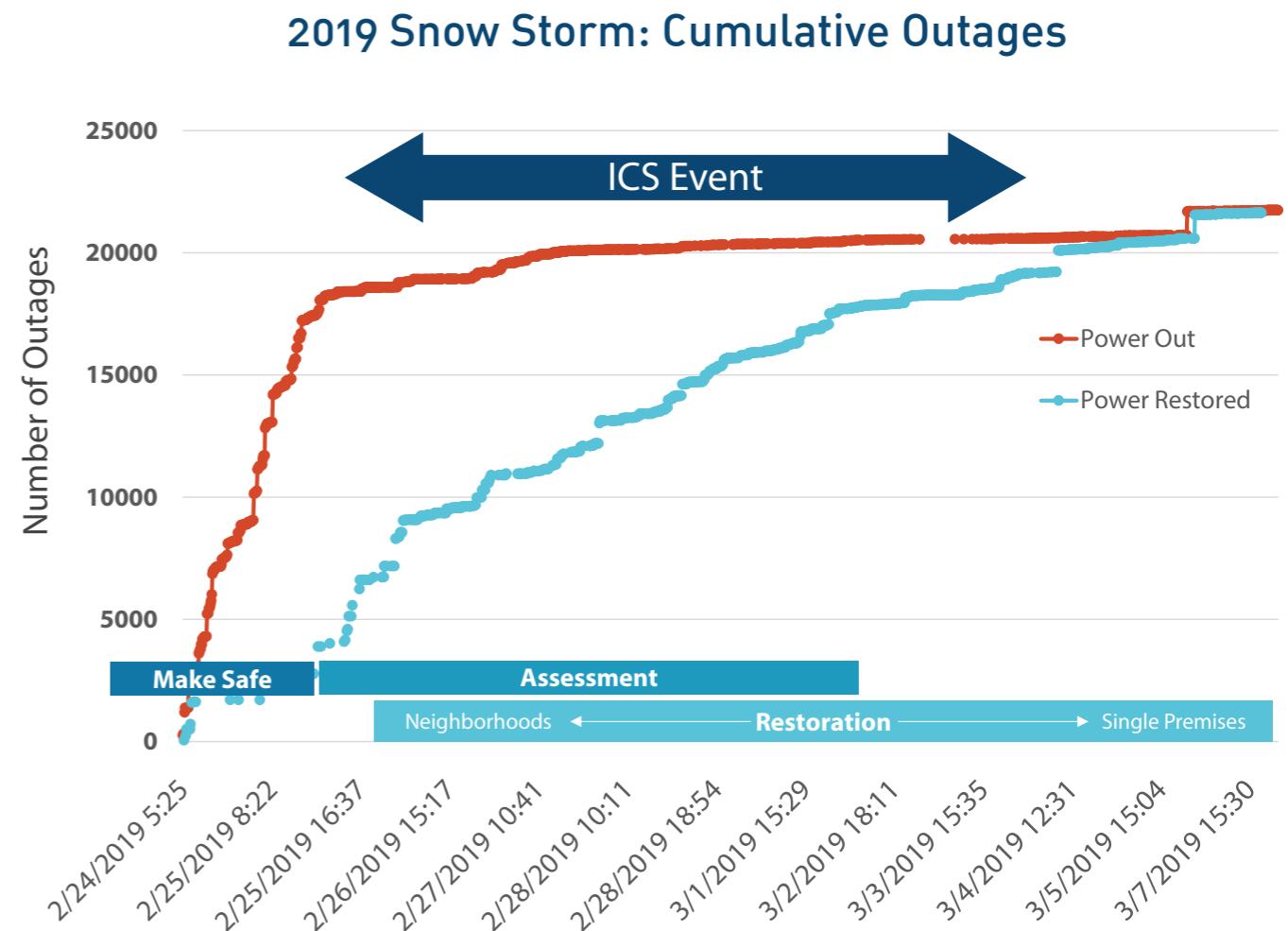
In the metro territory of Eugene, snow depths ranged from 10 inches in the northern communities, to up to 15 inches in the southern communities. EWEB's service territory in the lower McKenzie River Valley region experienced devastating damage, with snowfall up to two feet, resulting in numerous blocked roads and downed lines due to fallen trees.

An estimated 15,000 electric services were impacted by the extended outages for a total of about 20,000 cumulative outages. The majority of outages were due to tree contact with high voltage lines, automatically tripping-off power to homes and businesses. Power was restored to the greater part of customers during a nine-day restoration period.

EWEB initiated the Incident Command System (ICS) on Feb. 25, 2019 to manage the event and acquire mutual aid line crews to assist with restoration. The declaration of emergency activated more than 300 EWEB staff and 10 contract line crews, many of whom were resourced throughout the event. Damage from the storm resulted in approximately \$3.5 million in restoration costs (parts, materials, staff time and contracted labor).

EWEB follows a hierarchy of restoration to maintain public and staff safety throughout emergency events. The first priority of this event was "make safe," with line crews de-energizing and isolating downed wires. Where crews could not access downed wires, qualified staff stood post at the scene to instruct the public to stay clear. As downed high voltage wire safety was managed, efforts moved to assessing system damage in order to efficiently deploy crews for restoration activities throughout the service territory.

[Watch a time-lapse display of outages during the event.](#)



## Day 1: 15,000 electric services out\*

### WEATHER PATTERN LEADING UP TO THE EVENT

On Sunday, Feb. 24, 2019 a winter storm made landfall in the southern Willamette Valley, the surrounding Cascades, and as far south as Roseburg and surrounding areas in the Umpqua Valley. The storm was initially forecasted to result in about two inches of snow on the valley floor in Eugene, with freezing temperatures starting in the early hours of Feb. 25. Based on available forecasts, EWEB anticipated minimal damage to the electric infrastructure, with isolated power outages expected.

Actual snowfall in Eugene was eight to 10 inches, with accumulation as high as 15 inches in the south hills. In the lower McKenzie River Valley, up to two feet of snow accumulated in and around the communities of Walterville, Leaburg and Vida. At higher elevations, including EWEB's Carmen-Smith Hydroelectric Project, four feet of snow fell over the course of the storm.

### INITIAL OUTAGE DEVELOPMENT - MCKENZIE RIVER VALLEY IMPACTS

Isolated outages upriver began late morning Feb. 24, as trees began to break under heavy snow. Numerous tree limbs came into contact with primary cable and secondary lines were damaged from falling trees. EWEB troubleshooters and crews were dispatched upriver to restore service to the area.

Outages continued to build throughout the evening in EWEB's McKenzie River Valley territory. At approximately 1800, the 115kV feed from Holden Creek Substation to Carmen Substation tripped due to a fault, resulting in an outage to Blue River customers, the Army Corps of Engineers Cougar Power Plant and EWEB's Carmen-Smith Hydroelectric Project. This line remained out of service for eight days due to restricted access, and lack of BPA resource availability to restore the portion of BPA-owned line.

\*For the day-by-day event overview, numbers reported are electric services (primarily homes and businesses) without power. The actual number of outage incidents may be higher as some services experienced multiple outages during the event.



McKenzie River Valley



Eugene

## Day 2: 12,000 electric services out

### OUTAGES SPREAD FROM MCKENZIE RIVER VALLEY TO SOUTH AND SOUTHWEST EUGENE

About 0100 on Feb. 25, EWEB's Eugene territory began experiencing outages. This continued throughout the early morning hours as isolated outages were reported by customers, as well as smart meters with communications capability, in the southern region of Eugene. Crews patrolling the area noted numerous fallen trees, and limbs in contact with primary line as snowfall continued. Tree and limb contacts resulted in feeder breaker trips at the Monroe, Laurel and Dillard substations.

Two transmission system trips occurred between 0545 and 0600 on the Currin-Laurel and Dillard-Alvey lines. The Dillard-Alvey line was restored within 20 minutes by BPA. The Currin-Laurel line was restored around 0800, however an additional Currin-Alvey outage followed shortly thereafter.

Due to the increased damage to the transmission system and the rapidly climbing count of customers impacted, EWEB's standard outage response could not keep pace with the emerging event.

### INCIDENT COMMAND SYSTEM (ICS) ACTIVATION AND SITUATIONAL AWARENESS, "EVENT SIZE UP"

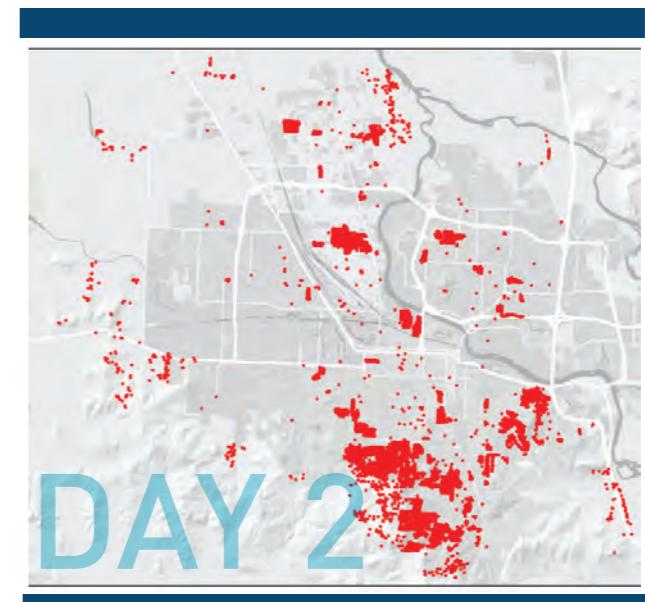
ICS was activated at 0710 on Feb. 25, 2019 establishing the Emergency Operations Center (EOC) at EWEB's Roosevelt Operations Center (ROC), thereby deploying additional field, support and office resources. Directly following the ICS activation, additional feeder trips occurred throughout south and southwest Eugene, as well as transmission trips in the southern region. Signs indicated the storm was moving from the McKenzie River Valley and higher elevations in the southern region, to the lower western region of Eugene.

Upon ICS standup, additional line crews were secured through EWEB's mutual aid agreements. Contractor crews arrived in a staggered fashion relative to their availability. Within 48 hours, 10 contract crews joined EWEB's five line crews in restoring power to customers, as well as multiple contracted tree and flagging crews. In addition, more than 300 EWEB staff reported to the ROC EOC to support restoration efforts.

The responsibilities and performance of each ICS section during the storm are detailed in the Restoration Performance section of this report.



**McKenzie River Valley**



**Eugene**

## MCKENZIE RIVER VALLEY REPAIRS AND A SHIFT IN STRATEGY

Following ICS activation, EWEB crews continued to work upriver responding to outages and working to restore the Thurston to Holden Creek transmission line. Crews also initially restored the 69kV "B" line which runs from Hayden Bridge to Leaburg. However, upon testing the line for electrical clearance, it was determined complete restoration would require extensive repairs. Due to the damage the 69kV "B" line sustained, load was subsequently transferred from the Leaburg substation to the restored Holden Creek substation.

With the heavy snow and extensive damage in the McKenzie River Valley, crews were not able to make efficient progress. The depth of the snow and the hazardous debris underneath created logistical complications including stuck vehicles and flat tires. Crews found access and mobility difficult to impossible in much of the area.

ICS leadership shifted the majority of the active line crews to the Eugene area in order to increase the rate of restorations and mitigate risk to staff safety, allowing additional time for conditions to improve in the McKenzie River Valley.

## MAKE SAFE STAGE

During the first three days of the response, crews primarily focused on making electrical facilities safe, de-energizing and removing downed wire, rather than on restoration of

power. This reduced risk to the public of electrical contact and increased access allowing for assessments and the necessary repairs to follow.



Fire caused by downed wire.

Downed wire reports came in from the general public, assessment crews and local agencies. During this time the Liaison office coordinated with Lane County area public entities, including police and fire, to gather additional reports of downed wires.

As crews focused on the make safe stage, the storm progressed on a northbound path through the southern Willamette valley and outages continued to persist. By mid-afternoon on day two of the storm, outages had spread throughout the entire EWEB territory with feeder trips occurring in the northern part of EWEB's territory at Spring Creek substation.

While make safe activities continued throughout the storm, the bulk of resources needed for public and staff safety occurred in the first few days.

## IMPACTS TO KEY ACCOUNT CUSTOMERS

Through this time, critical and priority community customers and loads were monitored for safety, and accelerated restorations were performed when feasible.

During the first ICS operational period, transmission trips occurred in some of EWEB's facilities with the highest customer economic impact. Tree contact on a direct feed and loss of the external Pacific Power Connection at the McKenzie substation resulted in an outage at the International Paper Mill. Additionally, trips at the University of Oregon substation resulted in outages to the university district.

## ASSESSMENT STAGE

As areas were determined safe, the efforts transitioned to assessment of field conditions. Assessments began Feb. 25 and continued through March 1. Targeted assessments were prioritized by customer count relative to the region of the system, with a goal of paving the way to restoration for the most customers in the shortest time. The order of assessment was also impacted by ease of access for assessment staff.

Assessments started in north Eugene, followed by west Eugene, then the central and southern portions, and finally the McKenzie River Valley. Assessment, and subsequent restoration, were slowed drastically in the areas of heaviest snowfall and damage. While consistent progress was made in lower elevation areas, progress in the heavily impacted south/southwest

portions of Eugene and McKenzie River Valley was at a much slower pace.

During assessment, trained EWEB personnel inspected distribution tap lines in the field to note visual indications of open fuses, tree contact, broken poles or cross arms, transformer damage, downed wire and customer-side damage. Assessments were performed on mobile tablets and the assessment forms sent to coordinators in the EOC for processing. The assessments were then assigned to staff for design or to operations for the repair and restoration queue.



Heavy snowfall and extensive damage in the McKenzie River Valley made access challenging.

# Days 3-6: Going from 5,400 to 3,600 electric services out

## RESTORATION STAGE

Restorations began to pick up pace on Feb. 26, with significant progress made by the end of March 1. As with assessments, restorations followed the hierarchy of repair to restore power to the greatest number of affected customers in the shortest time.

Throughout the event, crews were engaged with active incidents, which resulted in minimal standby time while waiting for materials or site preparations (such as tree removal). Materials were loaded onto trucks, to the greatest extent possible, from the EWEB warehouse to reduce travel to and from the field for equipment and supplies. When additional materials were required, runners from the Logistics section were assigned to provide delivery.

Logistics focused on acquiring needed resources that allowed crews to work continuously and safely without constraint during the storm. This included securing lodging for the contract crews and providing adequate meals for staff as they worked long shifts.

At the start of each day, all crews gathered for a safety and strategy briefing that focused on current hazards and confirmed restoration strategy. Crews were dispatched daily by 0700 with work packets to determine the day's scope of work.

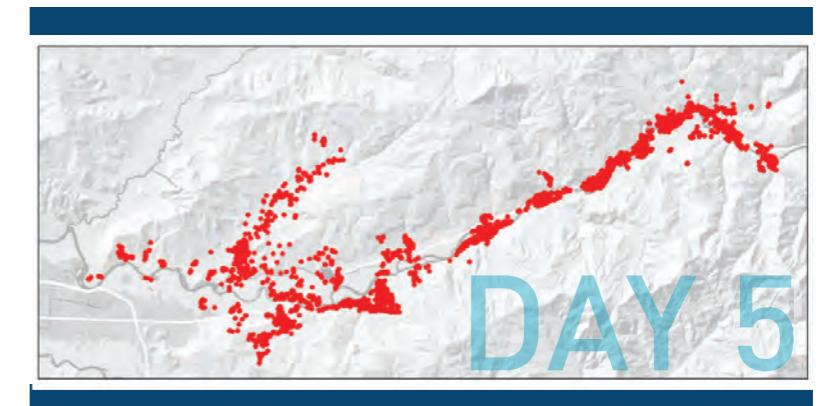


Crews gathered for a morning briefing before receiving the day's work packets.

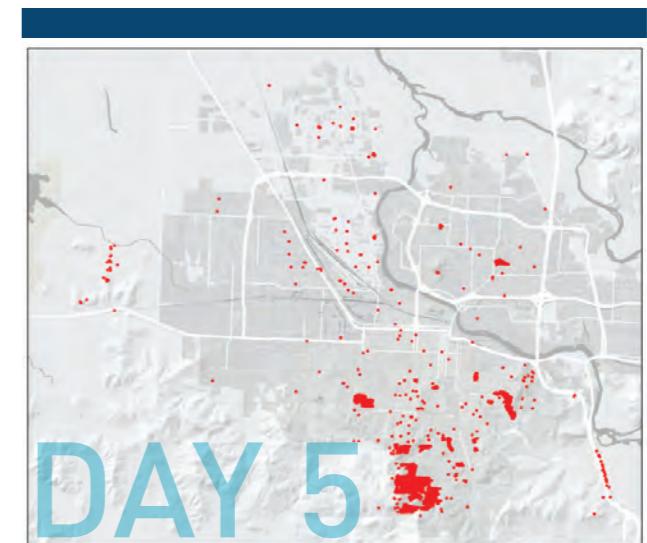
Restorations generally moved from north to south Eugene, with the final stage of restoration focused on the McKenzie River Valley. By the end of day six, all but one crew was assigned to restorations in the McKenzie River Valley. Work continued in this region with full resourcing until March 5.

## A FOCUS ON SAFETY

Throughout the event, safety was a top priority. Safety staff observed work in the field to confirm staff personal protective equipment usage and conducted hazard assessments resulting in additional safety recommendations. From Feb. 24 to March 6, four minor, non-recordable safety incidents were reported and recorded for EWEB staff and two for contracted staff. Nearly all of these incidents were related to working conditions associated with snow and ice (such as slips and falls).



McKenzie River Valley



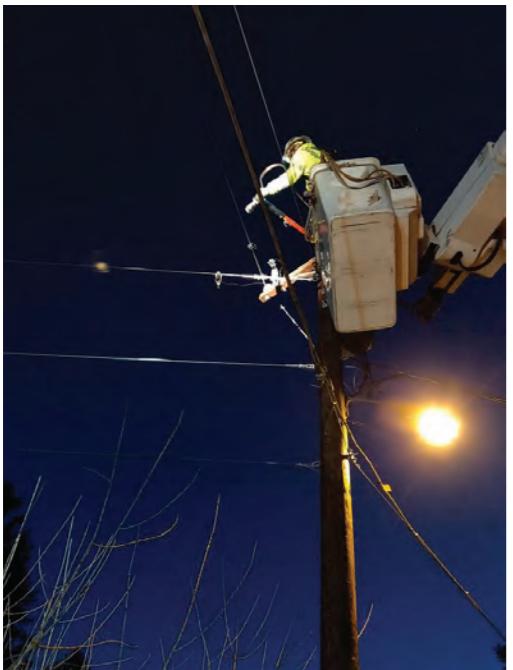
Eugene

## Days 7-10: Going from 3,200 to 113 electric services out

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### SINGLE PREMISE AND DEACTIVATION

As the scope of restoration reduced to single premise damage incidents, crews were transitioned back to the metro Eugene area to focus on premises where customers had engaged an electrician to complete customer-side repairs. Two-person troubleshooter teams spread throughout the service area to connect single premises.



Troubleshooter teams worked into the night restoring single premises once customer-side damage was repaired.

When work was deemed manageable by internal crews and normal operations support personnel, contract crews were released. ICS deactivation was signed by the Incident Commander on March 6 at 0900. At that time, approximately 113 electric services remained out of power, with a majority in the McKenzie River Valley region of the system.

Single premise restorations are often labor and time intensive. Restorations of single services continued for nearly two weeks following ICS deactivation.

Although a limited number of smart electric meters are currently deployed in EWEB's service territory, it was noted that when a smart electric meter was installed at a premise it helped expedite restorations. EWEB staff was able to "ping" the smart electric meter to determine whether or not the premise had power without requiring additional communication with the customer or sending a troubleshooter to the premise to determine the status.



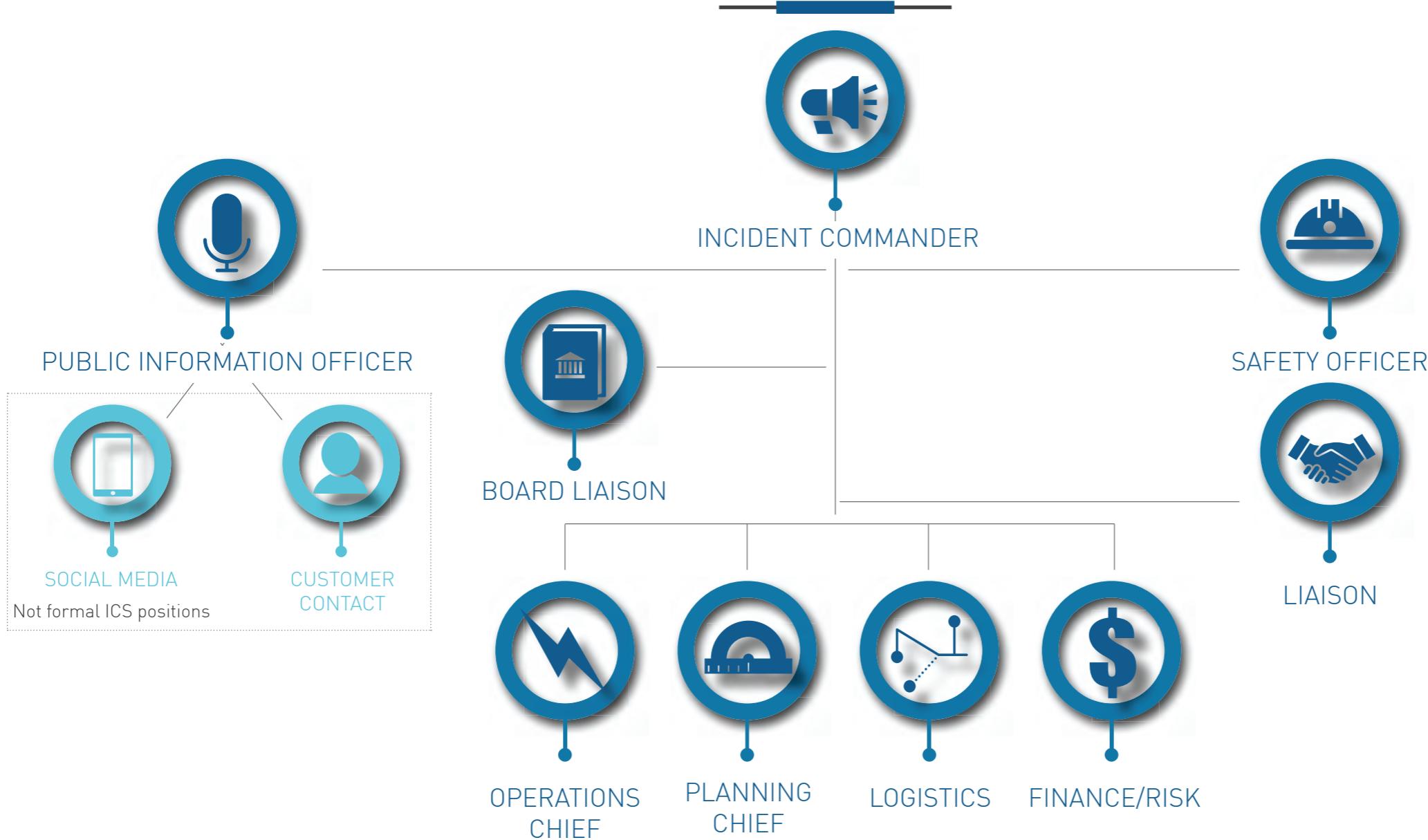
**McKenzie River Valley**



**Eugene**

# Restoration Performance

## ICS Structure: Chain & Unity of Command





# Incident Command

## CORE RESPONSIBILITIES

- Protection of life and property
- Activate ICS Command Staff
  - Maintain a manageable span of control
  - Inform ICS staff to establish formal command posts and contact references
  - Ensure customer communications / Liaison Office contacts confirmed with County and City agencies
- Determine level of outage damage
  - Discuss initial strategic goals with Dispatch
  - Inform Planning Chief of status for ICS Incident Action Plan
- Prepare initial ICS briefing
  - Approve "Storm Declaration" document
  - Set schedule for subsequent operational briefings
  - Approve Command staff resource staffing plans
  - Ensure Safety protocol is established and maintained
  - Establish operational tactical objectives with ICS staff
- Establish / Maintain accountability for ICS response, public safety and meeting tactical objectives

**SECTION STANDUP**

ICS was activated at 0710 on Feb. 25, 2019 to deploy additional resources. The Emergency Operations Center (EOC) was established at EWEB's Roosevelt Operations Center (ROC). The IC worked with the Planning and Operations Chiefs to develop a restoration strategy to "make safe" / restore system critical components.

**SECTION PERFORMANCE**

The Incident Command (IC) position met core responsibilities, notably: protected life and property, activated ICS Command Staff, established strategic objectives and maintained accountability for storm response and public safety. Additionally, the IC oversaw work flow to ICS Primary Chiefs to facilitate orderly response and restoration.

The IC scheduled and facilitated operational period briefings. Briefings included an update from Section Chiefs on status of objectives, staffing plans and any proposed changes in direction. The Planning Section Chief developed the operational period Incident Action Plan based on the IC's stated objectives, and for IC approval.

**RESOURCES**

**10 contract line crews added to EWEB's 5 crews within 48 hours**

**300 EWEB staff activated for ICS support**

All Incident Commanders notified / activated / briefed

## SECTION STRENGTHS

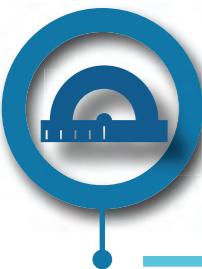
- Three-deep bench strength in the IC
- Good understanding of IC role by ICS sections influenced orderly execution of objectives
- Maintained focus on safety messaging to employees and public safety throughout operational briefings
- Established/maintained a manageable span of control, keeping efforts focused and sustainable

## NOTES OF SUCCESS

- Reporting structure for ICS command staff
- Timing of operational briefings (info share)
- Depth of organizational ICS understanding
- Steady work flow from Planning to Operations
- Proper use of Responder outage management software provided more data for strategic purposes
- Efficient use of i-Pad's for assessment
- Removal of damaged materials kept crews focused on restoration efforts.

## AREAS FOR IMPROVEMENT

- Additional training to increase bench strength regarding Responder outage management software
- Increase staffing bench strength in O&M planning
- Foster planning & operations communication meetings between operational briefings
- Prepare for internal employee overnight emergency lodging
- Install electronic reader boards for delivery of internal messages



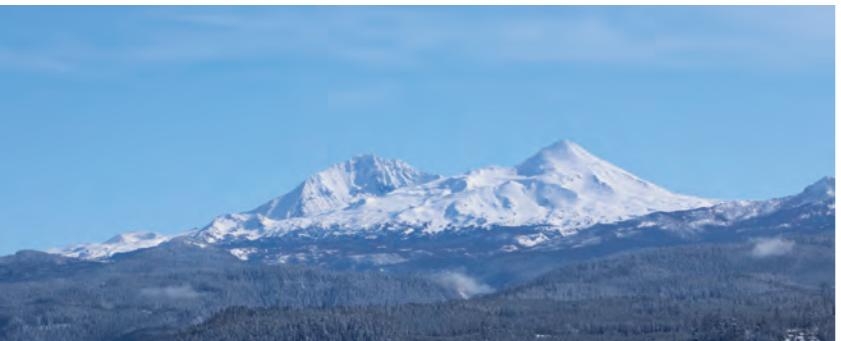
# Planning Section

## CORE RESPONSIBILITIES

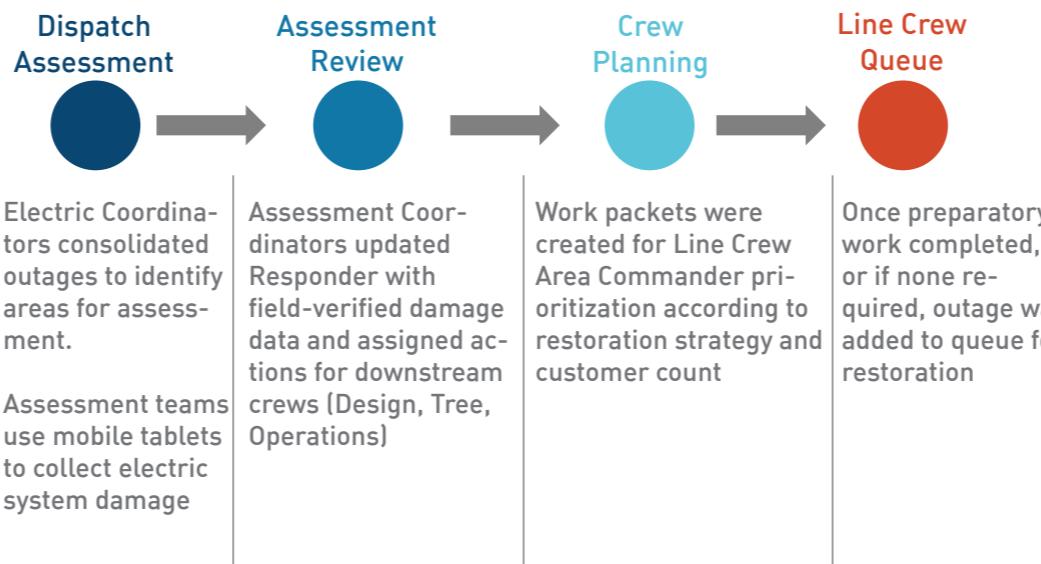
- Develop Incident Action Plan (IAP) every operational period throughout event
- Develop make-safe, triage and restoration strategy
- Perform field assessments and process field damage reports
- Assign crews for restoration work per restoration process
- Check in and out procedures through the Resource Unit
- Collect event documentation, metrics, statistics through Documentation Unit
- Recommend demobilization timing

## SECTION STANDUP

Planning Section staff were deployed upon activation of ICS. The first goal after mobilization was the make-safe stage. The Planning Section worked with the Incident Commander and Operations to develop a restoration strategy, execute assessments and process work packets for crews through the Responder outage management software according to the overall strategy.



## PLANNING SECTION PROCESS



## SECTION PERFORMANCE

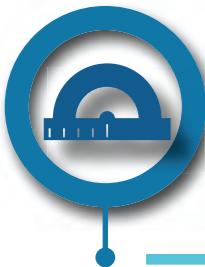
The Planning Section successfully produced work in pace with the need of the restoration crews, maintaining a work package queue with 12 - 24 hours of lead time. This fluctuated depending on the complexity of the damage assessments received from the field, planning staffing and crew restoration rate.

## NOTES OF SUCCESS

- Process – Effective in processing events for restoration by operations. It was scoped properly and the complexity and resource needs were feasible during the event to ensure steady and continuous progress.
- Training – Planning Section staff were adequately trained in their roles and able to complete work in the process as defined.
- Assessment Team staffing – Staffing was right-sized for processing speed among the Assessment Coordinators and Assessor Crews

## AREAS FOR IMPROVEMENT

- Resourcing – Resourcing gaps existed in crucial areas, and additional staff should be trained in order to provide uninterrupted queue flow -- specifically the Radio Office, and associate Scribes.
- Strategic Coordination – Operations and Planning could work more closely to coordinate flow of assignments. In the future, a process for coordinating detailed strategy outside of the IC briefings would ensure that assessments and work packages are processed in the order of restoration strategy. While generally achieved, should be documented a best practice.
- Technology – The GIS, Responder and associated hardware performed generally well, and was well supported by IS and GIS groups. However, some improvements could be made to the processing speed. Some of the slow processing speed experienced can be attributed to lack of familiarity with the software (to be solved by training). Additional factors are attributed to software and overall system configuration (server capability, etc.), which can be addressed with tuning of the system and possible hardware changes.



# Planning Section



## STAFFING

The Planning Section included up to 25 office staff and 40 field assessment and triage staff. Staffing fluctuated according to the required pace of assessment, design, and work package creation needed to ensure line crews were continuously occupied. The section consisted of the following teams:

**Planning Chief** – Provided strategic communication between IC level and situation unit. Led development of Incident Action Plans (IAP).

**Situation Unit Leader** – Developed situational awareness through monitoring outage data, resource levels and restoration progress.

**Assessor Coordinators and Assessors** – Prepared assessment forms for field assessors, and dispatched assessors according to regions based on overall event strategy. Processed assessment records and updated Responder outage management software. Assigned work to downstream process crews.

**Design Team** – Completed and delivered designs to Operations for damage which required design before repair (broken poles/cross arms, transformer load checks, anchoring, etc.).

**Documentation Unit** – Collected FEMA required documentation throughout event which does not exist in Responder outage management software or the Work Asset Management (WAM) database.

**Electric Coordinators** – Performed consolidation and roll-up quality assurance in Responder outage management software for dispersing to Assessor Coordinators. Coordinated reconnection of “Needs Electrician” customer outages.

**Dispatch** – Monitored SCADA and provided clearance activities for power system protection devices (i.e. high voltage breakers and switches).

**Needs Electrician** – Managed queue of customers who needed repair by a contractor electrician before reconnection. Processed supervisory letters and coordinated with Electric Coordinators for reconnection.

**Resource Unit** – Tracked and deployed resources for various ICS sections. Managed contractor check-in process.

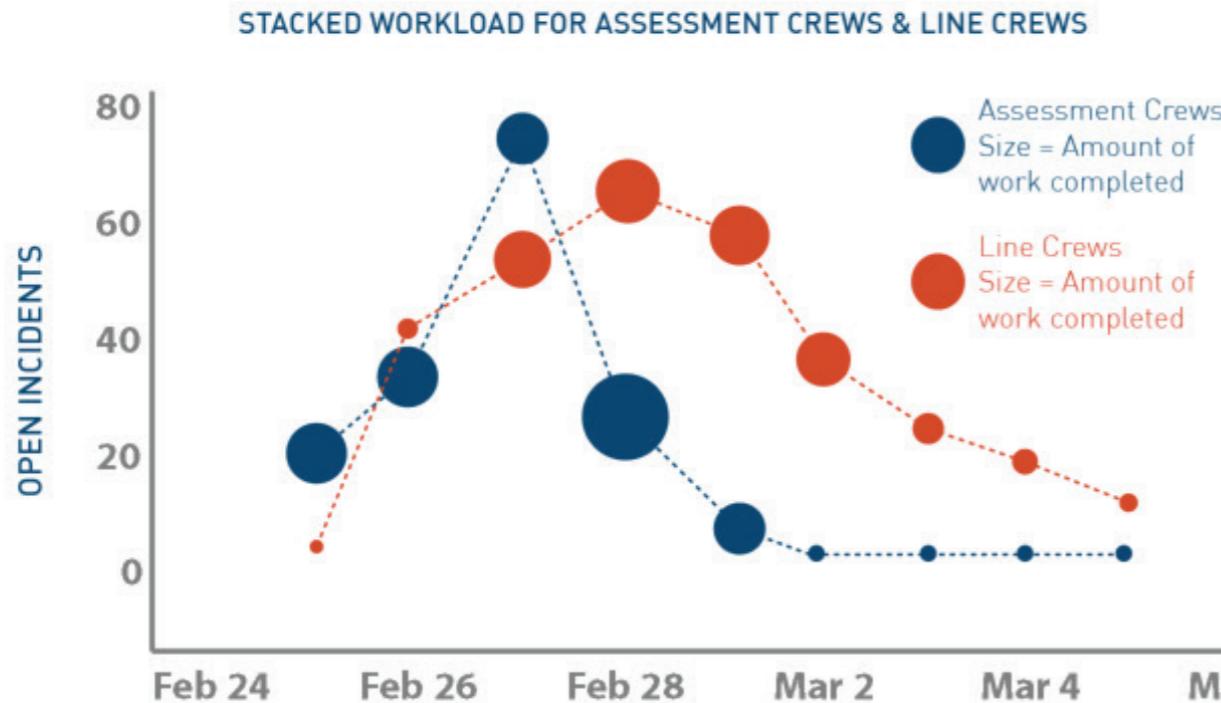
**Radio Office** – Directed field restoration and triage activities through radio communications to troubleshooters and line crew foreman.

**Triage Coordinator and Triage Crews** – Executed make-safe procedures for secondary down wire, including update of Responder outage management software to capture damage.

**Operations Liaison** – Coordinated with Operations Area Commanders to ensure assessment teams and crews were not performing redundant work and were not in conflict of space.

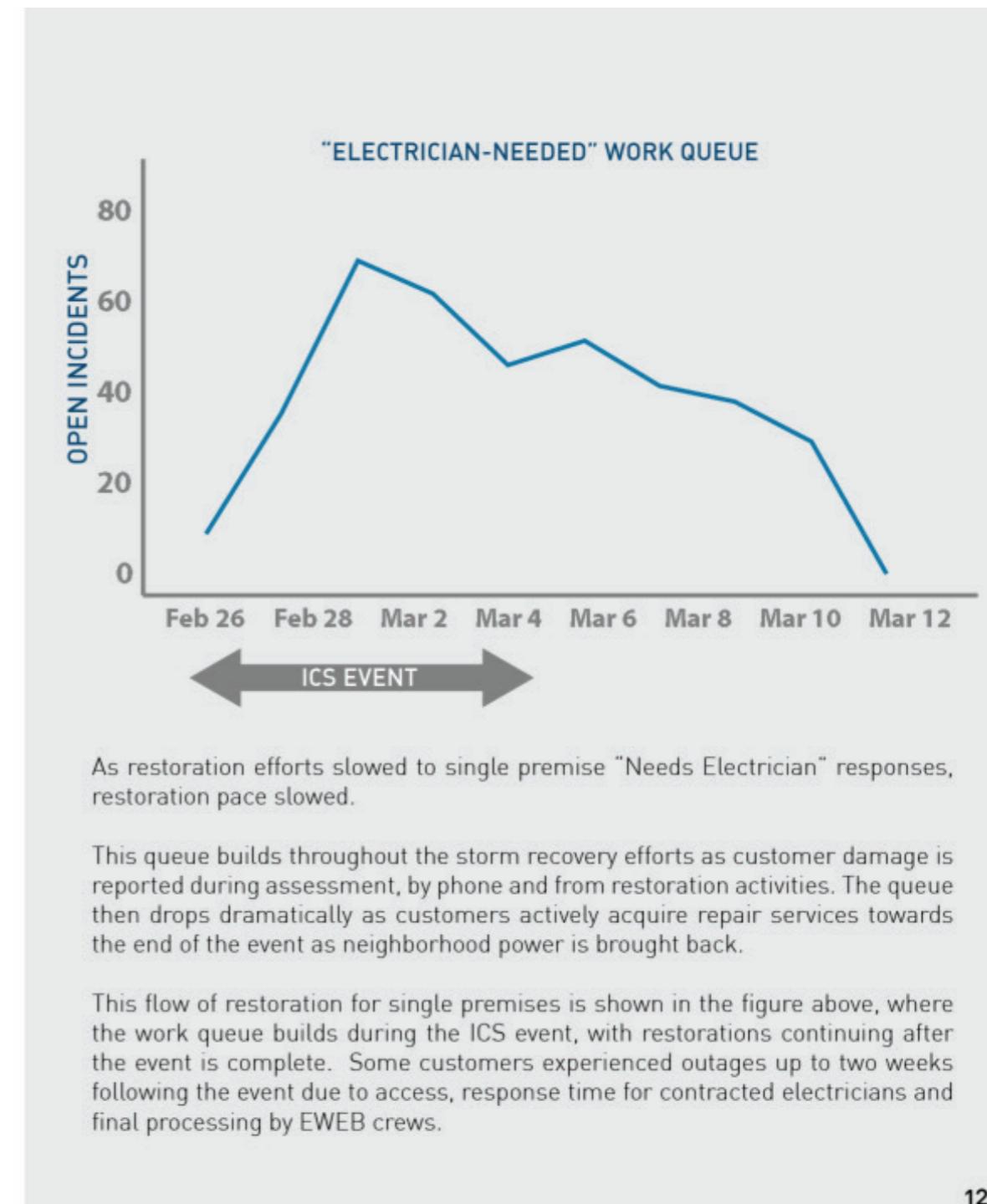


# Planning Section



In the initial phase of the event, crews spent a majority of the time making feeder and switching restorations, as well as responding to wire down reports. As the event progressed into the assessment stage, assessment progress accelerated, as seen by the Feb. 27 peak. The Line Crew Planning role of printing and delivering work packages to Line Crew Area Commanders peaked the following day. Active assessments were completed March 1, as shown by the flat line at the zero level following assessment completion to the end of the event.

From March 1 to the end of the restoration period, Line Crews were actively repairing and restoring customers. As the restorations moved to single premises, and crews were demobilized, the resourcing level of the crews decreased substantially.





# Operations Section

## CORE RESPONSIBILITIES

- Create work orders and prioritize work packages
- Form two-person teams for initial triage
- Restore feeders through switching (line and substation crews) and line clearing (tree crews)
- Complete “make safe” procedures to de-energize and isolate primary high voltage wire
- Release first responders upon arrival to wire down scenes in the field
- Determine work load of crews and recommend field resourcing
- Check in contract crews
- Perform restoration and repair work with full crews
- Estimate times of restoration for customers
- Form and manage two-person teams at the end of the storm for single premise reconnects

## RESOURCES



All crews worked the first shift until Feb. 25 at 2200



Crews worked 0600-2200 remainder of event



One triage crew worked 2200-0600. When possible identified phone/cable & wire watched to give trouble crews rest period.

## SECTION STANDUP

Three crews and one Line Crew Leader were called Feb. 23 at 2200 for initial restoration activities. At first, restorations were focused in the McKenzie River Valley, then spread to the metro area of Eugene. The decision was made to call all crews in on Feb. 24 at 0200. After full internal callout was initiated, and initial damage assessments gathered from field personnel, it was evident that mutual aid crews would be required due to the extent of the damage.

## SECTION PERFORMANCE

During ICS events, the Operations group mimics normal operational duties with expanded resourcing and increased pace. Following ICS activation, two-person teams were formed to respond to initial outage reports. As the storm and damage developed, full line crews were formed from internal line staff, and additional crews were acquired.

Throughout the storm, Operations maintained a focus on safety by keeping two-person teams dedicated to responding to downed wire or severe damage. The remaining crews were organized and dispatched by area commanders for repair and restoration of customers. Crews were assigned to general regions, with restoration job packets consisting of maps, materials and Responder outage management software damage reports. Priority of restoration was determined by hierarchy of repair and customer count, with a goal of each crew restoring the maximum number of customers in the shortest period.

Job packets were prepared by the Line Crew Planning office within Operations. These packets were based on field assessments by the Planning Office. Upon arrival to a restoration location in the field, a reassessment was completed to ensure no new damage had occurred, to confirm needed materials and resources, and to identify any safety issues.

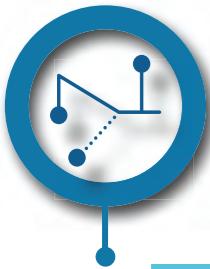
## NOTES OF SUCCESS

- Responder navigation
- Line workers as utility liaisons
- Time sheet accuracy and completion
- Crew location paperwork
- Releasing first responders
- Releasing wire watch teams
- Timely and consistent estimated time of restoration (ETOR) development
- Ability to communicate with other sections
- Use of contracted helicopter for remote transmission line assessment

## AREAS FOR IMPROVEMENT

- Responder training
- Naming and views in Responder outage management software
- Direct issue material for capital jobs
- Tree crews with Line crews only. No more grounds for trimmers.
- Printer station for contractors
- Finance briefings about time ticket expectations for contractors
- Daily log for crews
- Select utility liaisons before storm





# Logistics Section

## CORE RESPONSIBILITIES

- Procure and deliver food for all ICS staff
- Secure hotel accommodations for contracted staff
- Procure rental vehicles for use in deliveries, assessment and wire watch
- Maintain and repair vehicles and equipment
- Manage wire watch and flagger staffing

## STAFFING

Seventy-one EWEB staff members helped work the storm on the Logistics Team, including the Chief, Coordinators, Wire Watch, and other staff running parts, meals and incidentals. The support group pulled staff from seven different EWEB departments. This included 21 contract Flaggers working for EWEB through the storm from two different companies.

1,135 box lunches  
for field staff



1,110 breakfast burritos  
distributed



87 traffic locations



34 wire watch locations



## SECTION STANDUP

During the storm, Logistics had several important tasks which were needed immediately upon ICS activation: arranging food, equipment and accommodations as well as internal staff deployment were the first priorities.

## SECTION PERFORMANCE

Throughout the event, 87 different traffic locations were established, using 26 flaggers at one time in ten different locations. Wire watch was deployed at 34 different locations, with a max of five teams out at one time, to maintain situational safety. There were 243 requests for runners throughout the storm. Vehicle rentals included two Chevrolet Suburbans and two 15-passenger vans for employee shuttles. Additional logistical requests included:

- Transporting EWEB employees to and from their homes
- Running tools and materials to crews
- Picking up and delivering meals and snacks to ROC & HQ
- Transporting crews to hotels

The Pump & Controls Crew went to 35 different storm-related outages or alarms at pump stations. In addition, EWEB experienced four water main breaks in three days. This was impactful as several of the core Logistics staff are sourced from the water department. These additional events put pressure on the Logistics staffing.

The service group coordinated over 25 meal periods at the ROC and HQ. For field crews, 1,135 box lunches and 1,110 breakfast burritos were distributed.

## NOTES OF SUCCESS

- Having dedicated coordinators for the ground support and service groups
- Having a resource group to check people in and out and to provide personnel when needed
- Shuttle service for those that were unable to drive their own vehicles

## AREAS FOR IMPROVEMENT

- The support group needs to setup the Water ICS to accommodate dual computer monitors, etc.
- Need a “live” ICS documentation program that is user friendly and we can easily pull information out for FEMA.
- Wire watchers – training, contact info, we had many on the list working their primary roles and unavailable to wire watch.
- Deactivate ARCOS during a storm event for non-storm related items (i.e. main breaks). The system tries to call people that are already working.
- Provide sleeping arrangements for crews working 16/8 shifts that live too far to drive home. Set up cots in a room that is quiet enough for them to sleep.





# Finance Section

## CORE RESPONSIBILITIES

- Create emergency contracts
- Procure and distribute supplies
- Identify, estimate and record costs
- Ensure continuity of financial resources: Accounts Receivable (A/R) and payable
- Handle claims

## RESOURCES

**Supply Unit** was 24/7 for a few days and then switched to alternate schedule (one long day, followed by one short). All staff were on-hand for three hours each morning.

**Procurement Unit** spent significant time the first few days ensuring contracts were in place and adequate stock levels. Work leveled off about day five.

**Time Unit** on-site every day entering crew time and equipment and answering questions. Significant effort required to ensure accurate time reporting based on HR policy understanding and not widely-distributed instructions.

**Cost Unit** worked in Operations to help capture information and refine processes starting day two and for several days until released by Operations.

**Claims Unit** available, but very little activity during ICS.

**A/R Unit** was not created or tested during drills. The unit was activated late in the process with a team from A/R, Meter Reading and Advanced Meter Services (AMS).

## SECTION STANDUP

The Finance Section Chief was activated Feb. 25 at 0700. The Supply Unit stood up Feb. 24 at 2200 for McKenzie River Valley work. Cost, Procurement, Time and Claims Units were stood up between 0730 and 1000. Cost and Claims Unit leads/backups did not have laptops at home for system access and were unable to safely get to work or were out of the area. Assistance was enlisted from other groups. A/R was not activated until several days into the event. Initial work concentrated on emergency contracts, p-card limits, materials management and distribution, and activating ICS time codes.

## SECTION PERFORMANCE

**Procurement** - Prior to storm season, stock was increased on several restoration materials. Emergency trailers were stocked and several storm baskets prepared. There were only two stock shortages, which did not impact restoration efforts. Contract templates were prepared in advance and were executed in reasonably short order.

**Supply** - The unit was able to keep up with crew requests. Refinements included process for runners to pick up materials, and alternate work schedules to provide better rest. Supply Unit would like to have input into demobilization process.

**Time** - Crew time/equipment was entered daily. The new time ticket increased entry efficiency. Payroll validation was time consuming.

**Cost** - Region work orders and expensing wire was efficient. Working out of Operations to answer questions and immediately improve processes was effective. Process review will continue throughout FEMA application work.

**Claims** - During ICS, a majority of work was around employee incidents which were handled by the Safety Officer. Suggest moving that work officially to Safety.

**A/R** - Stood up by Finance Chief too late in process. Need to address meter reading issues, bill estimations, AMS information and customer communication regarding estimations earlier.

## SECTION STRENGTHS

- Stock levels were adequate for restoration needs
- Emergency trailers/storm baskets available
- Unit availability quickly determined and documented
- Emergency contracts were quicker to execute
- Quicker recording and interfacing of costs/time allowed for faster/more accurate projections
- Wireless enabled computers allowed staff to work from home so more resources were available (although not as efficient)

## AREAS FOR IMPROVEMENT

- Need to create A/R Unit procedures
- Simplify time recording for MAPT
- Vending machine materials need to be available for crews without machine access
- Cost Unit needs to develop additional templates/cheat sheets
- Advanced Meter Services role in ICS should be solidified





# Liaison Section

## CORE RESPONSIBILITIES

- Serve as EWEB's point of contact for Lane County Inter-Governmental Agencies during ICS events
- Serve as Customer Relationship Managers' point of contact for updates involving EWEB's key account customers (new)

## RESOURCES

The Liaison Office encountered a few staffing issues during the event. The primary Liaison Chief was unavailable initially due to an inability to travel to the office. The backup Liaison Chief was able to handle the activation of the Liaison Office despite limited training and experience in the position.

Additionally, the third Liaison Officer was unavailable until day three of the event due to the inability to travel to the ROC from their rural residence.

Finally, the Liaison Office experienced challenges with staffing of the Scribe position throughout the event. The Liaison's designated Scribe was unable to transport to the ROC due to access issues. Additional backup Scribe resources were available and utilized. Additional resources will be required as backups due to this experience.

The Liaison Office was open from 0630– 2200. Liaison Officers worked eight-hour shifts. March 2 at 2200, the Liaison Office officially deactivated. The Scribe position was invaluable in the beginning of the event; however, the Scribe's workload dramatically decreased as the event progressed.

## SECTION STANDUP

EWEB's Liaison Office was activated on Feb. 25 at approximately 0700. Correspondence was received almost immediately following the delivery of the Liaison Office activation email. As time permitted, the Liaison Officer made personal phone calls to affected agencies to inform them that the appropriate vector of communication into EWEB is through the Liaison Office for the remainder of the storm event.

## SECTION PERFORMANCE

The Liaison Office was successful in achieving its goals during the snow storm. The office was able to receive reports from Lane County, 911, and the City of Eugene (COE) regarding electrical hazards. The office was able to take pertinent, pressing information and deliver it to Electric Operations to immediately take action.

Additionally, the office facilitated coordination with the COE and Lane County to increase the efficiency of critical restoration to the community. A key example of this performance was sending a Triage Crew and Troubleshooter with Lane County Public Works to work as a team to establish accessibility to the McKenzie River Valley territory. Furthermore, the Liaison Office facilitated a similar partnership with the City of Eugene to "make-safe" power lines in trees or across critical routes.

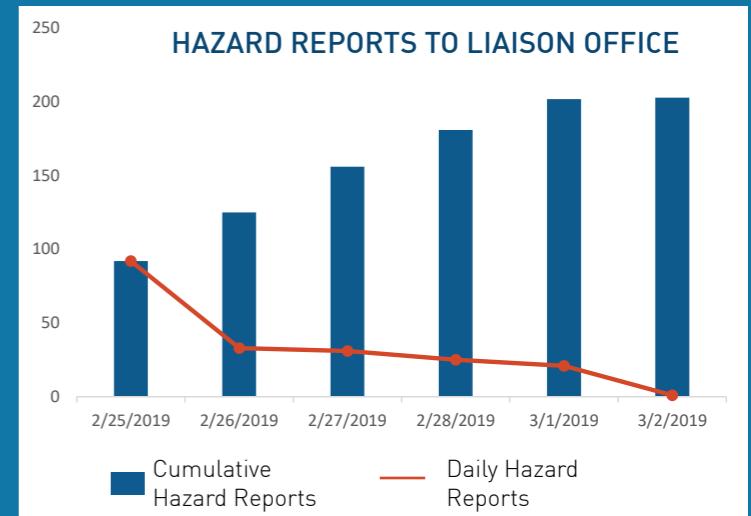
The new process the Liaison Office created for receiving information from external agencies worked extremely well. The transition from receiving hundreds of phone calls to receiving information via email increased efficiency of the office. Moreover, the Excel spreadsheet that the office sent out allowed for quick documentation of more data concurrently.

## NOTES OF SUCCESS

- Activation of the Liaison Office
  - The Liaison Office activated efficiently despite complications with staffing / training
- Hand-offs between Liaison Officers
  - Briefing templates and information logs created efficient transfer of knowledge during shift changes.
- New Liaison Information Reporting Template
  - This Excel spreadsheet allowed external agencies to report multiple issues simultaneously

## AREAS FOR IMPROVEMENT

- Recruit a fourth Liaison position. Establish depth at the Scribe position.
- Establish backup scribe positions and ensure hardware/software accessibility and training.
- Redesign Liaison Briefing Template





# Public Information Office

## CORE RESPONSIBILITIES

- Determine likely longevity of mass outage, begin communicating with internal/external audiences using pre-written “evergreen” messages.
- Develop outage/assessment/restoration information gathered from ICS officers, other staff and Responder to communicate with all internal audiences, customers and the media.
- Provide best available informational updates to internal and external audiences throughout the event.
- Manage digital and traditional news media communication channels.

## RESOURCES

By late morning on Feb. 25, the group was staffed with a PIO, Public Information Assistant (PIA) and two social media content authors. A staffing plan for six days was created, ensuring the group of six PIO staff had coverage from 0600 to 2200 each day of the event. By March 1, the staffing requirements eased due to the rapid restoration of customers at the tail end of the event.

## SECTION STANDUP

The Public Information Officer (PIO) was notified at approximately 0200 on Feb. 25 that outage count was increasing. Shortly after 0700, the decision was made to stand up ICS and the PIO notified members of the Public Information Group about ICS activation.

Staffing the Public Information Group, initially, was difficult due to transportation issues and the heavy surface snow. Logistics was able to send drivers and vehicles to pick up core members of the group.

## SECTION PERFORMANCE

As in past storm-related outages, communication during the initial 24 hours was difficult because of the heavy damage to the system. Using the pre-written messages and communicating realistic expectations helped fill the information void in the first 24-48 hours.

By the middle of Day 3 a better understanding of the scope of the damage to the system in Eugene and the McKenzie River Valley allowed the team to begin sharing more specific information, including some ETORs, daily restoration plans, including general streets/neighborhoods where crews were planning to work.

Public Information Group members worked collaboratively with Operations and Planning to gather the most up-to-date information to share with CSAs, customers via our social media and eweb.org platforms, as well traditional media. There were some initial process hiccups, but those were identified and modified. The Line Crew Leads/Operations were especially helpful during this event, sharing information proactively, which allowed the Public Information Group to disseminate timely and useful information.

## NOTES OF SUCCESS

- Following the 2016 ice storm, the Public Information Assistant role was introduced and tasked with disseminating timely information to Customer Operations Leads and Board Liaison
- The Public Information Group added additional bench strength for engaging with customers through Facebook and Twitter.
- One of the social media staff took on an additional role of a research and administrative support specialist. May create a new position within the group to take advantage of this skill set.
- The information coming from Line Crew Leads was exceptional. They made it a priority to loop in the Public Information Group when they had updates.

## AREAS FOR IMPROVEMENT

- Need to update on-hold messages. Although pre-written messages for on-hold messages were available, this communication tool was not used to full effect.
- Need to train additional staff on how to update the website. While the group is three-deep when it comes to the website, two of those staff were out of the office, leaving only one person to update the site and provide new content.
- Communicators need to better explain how the system work. Although customers found the Hierarchy of Repair graphics and messages useful, customers do not know where they stand within the hierarchy. Also need additional messaging focused on McKenzie River Valley customers.
- Communication to all about ICS activation/deactivation
- Contact Center should manage outage line calls/voice mail when ICS is activated



# Public Information Office

## COMMUNICATION DURING WIDESPREAD OUTAGES

### PHASE 1: PUBLIC SAFETY & SETTING EXPECTATIONS

Initial messages focus on protecting life and property and what to expect during widespread outages. Staff use “evergreen” messages about downed wires and communicate the extent of the damage, setting the expectation that customers could experience an extended outage.

Safety staff provide photos of the damage in the field to help set the landscape of the situation.

### PHASE 2: RESTORATION PROCESS & HIERARCHY OF REPAIR

Following the “make-safe” stage, messages transition to a focus on the restoration process and the hierarchy of repair. Evergreen messages are tailored to fit the circumstances with an emphasis on the need for assessing the extent of the damage and repairing up-stream damage before restoring customers.

Evergreen graphics are used to communicate messages.

### PHASE 3: RESTORATIONS

As details are made available, staff begin communicating daily restoration plans, helping customers to plan appropriately. At this stage, communications staff are also a valuable conduit for gathering outage information from customers that may have been overlooked or missed.

Safety staff continue to provide photos of where crews are working.

### PHASE 4: SINGLE PREMISE

In the final stages of the restoration process, focus is on communicating to customers who have been without power for an extended period. In addition, messages focus on customer-side repairs.

At this stage, most of the communication is one-on-one with customers over private message.

## COMMUNICATION STATISTICS DURING 2019 STORM



7 articles in the eweb.org Newsroom with **5,000** unique pageviews



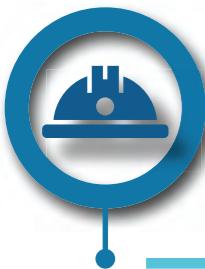
**117** Facebook posts, with average **6,000** engagements/day



**169** tweets, with average **1,500** engagements/day



**132** TV stories, **49** radio updates and **9** Register Guard articles



# Safety Section

## CORE RESPONSIBILITIES

- Provide IC Briefing information on weather, crew condition, operational recommendations and information for communication to PIO
- Perform field visits and crew evaluations to audit conditions
- Provide safety equipment and supplies to field staff as needed
- Escort dignitaries, media and executive staff on field visits

## RESOURCES

- 0500 Feb. 25 initiated Safety Officer role under ICS model
- 0100 March 1 shifted to single shift from 24-hour coverage
- 1200 March 1 shifted to single Safety Officer position
- 1700 March 5 stood down Safety Officer role under ICS
- Initial staffing model
  - Two safety staff during daylight hours (0600-1900)
  - One safety staff second shift (1700-0900)
- Single shift staffing model
  - One safety officer (0600-1800)



0 OHSA-recordable injuries

0 property damages



6 minor injuries



3 good catches/near misses

## SECTION STANDUP

The Safety Officer role was activated on Feb. 25 at approximately 0500. For the initial days of the response, two safety staff were available during daylight hours (0600-1900) and one individual staffed overnight (1700-0900)

## SECTION PERFORMANCE

Safety Officer and staff support of field crews and IC senior staff went very well. Briefing reports were uniform, complete and provided accurate information on field conditions. Safety staff escorted guests to visit field staff without incident. Safety staff were able to provide PIO photo documentation of field conditions which were then shared with the greater community via social media.

Additionally, safety reports were received and processed to look at the following categories of metrics

- All Injuries
- OSHA Recordable Injuries
- Vehicle incidents
- Good Catch / Near Miss reports
- Property Damage reports

## NOTES OF SUCCESS

- Pre-development of Safety Officer/staff incident forms ensured accurate documentation of process and complete/uniform information at ICS briefing events
- Staff shuttle service allowed critical staff safe commute during adverse conditions
- Safety Officer escorted media/executive team members safely to field operations
- Photo documentation provided to PIO for use on social media platforms
- Shared presentation of Daily Safety Briefing with all ICS staff (field & support staff) by Operations Officer and Safety Office
- 16/8 work shift
  - 0 OSHA recordable injury incidents
  - 0 lost work days due to injury
  - Crew condition (mental & physical) was excellent through whole event
- Solidified 3-deep training of Safety Officer position by taking advantage of job-shadowing opportunity during first five days of ICS event

## AREAS FOR IMPROVEMENT

- Duplicate Wire Watcher list initially on SharePoint site.
- Ensure that Wire Watch personnel are assigned duties based on time in field, not on regular work assignments (field staff who had been in field longer were reassigned to relieve office staff who were fresher on second night of event).
- Safety Officer assigned vehicle was 2 wheel drive – 4X4 vehicle with higher clearance is required to perform field assessment visits.
- Observed occasional exposure of field staff in roadway/right-of-way without class 2 hi-vis clothing or vest.
- Occasional lack of traffic control / flagging due to resources being unavailable. Additional contract flagging agreement was developed mid-event.
- Safety office to create a stock of storm-related safety supplies to be stored in warehouse in safety area. These materials are not available (sold-out) at vendors once storm arrives (cold weather gloves, ice-trekkers, hand creams, lip balm, hardhat liners, etc.).
- Provide some sleeping arrangements for crew members who can't physically go home during rest periods.
- Provide Wire Watch and make-safe support for County, ODOT, and City of Eugene road/tree crews to remote areas as soon as possible and when safe to do so. The balance between resource availability and community safety is complex.



# Board Liaison Section

## CORE RESPONSIBILITIES

- Obtain briefing from Incident Commander, reviewing shift notes and ICS Documents
- Receive, review and communicate to the Board the Incident Action Plan (IAP) Form ICS 201 from the Incident Commander
- Maintain contact with the Public Information Officer to review outgoing communication plan
- Participate in Incident Command Team meetings and provide general status report, feedback to Incident Commander from Board and Executive Team.
- Provide the Board and Executive Team with regular status reports obtained at the Incident Command briefings.

## RESOURCES

One person assignment is adequate. Worked closely with PIO office and had access to Chiefs as needed for additional information. Updated the Board two times a day, unless situation changed, as dictated by additional information. Hours are more flexible than other positions, and staff can work from home and call in and email remotely, primarily in the evenings. Must be mandatory that Board Liaison is present with the ICS team during the days.

### SECTION STANDUP

Public Information Officer activated Board Liaison on morning of Feb. 25. Initial actions were to attend ICS Briefings regularly, either in person or by phone. Coordinated with PIO on outgoing messages to the Board and Executive Team prior to disseminating the information.

### SECTION PERFORMANCE

Received correspondence and questions from Board members, primarily formulating responses for the inquiries that the Board had received. Informed Board on restoration process, using evergreen report, and other messaging.

Initiated call-out to each Board member on day five to see if there were any needs as a proactive approach to addressing any information or additional concerns.

Participated in County-wide coordination with Liaison Officer – seemed to provide a broader picture of the event and how other utilities and public services were performing due to storm.

## NOTES OF SUCCESS

- Communications with IC and PIO and Communications staff, information was accessible
- Amount of information to Board and Executive Team was proper amount
- Role seemed to be well respected amongst rest of ICS staff and team

## AREAS FOR IMPROVEMENT

- Select Board members wanted GIS maps of outages rather than online outage map
- ICS Form 214 was not used – was unaware of its need



# Performance Summary

## Notes of success

### SAFETY

A focus on safe work practices and real time assessment of hazards resulted in no recordable incidents, and few minor injuries. The decision to move to 16 hour shifts with eight hour rest periods throughout the storm increased crew efficiencies during working hours, and mitigated risk of accidents due to fatigue.

### PEOPLE

Initial standup was well-executed and employee engagement remained high during the first five days of the storm. This allowed for timely response to “make safe” and initial damage assessment paving the way to restoration, while maintaining safety.

### PROCESSES

Documented processes were followed with little change to workflow throughout the storm. Some ad hoc enhancements were made based on specific need. Existing technology used in normal operations was leveraged to streamline data processing for outages resulting in a nearly 100% paperless process flow.

### TRAINING

Staff understood their roles and objectives staying within their span of control under the ICS structure. This resulted in few backlogs, and quality remained high for service, support and restoration roles. This was a direct result of the focus on the Outage Management Process development and training efforts in 2017 and 2018.

### COMMUNICATION

The flow of information among internal staff increased, providing better strategic direction for field staff and contractors. Communication to the public about the overall event and outage status was increased through the use of EWEB’s online outage map and consistent messaging through available channels.

## Areas for improvement

### SAFETY

Specific improvements could be made to procedures regarding downed wire for field personnel. Additionally, transportation for staff proved challenging at the start of the event due to unsafe road conditions. While this was solved by providing a shuttle, the practice should be documented as a normal process for future events similar in nature.

### PEOPLE

After day five of the event, staff exhibited fatigue from working long hours and managing impacts of the storm event in their personal lives. This resulted in resource constraints in some key technical and support areas. Additional staffing resiliency, especially key roles, should be secured. Internal policies need revision to include detail for specific job descriptions during ICS events, including pre-determined and consistent compensation practices.

### PROCESSES

Further refinement of existing process is needed following the positive proof of concept from this event in order to close the gap between outage incident time and restoration time. Leveraging existing proven technologies, such as mobile field assessment, should be evaluated and implemented in the processes if found to be feasible and economical.

### TRAINING

Additional training is needed for the Responder outage management software to increase usability for information gathering and event processing to more staff. Additionally, ICS awareness and basic training should be required for all EWEB staff and the utility should continue to coordinate an annual “Blue Sky” drill to hone staff skills and refine processes.

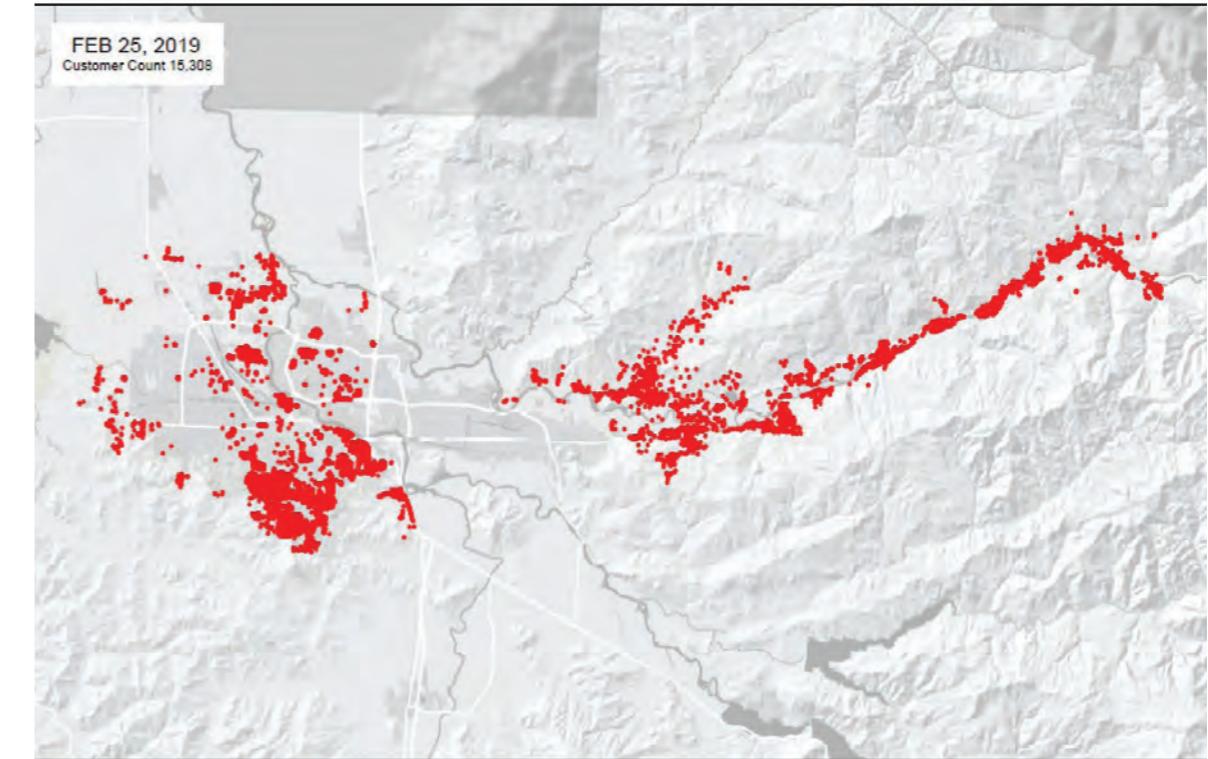
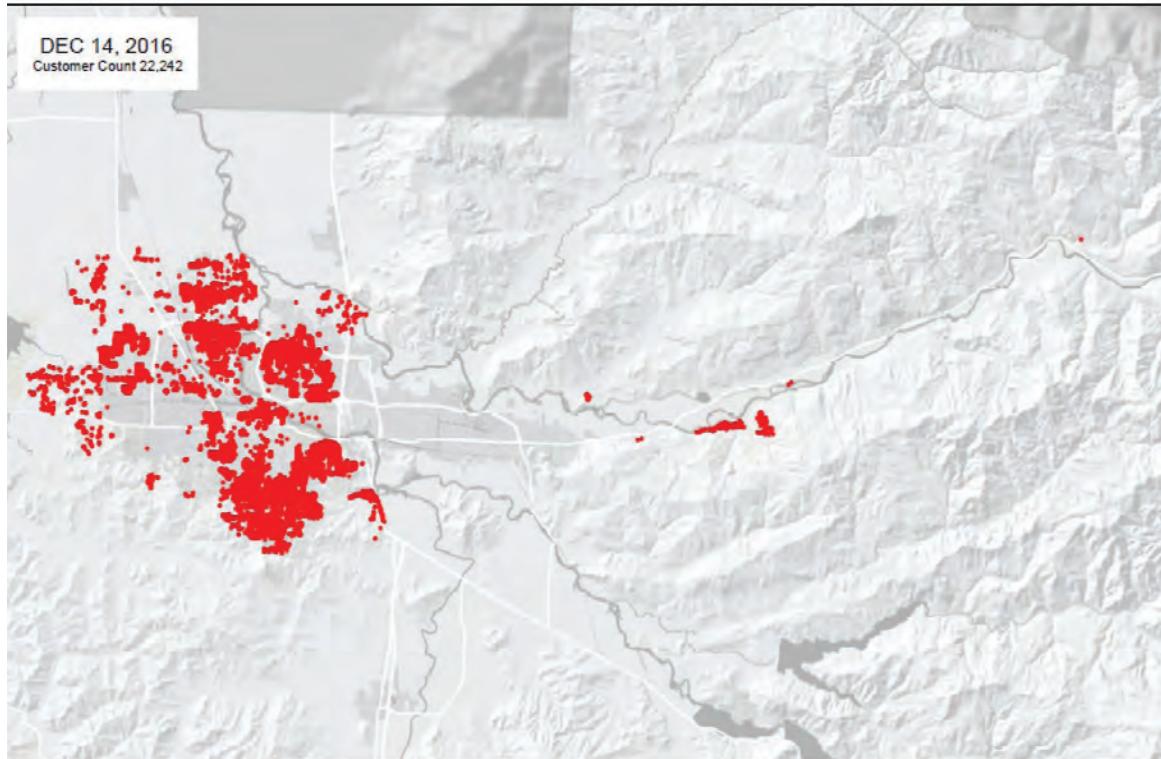
### COMMUNICATION

Daily updates to all internal staff, using multiple channels, should be incorporated into the communications process. Additionally, to increase staff situational awareness new methods for sharing information should be explored, such as screens or reader boards. External communication should build upon improvements realized in this event, continuing to strive for providing customers with relevant and timely information in all available channels.

# 2016 Ice Storm Reflections

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Following the 2016 ice storm, EWEB initiated an improvement process around storm restoration procedures. The improvement goals were based on internal and external feedback from internal hotwash meetings and customer feedback received during interactions throughout the storm, a post-storm customer survey and from a customer open house following the event.



# Goals following the 2016 ice storm

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1.

## SAFETY

Throughout the 2016 ice storm, safety remained the number one priority. This was shown through the after action report metrics, reporting a few minor injuries. This goal carried forward and was paramount to all plans, actions and processes.

2.

## PEOPLE

In order to maintain the workflow at a sustained pace and enable field crews to work without stalling, additional staff were needed to process and deliver information, goods and provide services. Internal resources were identified and secured through specific rosters by role. Staff engagement in the ICS structure grew from approximately 40 identified roles, to over 200; close to 50% of the entire utility.

3.

## PROCESSES

At the time of the 2016 ice storm, no documented process for outage event handling existed. Few internal staff were familiar with the process of an outage reported by a customer to full restoration of power. Through 2017 and 2018, internal staff worked to define processes used in the identification, assessment and restoration of customer outages. Processes were documented and refined in order to be streamlined and paperless, relying on existing software used on a daily basis by operations.

4.

## TRAINING

Following the ice storm, additional training was identified as a need. This included individual training to learn ICS practices and protocols via online FEMA classes, small group training to build technical skills around the use of the outage management software and full scale all-hands drills to practice and hone processes. In 2018, two "Blue Sky" drills were conducted which involved all ICS sections simulating event processes and strategic plans.

5.

## COMMUNICATION

Information for EWEB staff and customers was lacking in 2016. It was evident that providing more timely and useful information to the public was required in order to foster and maintain customer confidence throughout an ICS event. EWEB staff needed real-time data and metrics in order to make crucial decisions about the strategic focus of such events, in addition to provide meaningful communication to customers.

In 2018, staff worked on several communication-focused efforts aimed at increasing clarity around an ICS outage event. An online customer-facing outage map was developed by EWEB staff and launched in mid-2018. This allowed customers to gather real-time information about outages specific to them, gain context around the event impacts and make better informed decisions about their personal response. Building on experiences gained from the 2016 ice storm, communications staff created "evergreen" messages and trained additional staff on external communication strategies.

# Comparing a few statistics

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## COMMUNICATIONS COMPARISON

Consistent with the goals set out from the 2016 Ice Storm After Action Report, additional focus was placed on customer communication in the 2019 snow storm. This required streamlined process flows between the Planning, Operations and Public Information ICS sections, resulting in a successful collaboration that provided for more timely and useful customer communication regarding damage and restoration details.

During both events, communications and customer service staff actively engaged with customers through online channels, telephone and in person. Additionally, similar to 2016, meter reading staff could not safely perform duties due to the inclement weather resulting in estimated reads. In 2019, staff proactively communicated to customers regarding estimated reads/bills.

STATISTIC	2016	2019
Customer Outage Map Views	Map not developed	100,000
Outage Texts	148,000	85,000
Twitter Engagements/Day	4,000	1,500
Facebook Engagements/Day	10,000	6,000
Customer Calls & Emails	70,000	30,000
Number of Estimated Bills	7,000	14,000*
Estimated Bill Communication	Reactive to inquiries	Outbound calls & emails, TV interview

\*Reduced by 3,000 due to AMI reads.

STATISTIC	2016	2019
Days in ICS	10	10
Cumulative Outages	24,000	20,000
# Line Crews	32	15
#Tree Crews	14	10
Total Staff	200	300
Poles/Cross Arms Replaced	28/157	18/163
Wire Replaced (feet)	47,000	43,000
Transformers Replaced	40	30
Estimated Cost	\$4.2 million	\$3.5 million

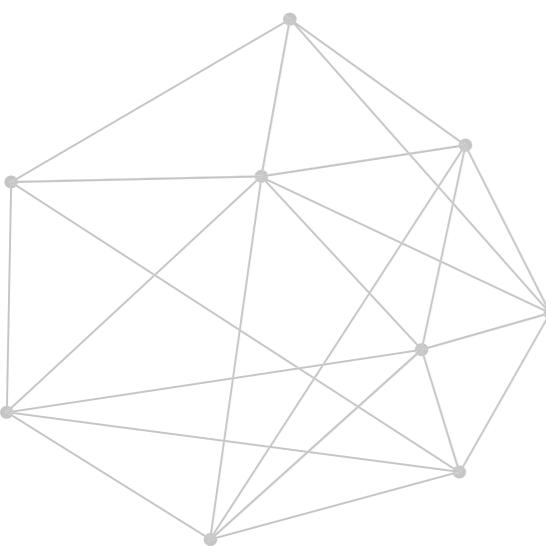
## RESTORATION COMPARISON

The magnitude of damage and scope of repair was similar between the 2016 ice storm and the 2019 snow storm. There were differences in the storm characteristics, however. Since the snow storm resulted in cumulative buildup of snow fall, access for assessment, triage and line crews proved to be more of an issue in 2019 than 2016. Additionally, though damage to the electric system was mainly comprised of tree to primary wire contact for both storms, the 2019 storm resulted in more uprooted and downed trees due to the weight of the snow on limbs, rather than primarily broken limbs as was experienced in 2016. Finally, in the 2016 ice storm, damage was isolated to the metro area of Eugene, with relatively little damage in the McKenzie River Valley. In the 2019 snow storm, the McKenzie River Valley system suffered widespread and devastating damage, with nearly all customers in the territory impacted.

Comparing restoration processes, it is clear that the utility was more efficient responding to the 2019 snow storm than the 2016 ice storm. Though both events were similar in cumulative outage count (20,000 for 2019, 24,000 for 2016) and duration (9 days until near complete restoration for both events), EWEB relied on 32 line crews in 2016 compared to 15 line crews in 2019. The more efficient use of staff for planning and organizing resulted in efficiency gains in the field. Line crew work was better organized and prioritized by geographical area, reducing redundancy and resulting in minimal idle-time for crews.

# Conclusions & Recommendations

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The 2019 February snow storm tested the resiliency of the EWEB electric system, internal staff and the utility's customer-owners in Eugene and the McKenzie River Valley. The storm event caused devastating damage to communities and EWEB's electric infrastructure, totaling \$3.5 Million in restoration costs. In total, over 15,000 electric services experienced at least one outage during the event, with the cumulative outages adding up to over 20,000. The bulk of customers had power restored within 9 days of the initial snowfall, with only very minor staff and public safety incidents.

Due to EWEB's strategic focus around emergency preparedness and disaster recovery and increased community awareness and preparedness, the cost, and overall impact of the event was measurably less than the 2016 ice storm, which was of similar magnitude. Though the per incident restoration cost and restoration time was similar between both events, effective communication and documentation increased during the 2019 event with no added cost. This, in conjunction with improved training and processes, resulted in more efficient restoration, while maintaining public and staff safety and aligning with requirements for FEMA reimbursement.

While EWEB's performance showed marked improvement, there is room for continued enhancements. Concrete and actionable lessons-learned have been identified and it is recommended EWEB continue to invest in resourcing, systems and tools that aid in an efficient emergency restoration response.

In addition, continued attention should be placed on informing the public of outage management processes, risks of impact to the customer and corresponding actions to help mitigate those impacts. Specific communication campaigns should be implemented and additional products and services developed where appropriate and within scope of EWEB's core service obligations.

With continued attention to emergency preparedness and the resiliency of the electric system, internal EWEB staff, customers and community members alike will experience an increased probability of protecting life and property during future events similar to the 2019 snow storm, or larger.