After-the-Fact and System Schedulers Meetings

October 22-23, 2019 – Portland, OR

NORTHWEST PowerPool

AFTER THE FACT & SYSTEM SCHEDULERS MEETING
October 22nd & 23rd, 2019
1pm-5pm, 8am-12pm respectively
Location: Embassy Suites by Hilton, Portland Downtown
319 SW Pine Street
Portland, OR 97024

Oct. 22:

1pm

- Welcome and Arrangements
- **Introductions**
- **History of Real-Time Trading** — **Demetrios Fotiou, Powerex**
- **Multiple RCs and ATF Coordination** — **Rose Statler, WAPA**
- Break & Refreshments
- Group Activity (Optional)
- **BPA: EIM** — **Russ Mantifel, BPA**
- **NWPP Corporate Overview** — **Frank Afranji, NWPP Pres.**

5:00pm

- **Reception (appetizers & cash refreshments)**

Oct. 23:

7am

- Breakfast

8am

- New Introductions
- **Northwest Natural Gas: Enbridge Pipeline Rupture Impacts** — **Scott Johnson, NW Natural**
- **Renewable Technology & Storage** — **Jason Yedinak, Doosan GridTech**
- Break & Refreshments
- **Avangrid: Year One** — **Kevin Dickey, Avangrid**
- **NWPP Projects and Resources** — **Keith Schreiner, NWPP**
- Farewells

NORTHWEST PowerPool

Presenter Biographies –
After-the-Fact & System Schedulers Meetings
October 22-23, 2019 – Portland, OR

Multiple RCs and ATF Coordination

Rose Statler has over 20 years of power utility experience working in prescheduling and after-the-fact accounting and settlements. Rose is currently on her second term of being the WECC MIC ISAS After the Fact Accounting Workgroup Chair. Her first term was back in 2005-2008 (2 ½ years) during which time, NERC had transitioned to CERTS for inadvertent reporting and WECC had transitioned to the WIT tool. She loves her family, exploring and being active and recently found a new love of weight lifting to relieve the stresses of life.

History of Real-Time Trading

Demetrios Fotiou holds a Bachelor of Applied Science degree in Civil Engineering specializing in Hydraulic and hydrologic engineering from the University of British Columbia and a Masters of Applied Science degree in Environmental and Municipal Engineering also from the University of British Columbia. Demetrios has worked in the energy industry for 30 years, including 24 in electricity trading. He is currently Director of Power at Powerex, with one of his responsibilities being managing the Realtime Trading group. He was the original Realtime manager and still the only Realtime manager in Powerex' history. Demetrios has taken an active role historically in the industry being heavily involved in many industry workgroups. He is happily married with 2 teenage children, and uses most of his spare time watching them compete in soccer and volleyball.

BPA: EIM

Russell Mantifel is the Lead for EIM Policy at Bonneville Power Administration, and is responsible for the evaluation of key policy issues related to EIM Implementation, including those regarding the scheduling and use of BPA transmission. Russell has worked with PNW EIM Entities that use BPA's transmission, or shared paths which BPA operates, for their own EIM participation. This work includes the development and execution of the Coordinated Transmission Agreement between BPA and the CAISO. Prior to BPA Russell worked at Portland General Electric on FERC and NERC compliance and regulatory issues.

NWPP: New Members Summary / Corporate Overview

Frank Afranji is President of the Northwest Power Pool where he is responsible for the management and coordination of various programs and services provided by the Power Pool. These include facilitation and coordination of reserve and frequency response sharing, response strategy, transmission planning, system coordination management, operational training services and additional serves to members and third parties through separate, customized contracts.

Prior to joining NWPP Afranji served as Director of Transmission and Reliability Services for Portland General Electric where he was responsible for various aspects of the gas and electric transmission system including capacity sales, contract administration, transmission scheduling, high voltage regional transmission planning, industry restructuring and Balancing Area activities. Afranji served on and chaired a variety of WECC and NERC committees.

Afranji earned Bachelor and Master degrees in engineering at Southern Illinois University at Carbondale, Illinois and Master of Business Administration from Portland State University. Afranji has considerable community involvement and has received recognition from many organizations including the Harold Schnitzler "Spirit of Unity" in 2009; The 1995 World Affairs Council of Oregon R. Willard deWeese Award for International Community Service; 1994 Ecumenical Ministries Louis Hunderup Award; 1993 Stephen Wise Humanitarian Award; 1990 Oregon Peace Institute Award.

Northwest Natural Gas: Enbridge Pipeline Rupture Impacts

Scott Johnson works at NW Natural as Assistant Director of Gas Supply. He manages the gas acquisition and scheduling team which handles the physical gas purchases and financial derivatives for the company. Scott also works with regulatory bodies, upstream pipelines, NW Natural's optimization partner, and gas reserves joint venture partner. Scott comes from an accounting background and started his career auditing energy companies with Moss Adams and has worked in financial reporting, and gas and regulatory accounting at NW Natural. Scott lives in Washougal with his wife and four children where they love everything outdoors.

New Renewable Technology & Storage

Jason Yedinak is the Manager of Power Engineering at Doosan GridTech, responsible for the design, installation, and deployment of large-scale energy storage systems. He has delivered over 60MW of energy storage systems to date, all built to the Modular Energy Storage Architecture (MESA) standards and controlled by the Doosan GridTech Intelligent Controller. Mr. Yedinak has over 13 years of renewable resource integration experience.

Mr. Yedinak received his Bachelor of Science in Electrical Engineering and a Smart Grid Planning and Operation graduate specialty certificate from the University of Washington. He is a licensed Professional Engineer in Washington and Texas. He is a member of the NFPA and IEEE Power and Energy Society. In his free time, Mr. Yedinak enjoys playing soccer, mountain biking, fishing, and skiing.

Avangrid: Year One

Kevin Dickey is Managing Director, Trading Operations. He oversees the teams responsible for the physical delivery of AVANGRID's North American resources including Real-time Trading, Power Resource Scheduling, and Real-time Meteorology. He joined the company in 2005 and has over 25 years of experience in gas and power trading operations. Kevin also served as Director of Real-time Trading and Manger of Power Resource Scheduling at AVANGRID. Prior to 2005, Kevin held positions as a NERC certified System Operator and Manager of Power & Gas Scheduling at Idaho Power from 2000-2005. Kevin began his energy career in the gas business in 1994.

NWPP: Source.Training, upcoming projects, and more.

Keith Schreiner is the Lead eLearning producer at the Northwest Power Pool. He has worked in the Electric industry since 2012 with responsibilities for designing and producing eLearning courses for System Operators and leading the creative team at the NWPP. Keith participated in NERC's Train the Trainer Events in 2015,2016,2017 and is currently serving as the manager of the NWPP's Operations Training Subcommittee (OTS) where his responsibilities include but are not limited to working with the NWPP member representatives on focusing training needs and delivering training materials on a variety of subjects as well as helping chart a course for training in the NW region.

Prior to Joining the NWPP Keith was the owner operator of Auditory Sculpture llc from 1997-2012 where he was the lead producer for creative projects across the entertainment industry, from top 20 Billboard music artists to National advertising campaigns for companies such as Adidas, Nike, Intel, Microsoft, Autodesk, Twitter, Facebook and work in TV and Film. Keith holds a BS in Bio-Psychology and did independent research at the Dumond Conservancy for Primate Conservation where he assisted in a study on neo-tropical monkeys use of a cognitive map while foraging and a self-directed study on using Positive Reinforcement Techniques as a form of enrichment in Papio Hamadryas.

ISAS ATF Workgroup Update

Rose Statler

Public Utilities Specialist, Technical Lead

NWPP ATF System Scheduler's Meeting 10/22/2019

Western Area Power Administration

Agenda

1. ISAS ATFWG Activities
2. Multiple RC's
3. Change to the Submittal Process for WIT Change request forms
4. Questions

ISAS ATFWG Activities

- ATF workgroup members Craig Henry, Sharon Liebert, Danielle Smith, Clint Savoy, Jennifer Nelson, Calvin Dacus, Stacey Casiano, Calvin Dacus, and my self looked at the ATF documents (ATF Manual Guideline, ATF Tagging Guideline, Guideline for Reconciling Inadvertent Interchange Reporting Discrepancies, and the WECC Interchange Tool Checkout Guideline) and updated them to account for;
  - RC Change
  - Retirement of NERC Standard BAL-006-2
  - The WECC change to wecc.org from wecc.biz references

ISAS ATFWG Activities

- Documents are going to be review by the ISAS Chair then posted to the WECC Website for Comment
- Vote to approve changes expected during the January 2020 ISAS meeting

Multiple Reliability Coordinators

- Effective January 1, 2020 Peak RC will be replaced by 3 active RCs
- RC West (hosted by CAISO) – Began parallel operation for the California Bas July 1st 2019
- BC Hydro – Bagan parallel operations September 2nd 2019
- SPP will begin parallel operations December 3rd 2019
- GRID Force is still going through the RC approval process and has elected RC West for RC Services
- Alberta remains it's own RC – Will use RC West for WIT BA Administrative functions

Multiple Reliability Coordinators

- BC Hydro – Will use RC West for WIT BA Administrative functions.

WIT Change Request Submittal Process Changes

- Effective November 1st 2019 WIT Change request forms must be submitted to your new RC WIT BA Administrator
- What remains the same in the WIT Change Request process?
  - Either the Source or Sink BA is responsible for the initiation, submittal and follow through of a WIT Change
  - All entities involved in the physical segment on a tag must approve and sign off on a WIT Change request form
  - Includes, Transmission Providers, Intermediary BAs, Source and Sink
  - PSE's should be notified, but are not required to sign off

WIT Change Request Submittal Process Changes

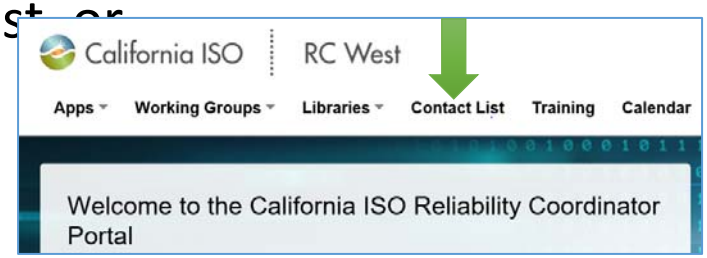
- What remains the same cont..
  - If a WIT Change Request will be replaced by an ATF tag, they must be approved and submitted with in the ATF Tagging deadlines (168 hours to the hour from the start of tag replacing)
  - WIT Change Requests are used for
    - Correct erroneous Tags which reflect the wrong TP(s), wrong BA(s), wrong Market Path
    - Document actions that were agreed to and controlled to in real time
  - WIT Change Request are not to be used for
    - Market manipulation
    - Generator imbalance

WIT Change Request Submittal Process Changes

- What Changes in the WIT Change Request process?
  - How and to whom we submit a Change Request form
  - WIT Change Request forms will be submitted to your entities contracted RC's WIT BA Administrator via a portal
    - Customer Inquiry Dispute Information (CIDI) is the portal for RC West
    - Request Management System (RMS) is the portal for SPP

WIT Change Request Submittal Process Changes

- How to gain access to the portal(s)
- CIDI
  - Reach out your organization's User Access Administrator (UAA)
  - If you do not know who your UAA contacts are, you can:
    - Go to RC Portal at https://rc.caiso.com, pull up the Contacts list, or



    - Contact the ISO Service Desk at (888) 889-0450 and provide your organization's name and they can pull up the UAA information for you.

WIT Change Request Submittal Process Changes

- Request for the EXTERNAL IMS READ-WRITE role in CIDI. Access will be granted within 24 – 48 hrs.
- If the user **has an existing ISO CMA certificate**, the CIDI application will be automatically added to the user's profile.
- If the user **requires a new certificate**, the user will receive an email notification with instructions on how to register and install their certificate.

WIT Change Request Submittal Process Changes

- CIDI cont…
  - RC West has posted a training guideline to walk you through the entire process on the WECC website under ISAS ATFWG for you to download and follow
- RMS
  - SPP RC customers will need to request an account by going to https://spprms.issuetrak.com and select "Register Now" option from the login screen
  - SPP has also posted a training guideline on the WECC website under ISAS ATFWG for your to download and follow

WIT Change Request Submittal Process Changes

- Both RC West and SPP plan on coordinating changes to WIT by forwarding the WIT Change Request Forms to each other
- Both RC's will be responsible for ensuring the Interconnection is balanced each month

WIT Change Request Submittal Process Changes

- RC West is the WIT Administrator and will be responsible for
  - Coordinating that the FERC (CERTS) sight is locked each month
  - Coordinating enhancement changes to the WIT tool with OATI
  - Would like active feedback/participation in the WIT Users group from end users in ATF

WIT Change Request Submittal Process Changes

- Submitting a WIT Change request for through the respective portals should also
  - Inform the ATF Workgroup Chair
  - No more emails are required
- Peak will support both RC West and SPP if needed for the change request forms
- If you do not have access to the respective portal do so ASAP
- WECC website: https://www.wecc.org

QUESTIONS?

BPA's EIM Update

Russ Mantifel

October 22, 2019

Overview of BPA's System

General Information

BPA established	1937
Service area size (square miles)	300,000
Pacific Northwest population	13,712,171
Transmission line (circuit miles)	15,238
BPA substations	260
Employees (FTE)	2,891[1/]

1/ FTE for fiscal year 2017 from the FY 2017 Congressional Budget.

Customers

Cooperatives	54
Municipalities	42
Public utility districts	28
Federal agencies	7
Investor-owned utilities	6
Direct-service industries	2
Port districts	1
Tribal utilities	3
Total	143
Marketers (power and transmission)[2/]	200
Transmission customers	532

2/ As of February 2018.

Transmission System

Operating voltage	Circuit miles
1,100 kV	1
1,000 kV	264[8/]
500 kV	4,869
345 kV	570
287 kV	229
230 kV	5,328
161 kV	119
138 kV	56
115 kV	3,520
below 115 kV	282
Total[9/]	15,238

8/ BPA's portion of the PNW/PSW direct-current intertie. The total length of this line from The Dalles, Oregon, to Los Angeles is 846 miles.
9/ Total circuit miles as of February 2018.

Federal Hydro Projects

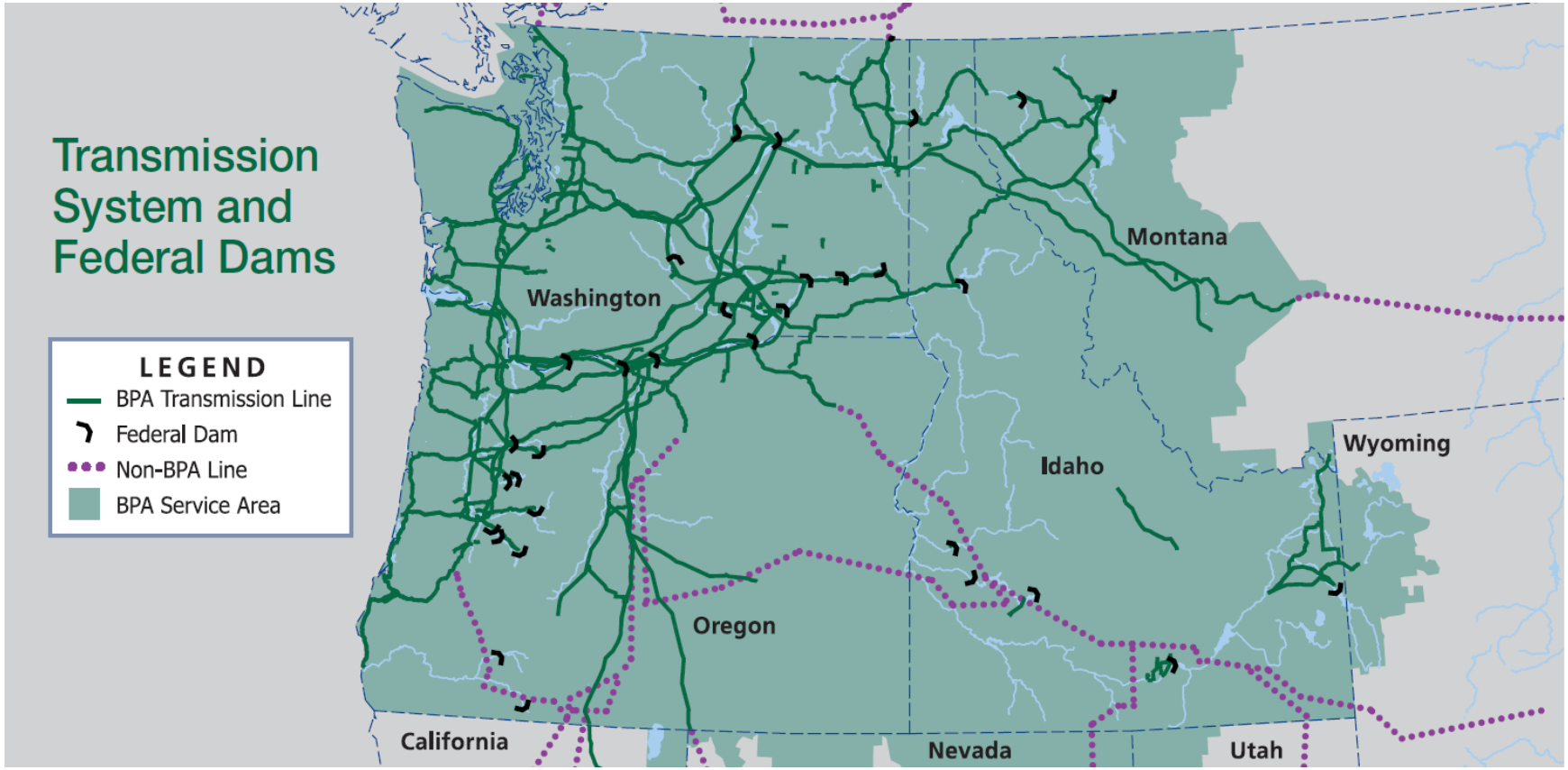
31 federal dams (max. capacity) ..... 22,458 MW

Projects owned and operated by:
U.S. Army Corps of Engineers (14,651 MW) 21 dams
Bureau of Reclamation (7,807 MW) ..... 10 dams

Federal Generation

Hydro generation	9,377 aMW
Total generation	10,313 aMW
60-min. hydro peak generation	14,192 MW
60-min. total peak generation	14,600 MW
All-time 60-min. total peak generation record (June 2002)	18,139 MW

Overview of BPA's System



BPA's EIM Evaluation

- BPA executed an Implementation Agreement with CAISO in September 2019
- BPA is pursuing a Western EIM implementation based on six principles:

1. Consistent with statutory, regulatory and contractual obligations.
2. Maintain reliability.
3. Voluntary participation.
4. Sound business rationale.
5. Consistent with the objectives of BPA's strategic plan
6. Transparency of commercial and operational impacts on products and services.

Five Phases to Western EIM Decision

Exploration July 2018–June 2019

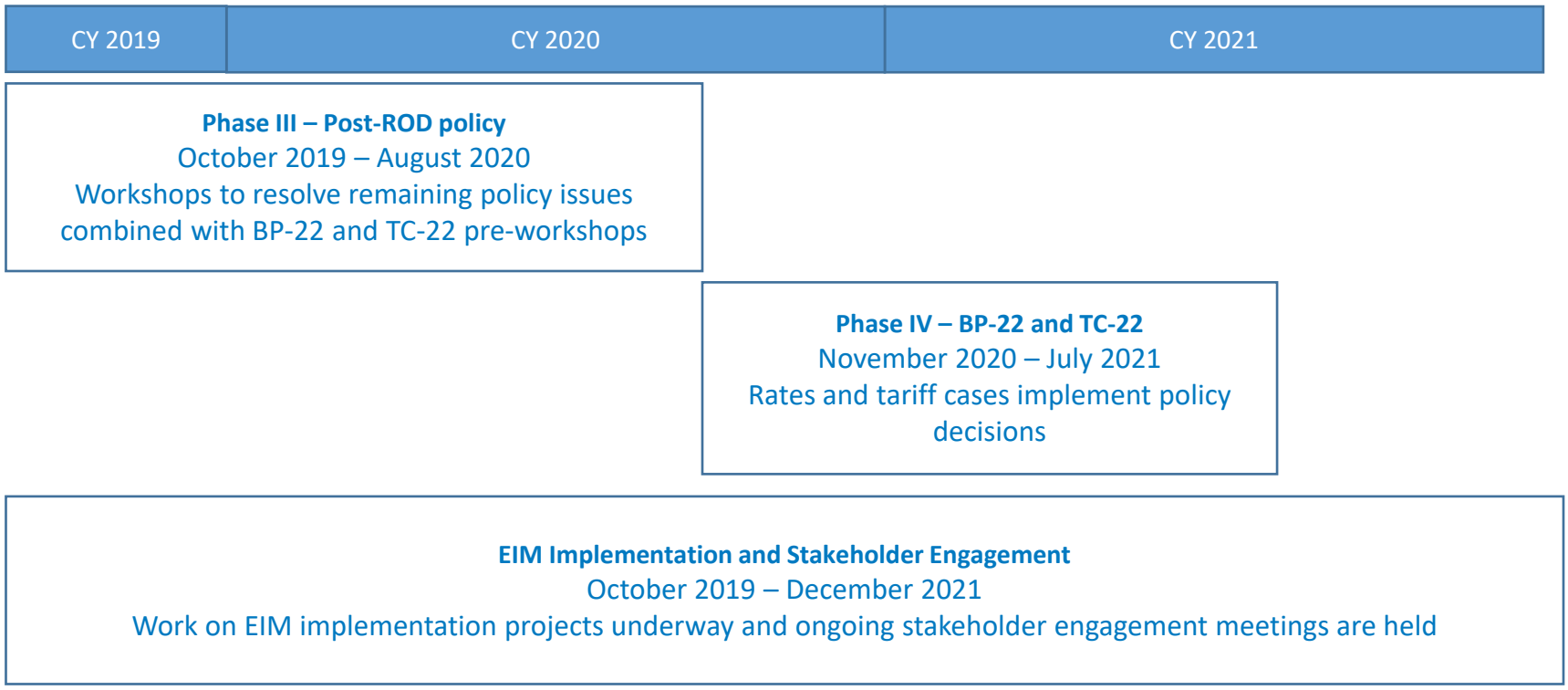
Implementation agreement June–Sept. 2019

Policy decisions Oct. 2019–Aug. 2020

BP-22 & TC-22 Nov. 2020–July 2021

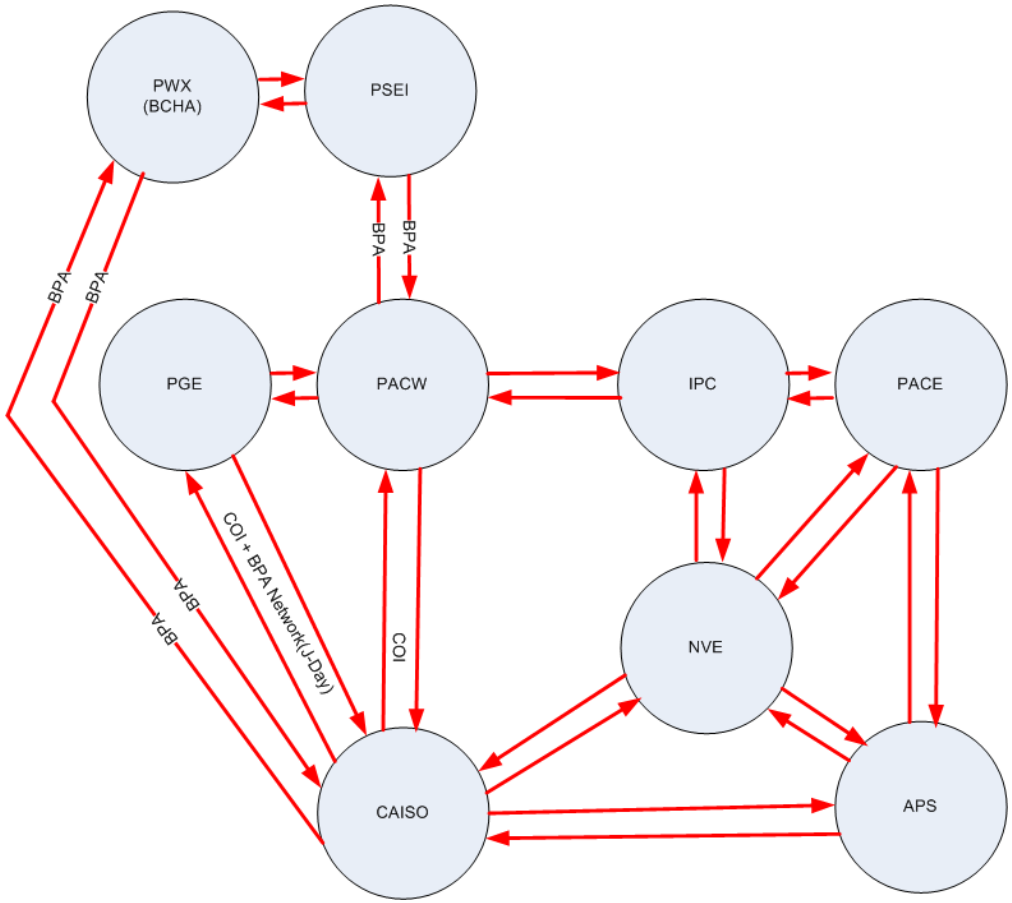
Close-out Oct.–Dec. 2021

EIM POLICY TIMELINE



EIM Transfers (Today)

- Transfers between EIM Entities are currently limited to these transfer paths
- EIM will facilitate **wheeling** of EIM energy through EIM Entities (e.g., CAISO → NVE → PACE → PACW →PSEI) when more efficient transmission paths are constrained



BPA's EIM Transmission Policy

- BPA has determined it will use the Interchange Rights Holder methodology to make transmission available for EIM Transfers
  - As opposed to the "ATC" methodology
- BPA will determine timing and any other requirements in the Phase III Post-ROD Policy process
- BPA has not made determinations about scheduling timelines for the EIM and will also discuss these in the Phase III Post-ROD Policy process

Next Steps

- BPA's first Phase III Policy meeting is October, 23
- Further discussion about scheduling changes will be centered on that forum

NWPP RESOURCE ADEQUACY Future Phases

After-the-Fact - System
Scheduler Meeting
October 22,2019

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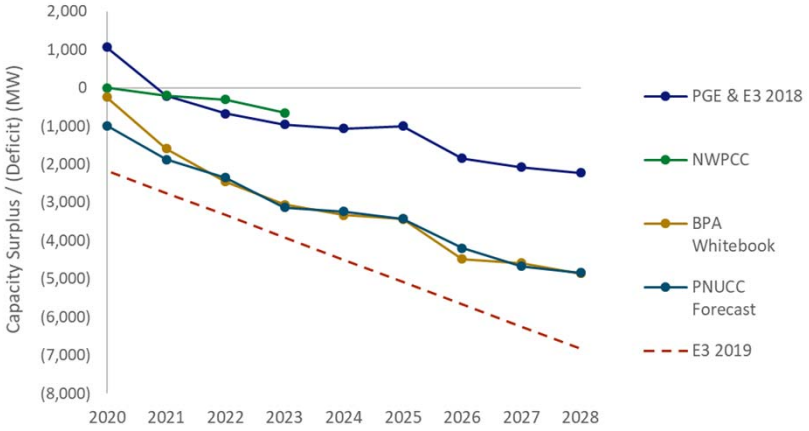
A REGION IN TRANSITION

- Coal retirements – losing firm resources when the region already has relatively tight load-resource balance
  - 3,000 MW of coal resources will come offline in the next two years
- New state policies demand a shift to a cleaner electricity supply portfolio
  - Oregon Senate Bill 1547 increased the state's RPS to 50% in 2016
  - Washington Senate Bill 5116 established goals of carbon neutrality in 2030 and carbon-free by 2045
- Utilities acting on their own – combination of policy and economics
  - Avista and Idaho Power have pledged 100% clean electricity by 2045
  - PacifiCorp, PSE, Idaho Power proposing early retirements of coal

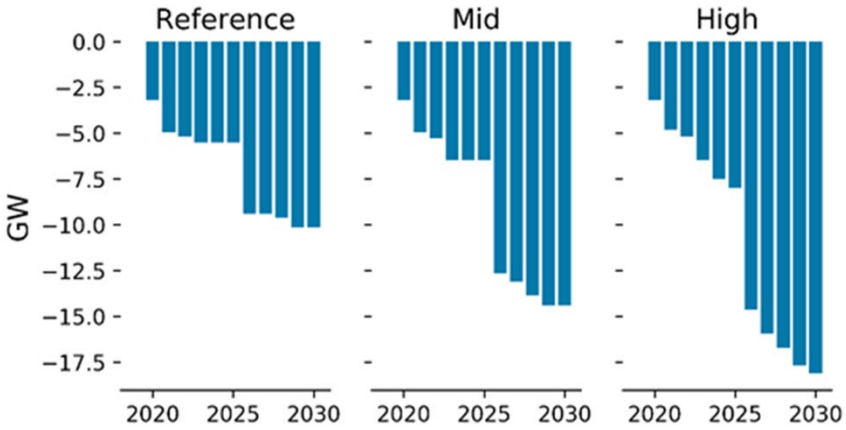
MULTIPLE STUDIES AGREE THAT THE NW IS APPROACHING A PERIOD OF CAPACITY SHORTFALLS

NW Capacity Surplus / Deficit in Recent Studies



Note: WECC also publishes a resource adequacy assessment, but it focuses only on summer, whereas resource adequacy is primarily a winter issue for the Northwest

US WECC Coal Retirement Scenarios



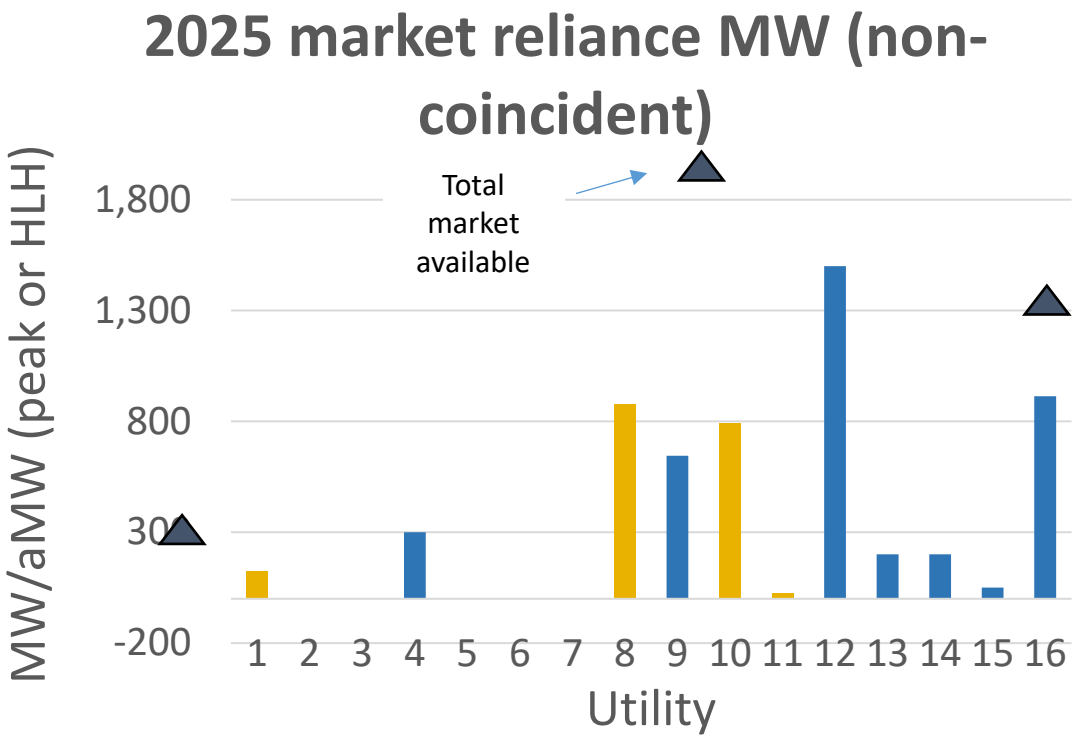
Note: Coal retirement scenarios developed by NWPP IRP Team. From research of announced and potential retirements from across the US WECC.

Market reliance, yes!

Season of highest use

SUMMER

WINTER



Data from IRP survey. Missing data filled in when possible.

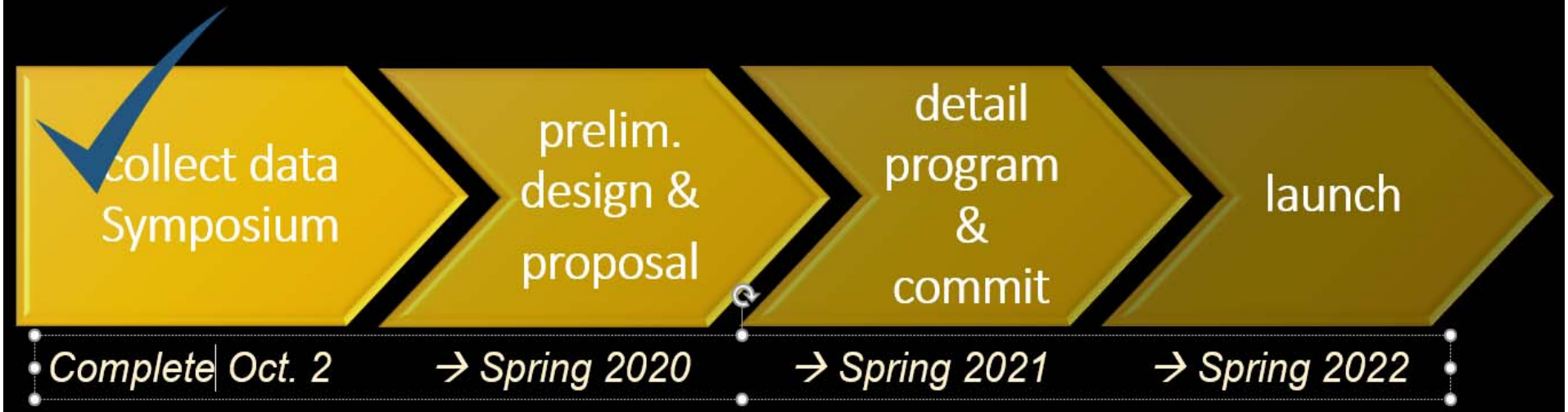
WORK GROUP RECOMMENDATIONS

1. The region should take further steps to develop a regional resource adequacy program to achieve the following benefits:
   - To maintain reliability during a period of significant transition for the region's electricity system;
   - To promote increased transparency and uniformity that will provide utilities, regulators, and stakeholders alike with a clear understanding of the region's resource adequacy position;
   - To allow utilities and their customers to safely realize the full benefits of the load and resource diversity that exists across the region while maintaining reliability;
   - To provide a platform for utilities to share planning reserves and make optimal use of existing resources.

WORK GROUP RECOMMENDATIONS

2. The design of a resource adequacy program for the NW should be tailored to reflect the unique qualities & characteristics of the region
   - Significant role of hydroelectricity & public power
   - Transmission and fuel delivery constraints in the region
3. A resource adequacy program should not usurp authority that is vested with the utilities and their governing bodies to determine the best way to meet resource adequacy requirements
   - RA program must include binding commitments for each member to do its share to maintain regional reliability and must have exclusive authority over resource capacity accreditation
   - However, decisions about which resources to procure to satisfy the regional obligation would continue to rest with member utilities

DEVELOP RESOURCE ADEQUACY PROGRAM



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Development of a Resource Adequacy Program

- Detail program elements (Spring 2020 – Spring 2021)
  - Finalize key design elements, cost & benefits of program estimates
  - Refine governance/organizational structure
- *Decision point: Execs agree to program as designed and to fund implementation*

- Launch (Spring 2021 – Spring 2022)
- *Execs sign off when implementation is complete*
- **RA Program goes live end of Spring 2022**

Stockholder Committee R/A Program

- **Stakeholder Advisory Committee**: .
- Suggested Stakeholder Advisory Committee with the following Membership:
  - Commissioners*
  - Public Power Stakeholder groups
  - Environmental community stakeholders
  - Independent Power Producers
  - Demand-side developers
  - Industrial/commercial users
  - Ratepayer advocacy group
  - Natural Gas Utility
- **Regular Public Webinars:** Provide regular public updates to all interested stakeholders about the process and options under consideration

Questions and Input

Enbridge Pipeline Rupture Impacts

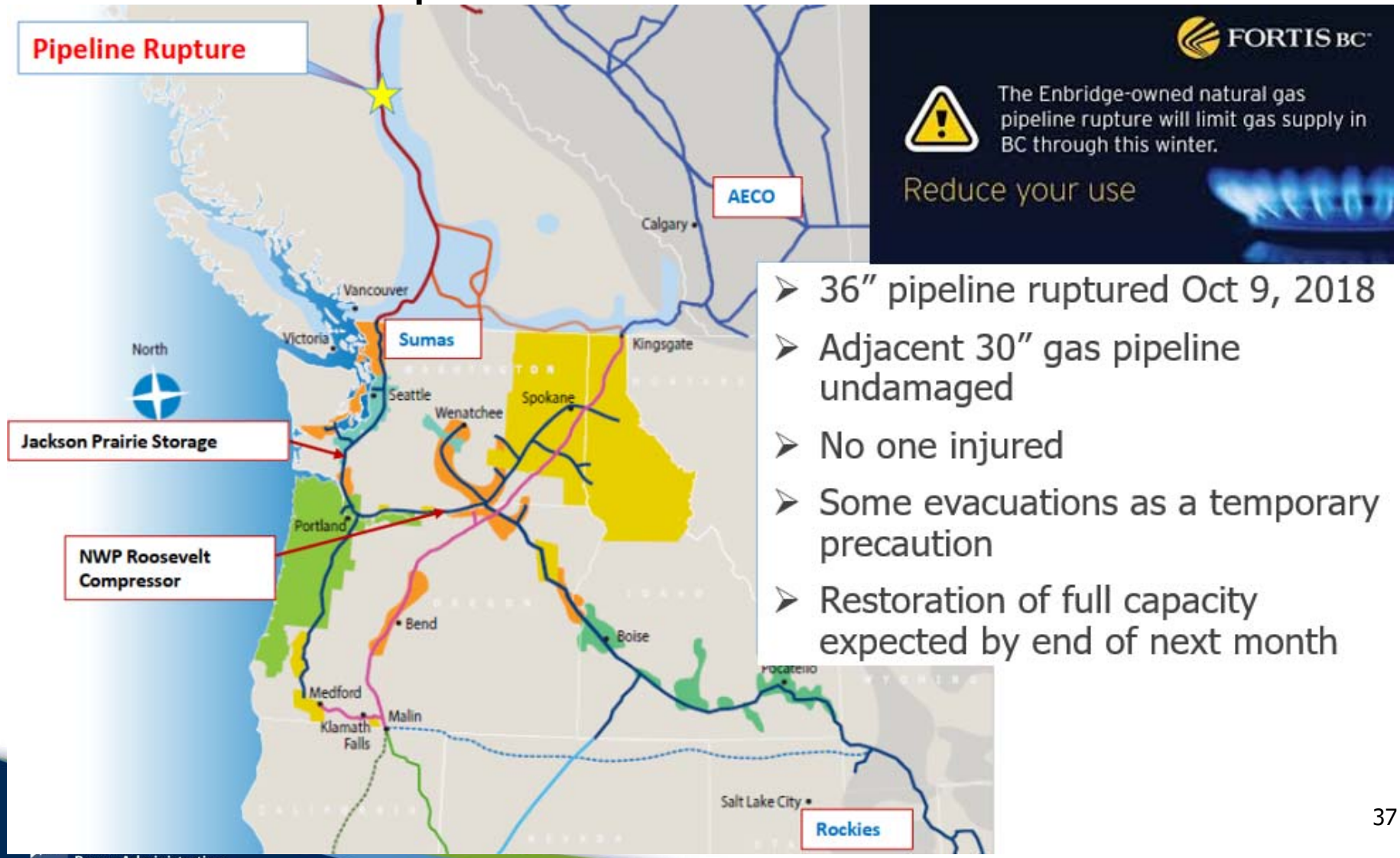
October 23, 2019

- Scott Johnson

Western Area Power Administration

NW Natural®

Initial Impact



- 36" pipeline ruptured Oct 9, 2018
- Adjacent 30" gas pipeline undamaged
- No one injured
- Some evacuations as a temporary precaution
- Restoration of full capacity expected by end of next month

The Region Rallied in Response

NW Mutual Assistance Agreement

- Phone calls coordinating response hours after the rupture
- All participants looked for ways to alleviate the emergency
- All actions were voluntary

Constraints on the system

- Jackson Prairie storage was limited due to maintenance
- Roosevelt compressor station was limited due to maintenance

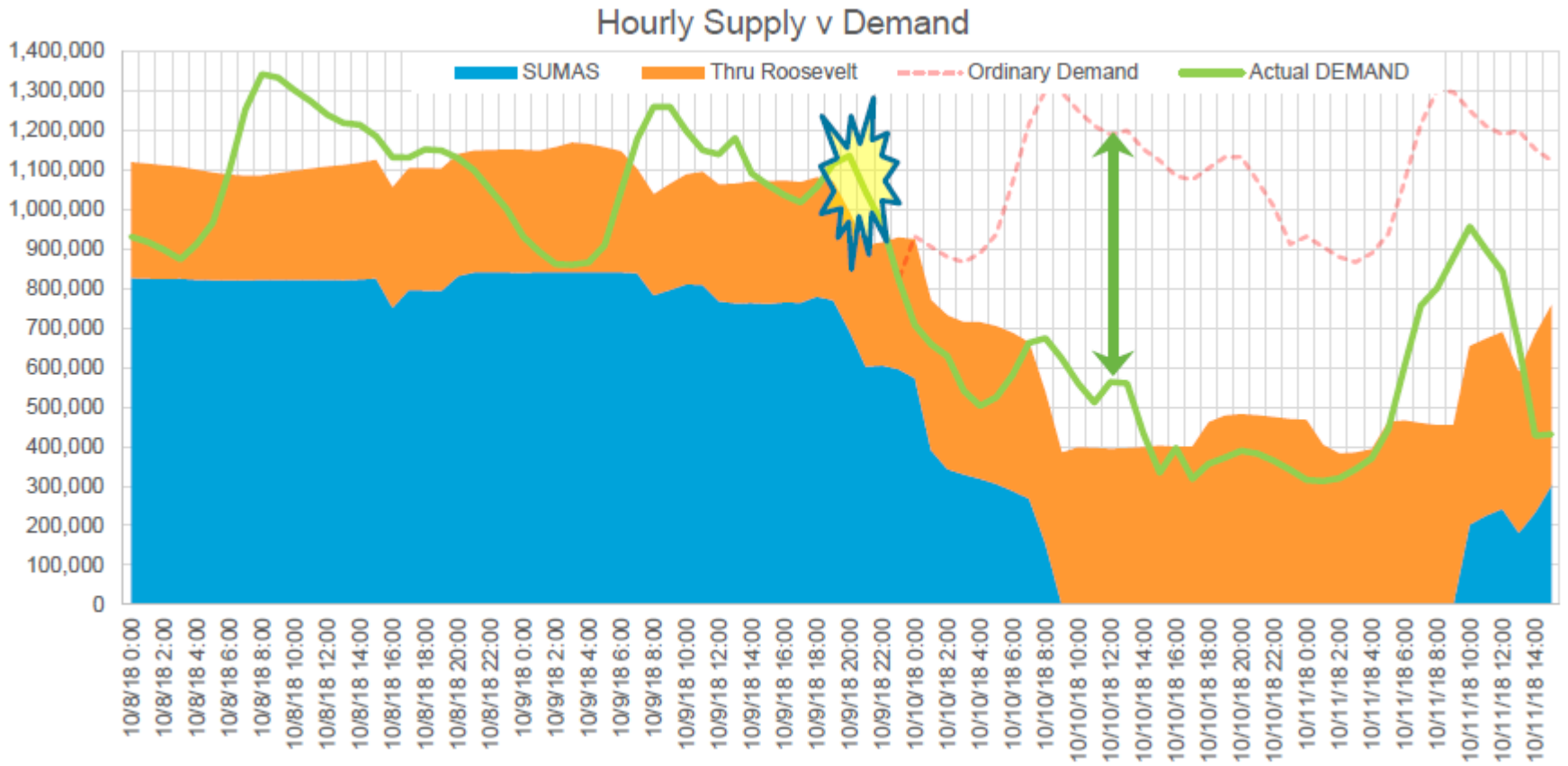
Increases to supply

- Mist turn around (~180k Dth)
- Increase gas from the US Rockies (~140k Dth)

Decreases to demand

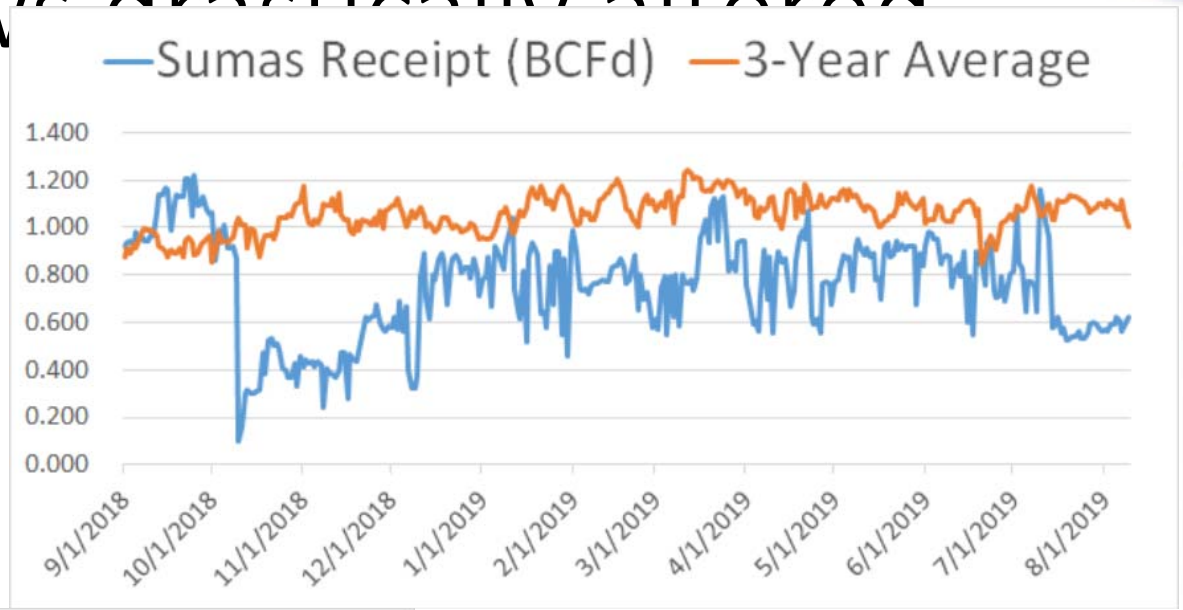
- Power Generation shut-in (~490k Dth)
- Interrupted LDC interruptible customers (~80k Dth)

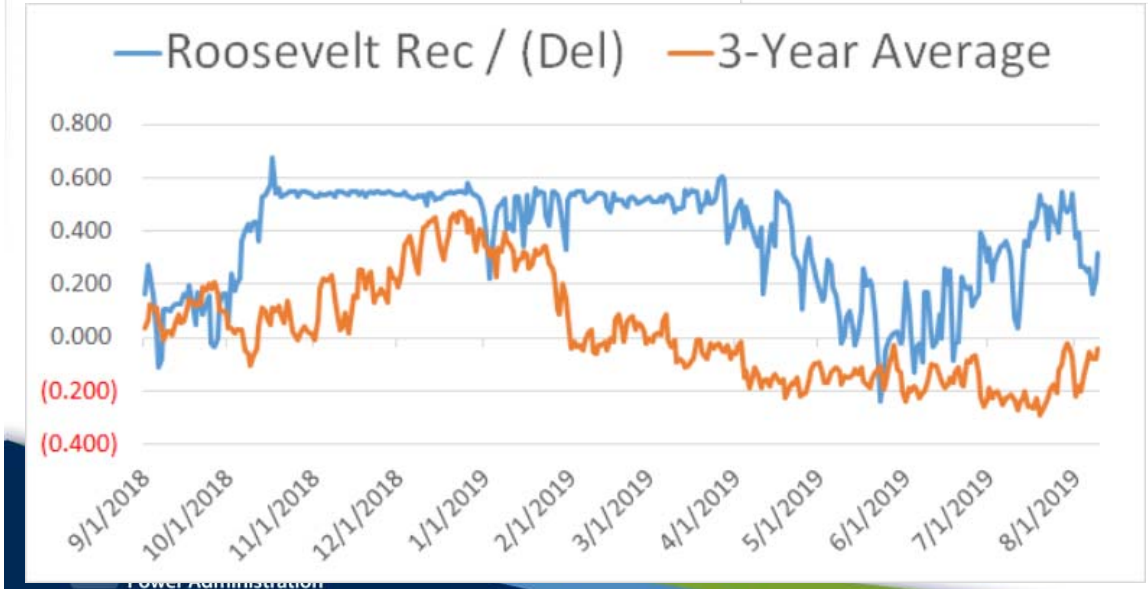
The Region Rallied in Response



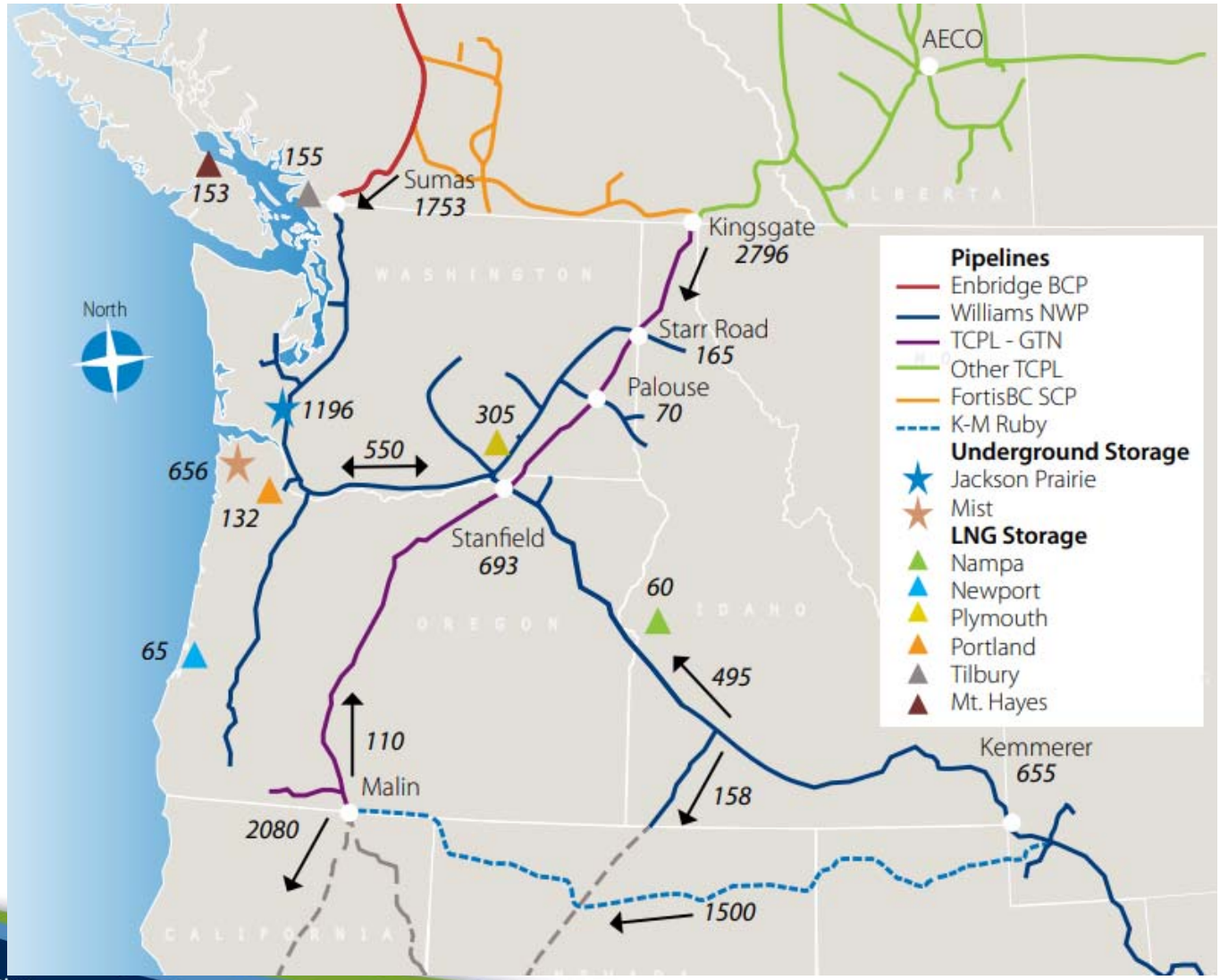
Source: Northwest Pipeline, 11/9/2018

Pipeline flows drastically altered





Natural Gas Infrastructure Map



Western Area Power Administration

Winter Strained and Then…

Cold February!

- February PDX average temperature of just 37.6 degrees was 6.2 degrees below normal.
  - 3rd coldest February on record at PDX
  - Coldest February in Portland in 30 years
  - 28% colder than normal
  - Similar weather throughout the Northwest
- Then March started much colder than normal.
  - The average temperature for the first four days was 37.1 degrees.

NW Natural in February

- Average February demand around 315k Dth/day while February 2019 averaged about 437k Dth/day
- Maximized Mist storage withdrawals with limited compression
- Dispatched LNG and Jackson Prairie storage
- Called on never before used recall agreements
- Interrupted interruptible sales customers for 9 days
- Entitlements on transportation customers
- Looked for reprieve in weather!

Regional Feb/Mar 2019 Picture

- Enbridge delayed remediation work as long as they could until February 23rd

- Jackson Prairie storage main compressor went down reducing the total facility availability
- Similar issues with compression at Mist storage facility
- Entitlements and OFOs compounded the issues
- Electric system constraints (I'm not an expert here)

- All this led to early March - highest prices ever recorded!

Limited Supply at Sumas Increased Volatility