March 5, 2024

MEMORANDUM

TO: Council Members

FROM: Tomás Morrissey

SUBJECT: January 2024 Cold Weather Event

BACKGROUND:

Presenters: James Gall, Avista; Tomás Morrissey, Northwest Power & Conservation Council staff.

Summary: In mid-January 2024 the Northwest region experienced a cold weather event. Some utilities in the Northwest hit record load levels, including the Bonneville Power Administration balancing area which reached loads not seen since before the 2001 Power Crisis. James Gall, Avista, and Tomás Morrissey, Council staff, will share data and insights on temperatures, loads, resource performance, and power prices during the event.

Relevance: Cold weather in January 2024 stressed the Northwest power system. By studying the event we can learn how the power system performs under extreme conditions. This can help inform the Council’s resource adequacy assessments and other planning work.
January 2024 cold weather event

March 2024

January cold event and the Northwest

- The Northwest, as defined by the Power Act, includes all of Idaho, Oregon, Washington, and Western Montana
  - This breaks up the Northwestern Energy and PacifiCorp East balancing areas. Some of the material today include those full areas for simplicity
  - Other groups may have different definitions of the Northwest

- The Northwest is part of the larger Western Interconnection
Temperatures around the Northwest

Minimum daily temp in January 2024

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Map from NOAA
Data from NOAA, taken from airport stations

Cold, but not record low, temperatures

Historical min temps NW region (1950-2024)

Data from NOAA
Weighting:
6% Boise
21% Spokane
25% Portland
48% Seattle
Northwest region loads during the event

Northwest Power Act region hourly load estimate

Load on Jan 16 were nearly as high as Jan 13 despite warmer weather in most of the Northwest.

Northwest loads, peak and energy

Historical load trends

*2023 & 2024 data are initial

EIA Form 930 data, data discrepancies may exist. Includes the BAs of PACW, PGE, BPA, SCL, TWPR, PSEI, CHPD, DOPD, GCPD, AVA, IPCO, and portions of PACE and NWMT.

FERC 714 and EIA 930 data
Resource stack *(approximate)*

Northwest (including 100% of NWMT and PACE)

42,253
42,919
42,925

*"BPA & GRID other" is likely mostly natural gas plants*

Flows into the Northwest

Imports and exports (NW with 100% NWMT & PACE)

Canada  California*  Southwest  WAPA

*Graph shows flows, not power origin: California was net importing from the Southwest while also exporting to the Northwest*

EIA form 930 data. Data have been edited to address discrepancies; some discrepancies may still exist. Includes the BAs of PACE, PACW, PGE, BMX, TCL, NWMT, PSEI, CHPD, DOPD, CCPD, AWA, AVRN, IECO, NWMT, WWA, GWA, plus the BPA import portion of GRID.

Some of the WAPA & Southwest imports are NW resources located out-of-region

EIA form 930 data. Data have been edited to address discrepancies; some discrepancies may still exist. Canada includes interchange with BC & AESO; California includes the AC line & power flowing into PACE; Southwest is NEVP & AZPS; WAPA is WAUW & WAOM.
California imports and exports

AC & DC interties

- AC intertie (see graph) was flowing south-to-north at its limit the full event
- DC intertie south to North (not shown) was down for maintenance

From BPA - negative values indicate power flowing from south to north (Northwest importing)
Resources in the Southwest

Resources in California
Tying into the Council’s work

- This event would have violated the market reliance limit in our current adequacy assessment assumptions

- We capture regional temperatures in the model as cold and colder than this event
  - We are still digging into the data and comparing it to events in the model

- The new adequacy metrics we are moving towards are better positioned to quantify an event like this
  - The old metric (LOLP) focuses only on frequency of years with at least one event
  - The new metrics capture frequency, duration, and magnitude of events
  - This will allow us to think about resource selection more holistically in future work
Temperature background

January 13, 2024, max and min temperatures (F)

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Regional lowest daily temp

Historical min temps NW region, 5 day min avg. (1950-2024)

10th percentile, 30y
10th percentile, all
MLK Weekend Weather Event

James Gall
Manager of Integrated Resource Planning

March 13, 2024

Tom Pardee
Natural Gas Planning Manager
January 13, 2024 Low Temperatures
Historical Peak Load (Avista Customers)

- Winter Peak
- Summer Peak
- Recorded Peak

Megawatts

Year: 1997 to 2024

Winter Peak:
- 1997: 1,500
- 2001: 1,600
- 2004: 1,821
- 2005: 1,900
- 2006: 1,889
- 2007: 1,900
- 2008: 1,890
- 2009: 1,880
- 2010: 1,870
- 2011: 1,860
- 2012: 1,850
- 2013: 1,840
- 2014: 1,830
- 2015: 1,820
- 2016: 1,810
- 2017: 1,800
- 2018: 1,790
- 2019: 1,780
- 2020: 1,770
- 2021: 1,760
- 2022: 1,750
- 2023: 1,740
- 2024: 1,730

Summer Peak:
- 1997: 1,600
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Loads and Resources

- **Natural Gas**
- **Hydro**
- **Wind/Solar**
- **Colstrip**
- **Kettle Falls & QF**

**Load**
- **Load Adjusted for Curtailed Industrial Demand**
- **Capacity Required (Op Reserves/ EIM Flex Up)**
- **Sales**

**Megawatts**
- Ranges from 0 to 2,500

**Day**
- From 11 to 17
Mid-C Area Pricing

**Graph Details:**
- **Y-axis:** $ per MWh
- **X-axis:** Dates from 1/11/2024 to 1/17/2024
- **Available Data:**
  - Prompt Month
  - Day Ahead
  - Real Time
  - CGAP_CHPD_MIDC-APND

**Graph Overview:**
- The graph shows fluctuations in pricing from $0 to $2,000 per MWh across the specified dates.
- Each data type is represented by a different line color for easy comparison.

**Additional Observations:**
- The pricing data is likely to be used for electricity market analysis and decision-making processes.
Avista’s WA/ID Gas & Electric Demand

Total MMBTU of Daily Demand

- 1/13/2024: 315 MMBtu (000) - Electric: 141, Curtailed Electric: 6, LDC Natural Gas: 18
- 12/22/2022: 283 MMBtu (000) - Electric: 141, Curtailed Electric: 6, LDC Natural Gas: 18
- 6/30/2021: 128 MMBtu (000) - Electric: 141, Curtailed Electric: 6, LDC Natural Gas: 18

Daily electric MWh multiplied by 3.412
Potential Resource Adequacy Changes

- Update load forecast dataset to include new event.
- EIM Uncertainty Flex Ramp Up will be additional planning requirement.
- If planning margin is less than the single largest contingency resource, the planning margin will be adjusted to this level.

- Should we assume a low water for storage hydro resources QCC?
- Is a lower Loss of Load Probability (5%) target more prudent?
- Can Avista depend on the market in extreme events (330 MW)?
January 2024 cold weather event

March 2024

Northwest Power and Conservation Council
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  - **Other groups may have different definitions of the Northwest**

- The Northwest is part of the larger Western Interconnection

Graphic from the EIA with NWPCN additions
Temperatures around the Northwest

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Historical load trends

Northwest loads, peak and energy

Jan 2024 peak estimate
(~35,600 MW)

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Resource stack (approximate)

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From BPA - negative values indicate power flowing from south to north (Northwest importing)
Thoughts on the CAISO / Southwest dynamic

• CAISO had a resource surplus during the cold event (see graph)

• In real-time the cheapest resources were often in the Southwest
  – The day-of economics are largely calculated by the EIM

• There were transmission limits on how much power could flow up to the Northwest

Resources in the Southwest

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Resources in California

California resource stack

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BPA hydro in January (2007 – 2024)