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POWER ADMINISTRATION

Generation Inputs Workshop

December 5, 2013

Agenda

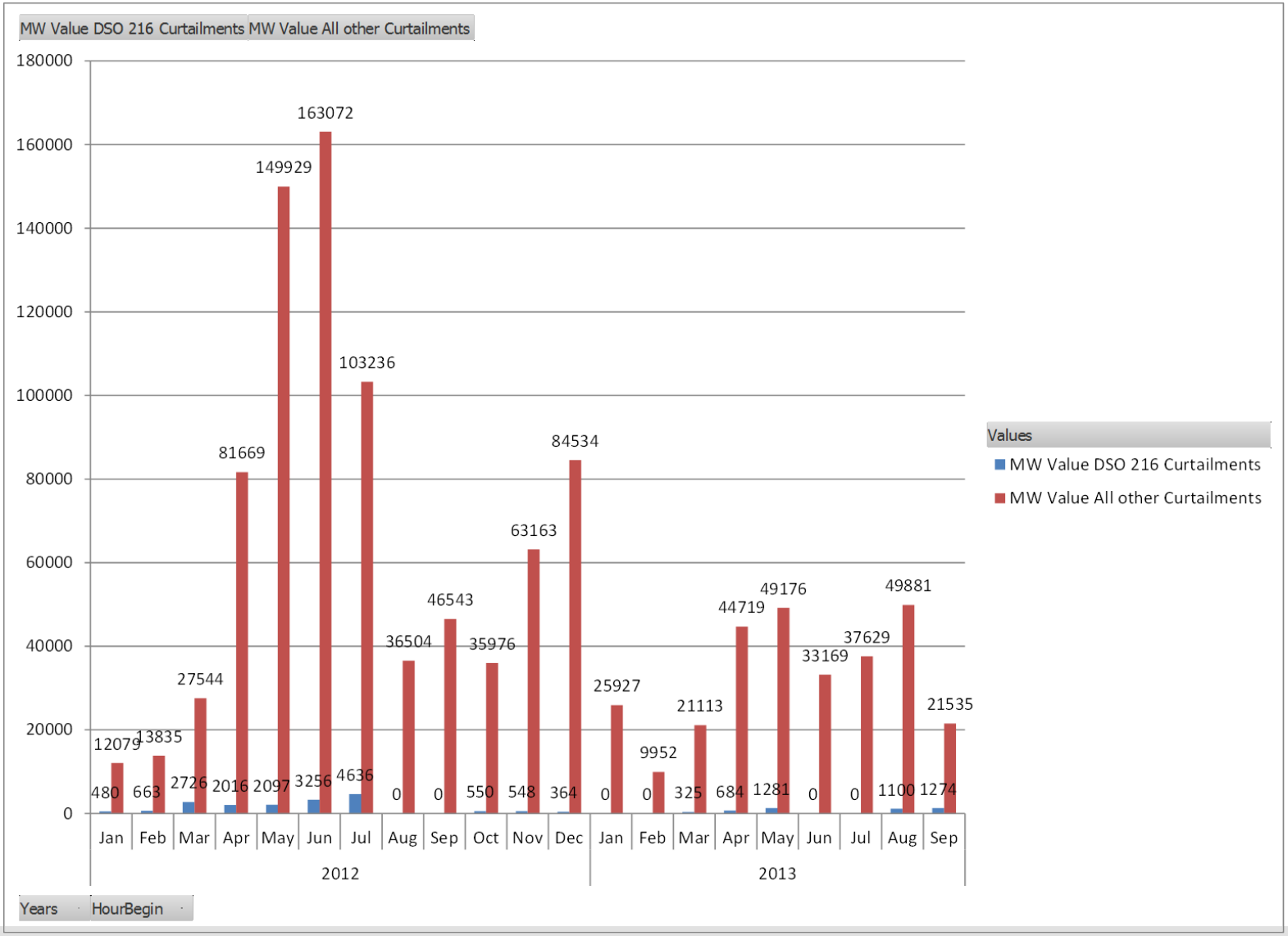
- Follow Up from Last Workshop: Purchases of Balancing Reserve Capacity by Bonneville When No Deficiency Exists
- Quick Overview of DSO 216 Curtailments Versus All Other Curtailments
- Balancing Reserve and Its Components
- Acquisition and Scheduling of Balancing Reserve Capacity – Long-Term, Preschedule & Day-Ahead Markets
- Customer Presentations

Purchases of Balancing Reserve Capacity by Bonneville When No Deficiency Exists

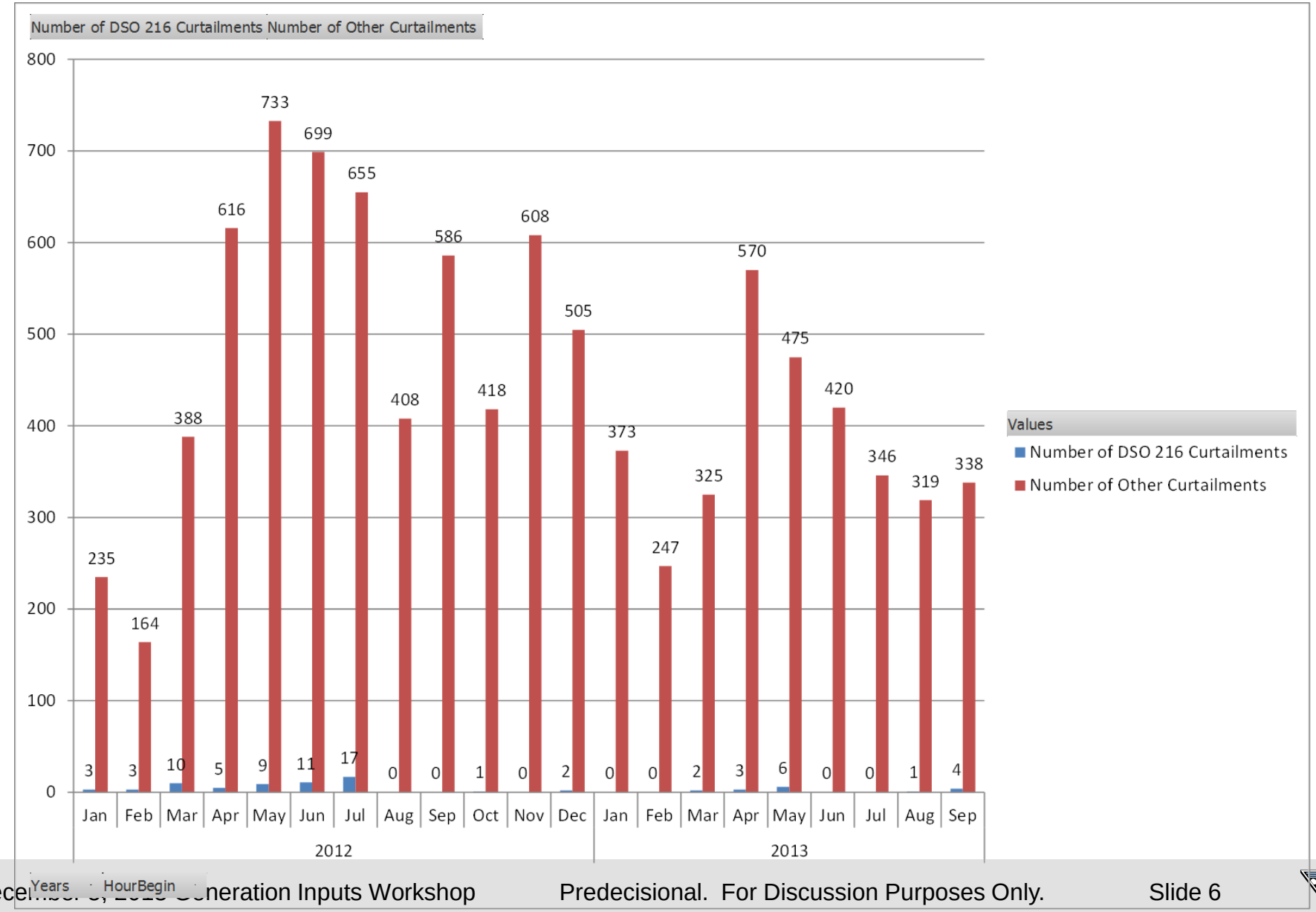
- It would not be prudent business practice for Bonneville to purchase balancing reserve capacity when it has sufficient balancing reserve capacity available.
- Bonneville has developed the self-supply program so that customers have the option to provide for their balancing reserve capacity needs without purchasing from Bonneville.
- Bonneville does not have the statutory authority to purchase additional balancing reserve capacity when it has sufficient balancing reserve capacity as determined by Bonneville on a forecasted basis to meet forecasted need.

Quick Overview of DSO 216 Curtailments Versus All Other Curtailments

DSO 216 Curtailments Versus all other Curtailments, MW



Number of DSO 216 Curtailments Versus all other Curtailments



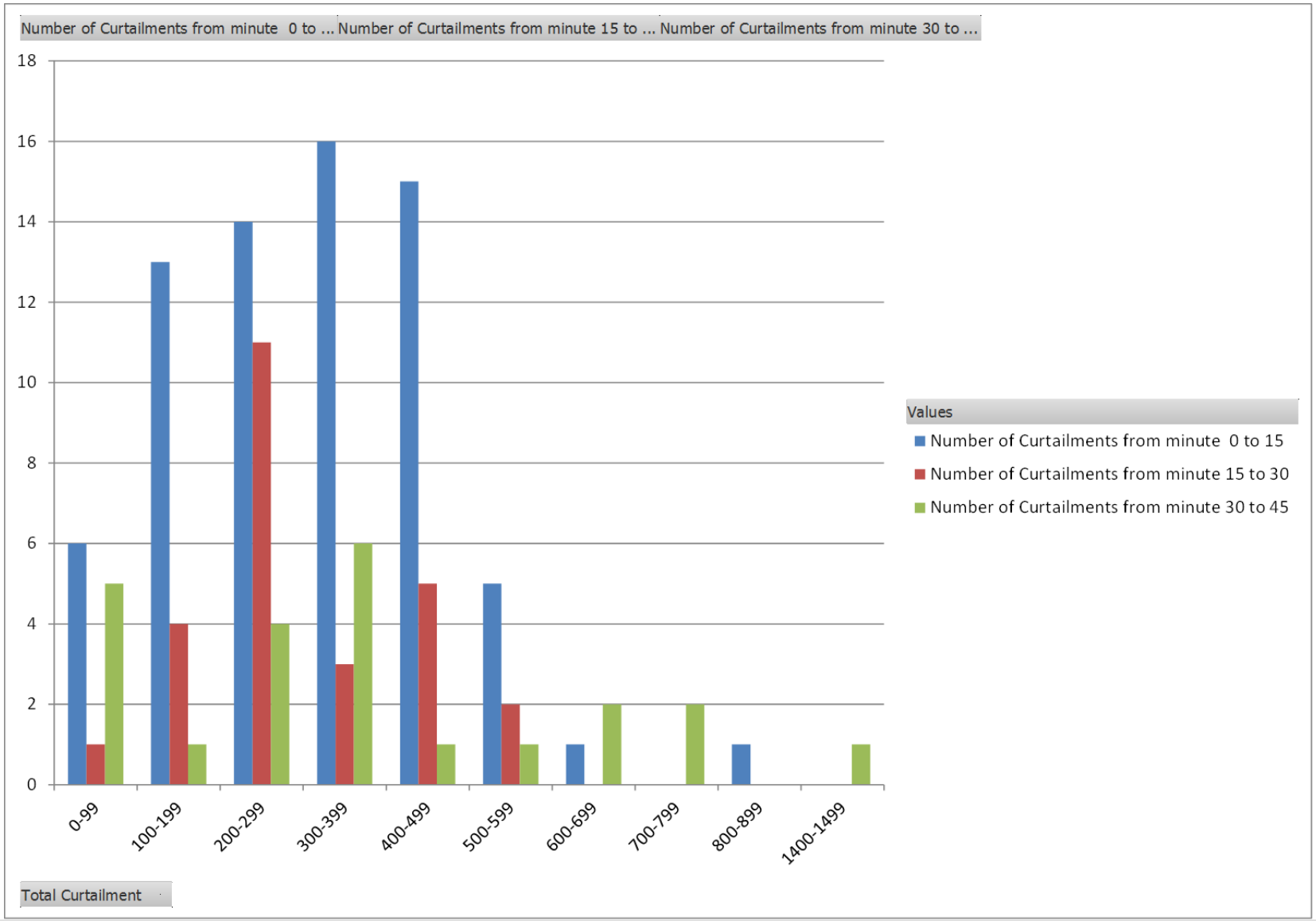
Numbers behind graphs

- MW summary
  - From January 2012 through September 2013, MW values of DSO 216 curtailments constituted 1.94% of total MW curtailed
- Number of curtailments summary
  - From January 2012 through September 2013, the number of DSO 216 curtailments was 0.81% of total number of curtailments

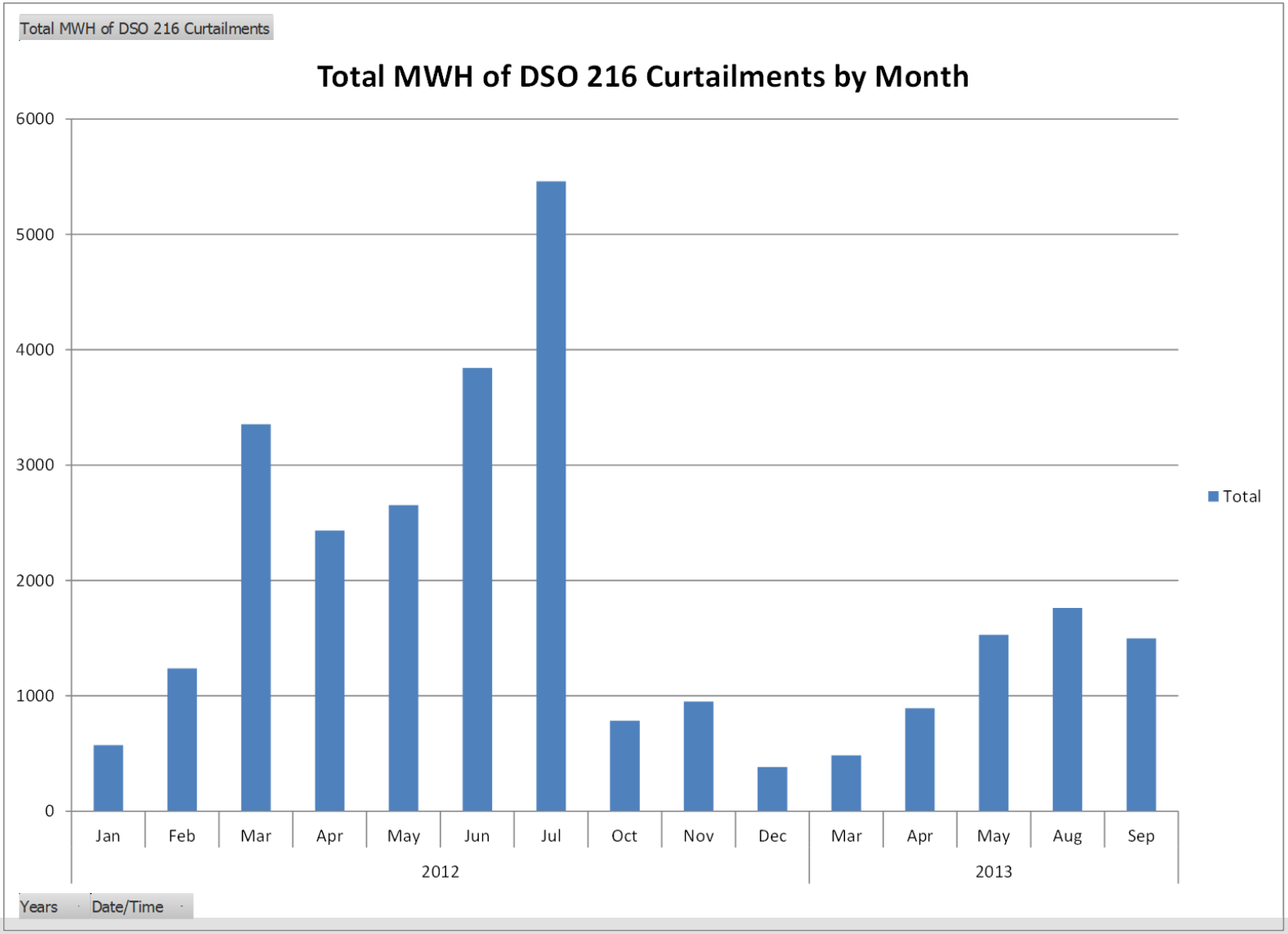
DSO 216 Analysis

- The next set of slides analyze DSO 216 curtailments from January 2012 through September 2013

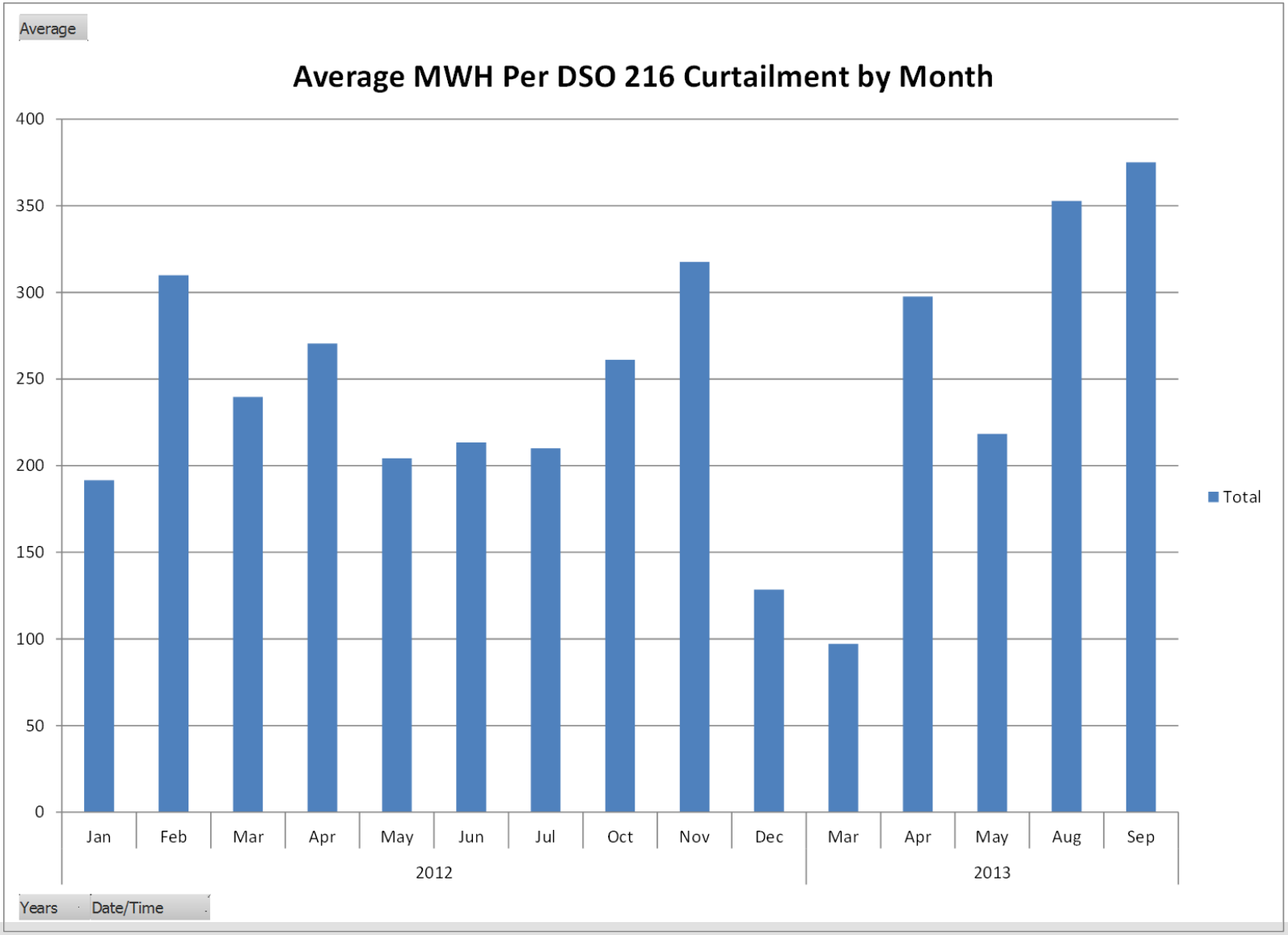
Number of DSO 216 Curtailments by Size of Curtailment and Time in Hour



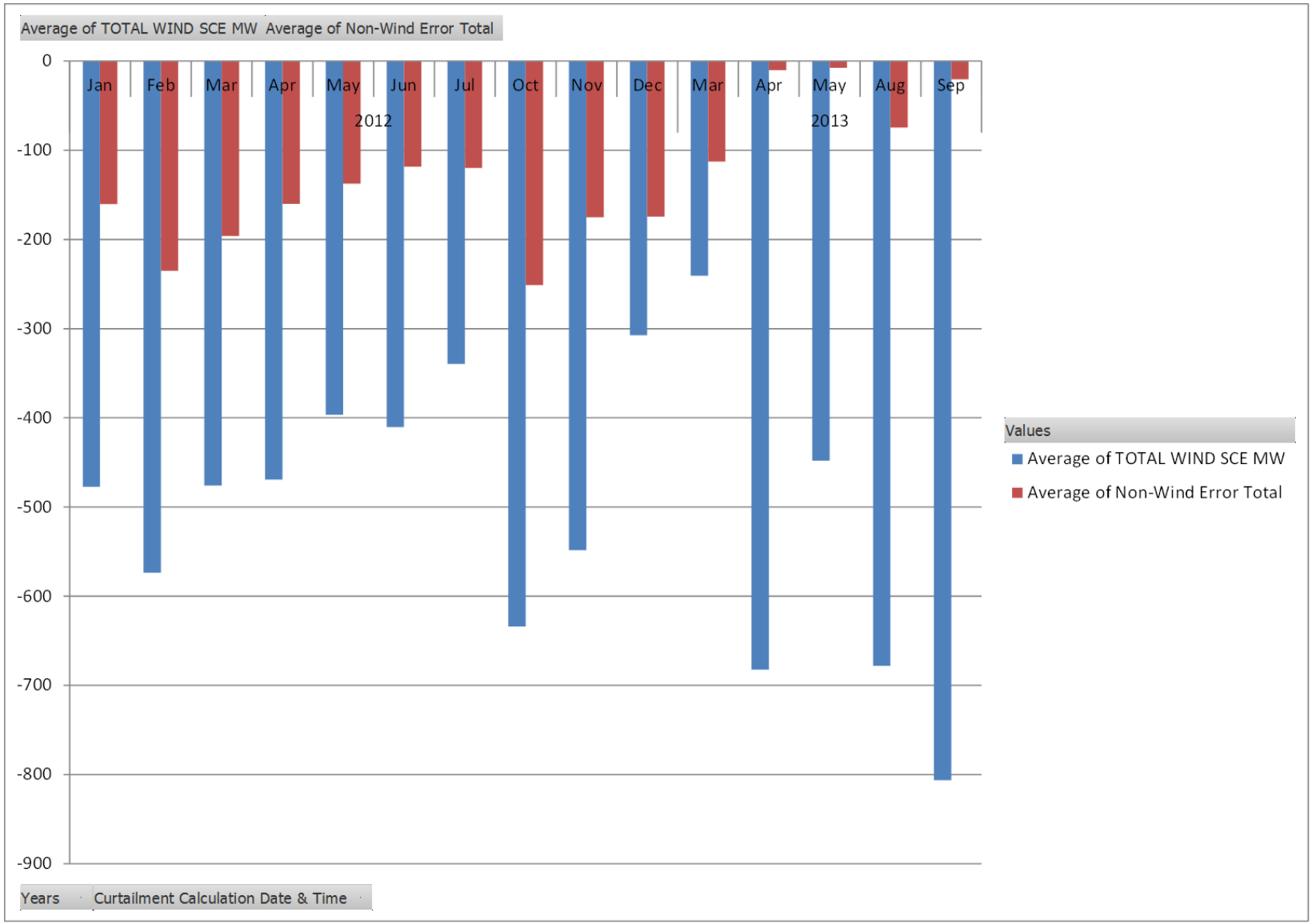
MWH DSO 216 Curtailments
Note: Months not listed had no curtailments



Average MWH per DSO 216 Curtailment
Note: Months not listed had no curtailments



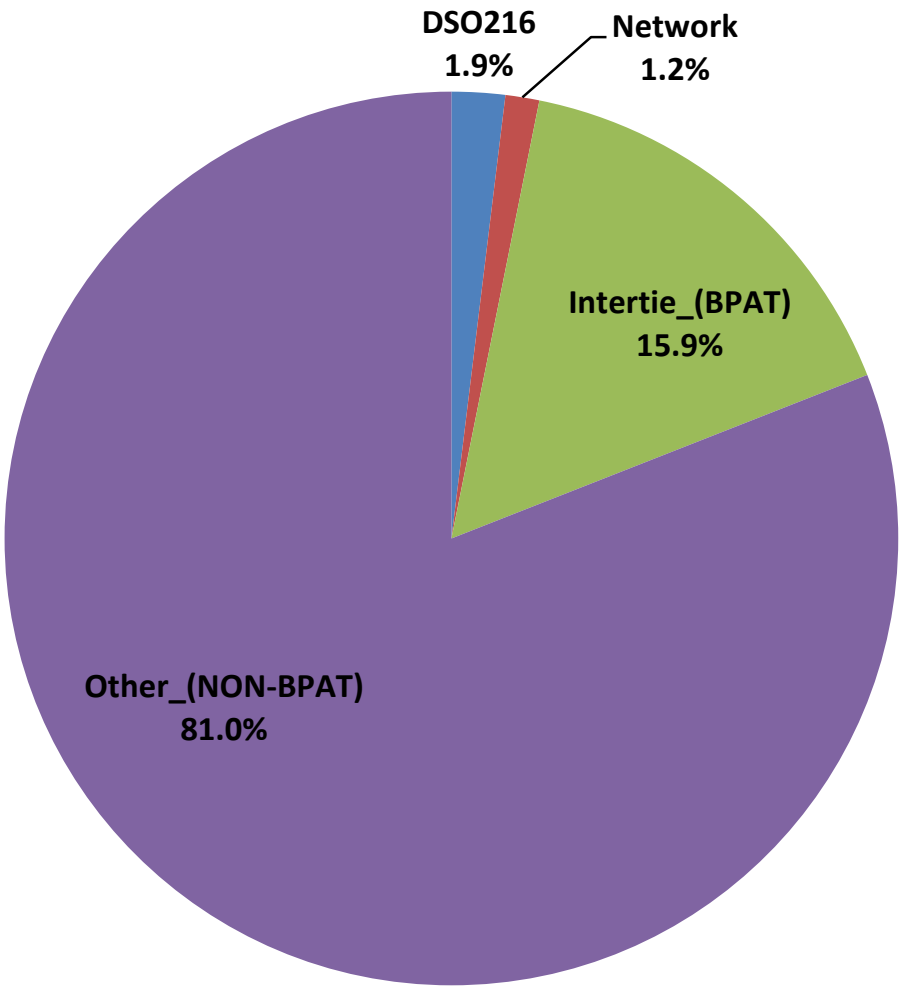
Average Wind versus Other Error During DSO 216 Curtailments



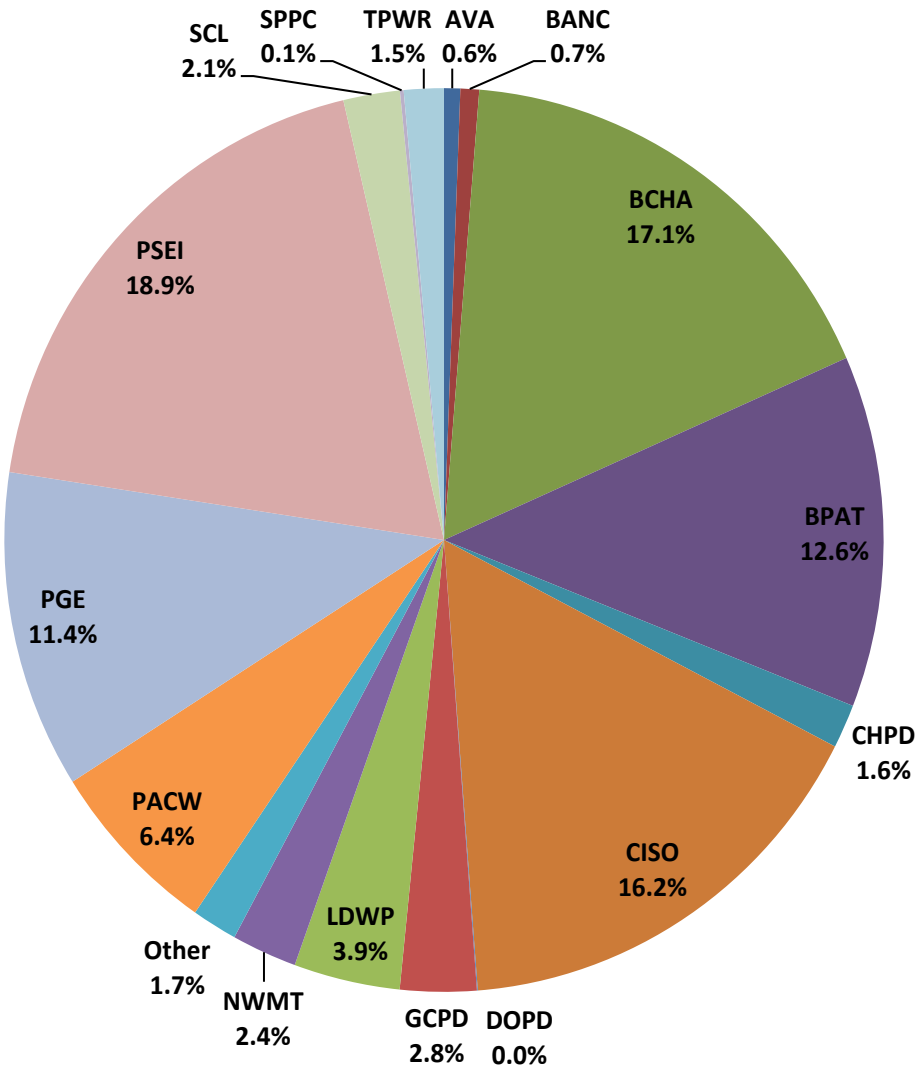
Curtailment Analysis for BPA Tags

- Summary
  - BPA tags were taken from December 1, 2011 to September 30, 2013
    - DSO 216 curtailments represented 1.93% of all curtailments.
    - The average DSO216 curtailment is 1.23% of the total scheduled MW vs. 2.37% for all other types of curtailments.
    - 0.31% of all scheduled MWs sourcing or wheeling through the BPAT BA are curtailed.
    - 0.01% of all scheduled MWs are curtailed as a result of DSO 216.

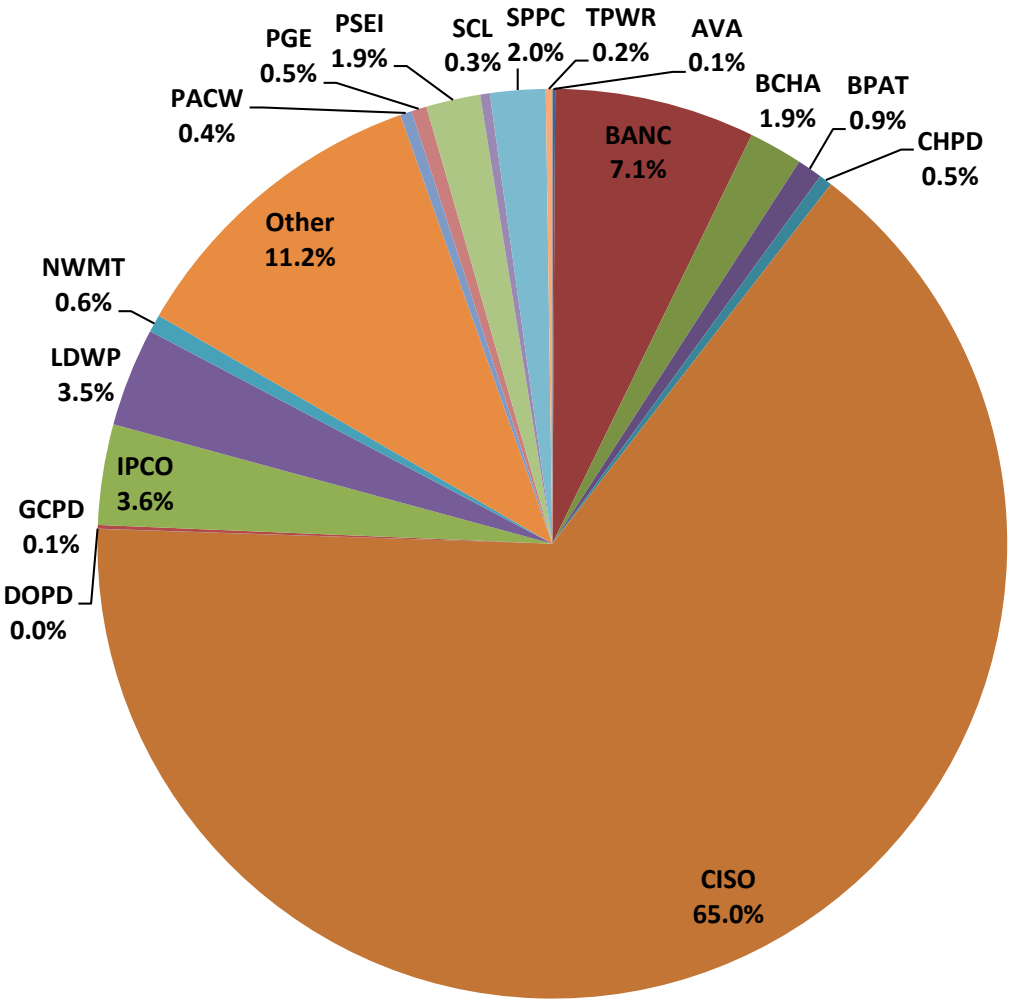
Distribution of Curtailment Types by MW



DSO216 Curtailment by MW



All Curtailments by Load Control Area by MW



DSO 216 Summary Sorted by Average Percent of Total Schedule

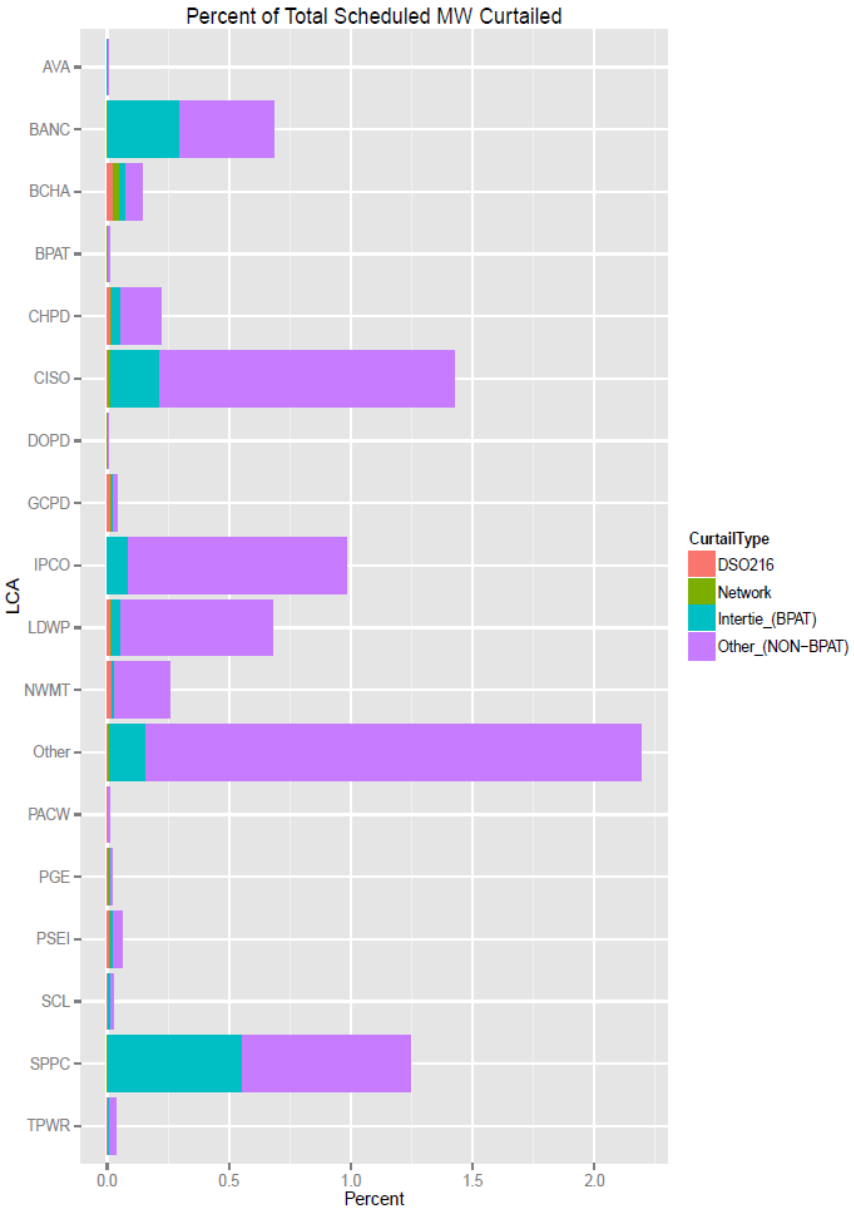
	LCA	count	meanSched	meanCurt	minCurt	maxCurt	stdevCurt	ratioOfMeans
1	CHPD	23	213.13	15.04	1	54	14.12	0.07
2	GCPD	45	209.20	13.71	1	73	15.36	0.07
3	NWMT	34	324.09	15.50	1	74	17.98	0.05
4	DOPD	1	168.00	7.00	7	7		0.04
5	SPPC	5	145.40	6.00	1	14	6.08	0.04
6	TPWR	20	480.55	16.10	1	64	16.57	0.03
7	BCHA	92	1226.46	40.93	1	308	55.80	0.03
8	PSEI	79	2156.15	52.68	1	296	58.68	0.02
9	LDWP	58	625.12	14.81	1	69	14.06	0.02
10	SCL	27	919.56	16.93	1	145	27.65	0.02
11	Other	40	556.08	9.18	1	30	7.54	0.02
12	PGE	88	2075.72	28.47	1	168	34.05	0.01
13	BANC	19	839.63	7.95	1	34	7.60	0.01
14	CISO	91	4236.60	39.21	1	263	40.93	0.01
15	PACW	74	2454.69	19.15	1	111	21.17	0.01
16	AVA	19	898.16	6.89	1	18	4.97	0.01
17	BPAT	83	7214.78	33.35	1	269	44.62	0.00

Table 1: DSO216 Summary sorted by "ratioOfMeans" (average % of total scheduled)

All Other Non-DSO 216 Summary

	LCA	count	meanSched	meanCurt	minCurt	maxCurt	stdevCurt	ratioOfMeans
1	AVA	85	1082.28	12.12	1.00	129.00	15.91	0.01
2	BANC	3132	808.49	25.86	1.00	684.00	58.03	0.03
3	BCHA	547	1132.33	32.84	1.00	492.00	52.95	0.03
4	BPAT	1291	6741.56	5.78	1.00	337.00	20.03	0.00
5	CHPD	321	217.15	15.40	1.00	173.00	18.89	0.07
6	CISO	7916	3799.58	93.12	1.00	2344.00	143.41	0.02
7	DOPD	12	84.00	7.67	1.00	13.00	4.01	0.09
8	GCPD	39	281.51	22.31	1.00	80.00	20.58	0.08
9	IPCO	1450	329.13	28.06	1.00	241.00	47.42	0.09
10	LDWP	436	467.40	89.63	1.00	675.00	116.34	0.19
11	NWMT	210	439.01	31.26	1.00	191.00	32.48	0.07
12	Other	4114	481.63	30.98	1.00	460.00	35.47	0.06
13	PACW	223	2276.67	14.79	1.00	330.00	30.56	0.01
14	PGE	207	1922.89	17.75	1.00	620.00	45.25	0.01
15	PSEI	435	2396.34	40.93	1.00	351.00	54.89	0.02
16	SCL	147	965.91	23.36	1.00	199.00	30.91	0.02
17	SPPC	1699	132.60	13.16	1.00	151.00	14.98	0.10
18	TPWR	78	461.09	29.68	1.00	259.00	53.65	0.06

Table 2: All Other Non-DSO216 Summary


Percent of Total Scheduled MW Curtailed
AVA
BANC
BCHA
BPAT
CHPD
CISO
DOPD
GCPD
IPCO
LDWP
NWMT
Other
PACW
PGE
PSEI
SCL
SPPC
TPWR
LCA
0.0
0.5
1.0
1.5
2.0
Percent
CurtailType
DSO216
Network
Intertie_(BPAT)
Other_(NON-BPAT)

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Balancing Reserve and Its Components

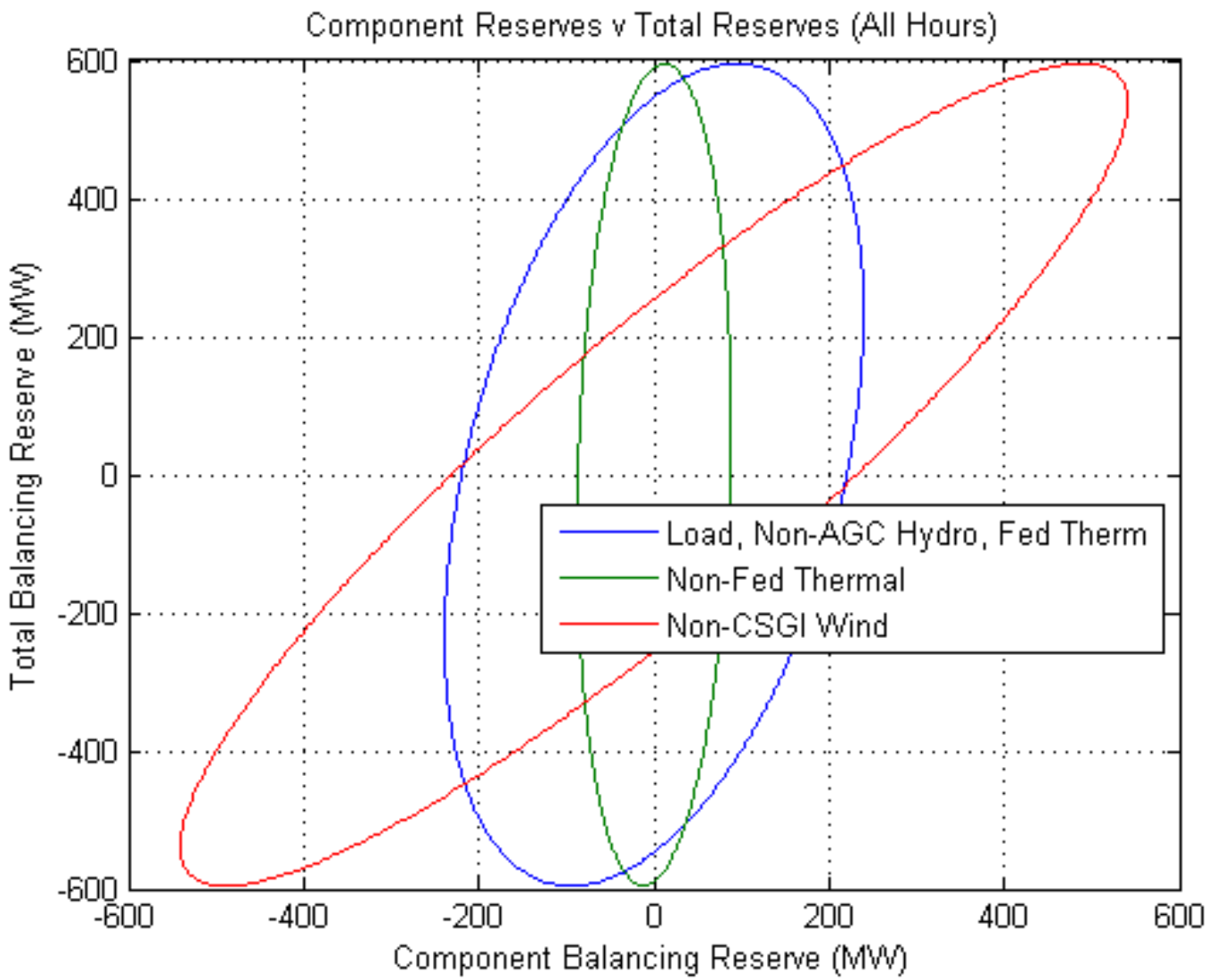
Balancing Reserve and Its Components

- All of the following charts are based on actual data from January 2013 through September 2013.
- The data have not been scrubbed for bad data or contingencies.

Ellipse Chart

- The following chart depicts the 99.5% variation in the components of balancing reserves plotted against the 99.5% of total balancing reserves.
- The width of each ellipse is driven by the individual component's uncertainty (x-axis).
- The slope of each ellipse is driven by the strength of the relationship between the component's error and the total balancing reserve (y/x-axis; steeper slope = stronger correlation).
- The height of all ellipses (y-axis) is equal to the 99.5% total for all balancing reserves (600 MW for the time period)

Components of Balancing Reserves Deployed



Non-CSGI wind has a strong relationship between its error and the total balancing reserve.

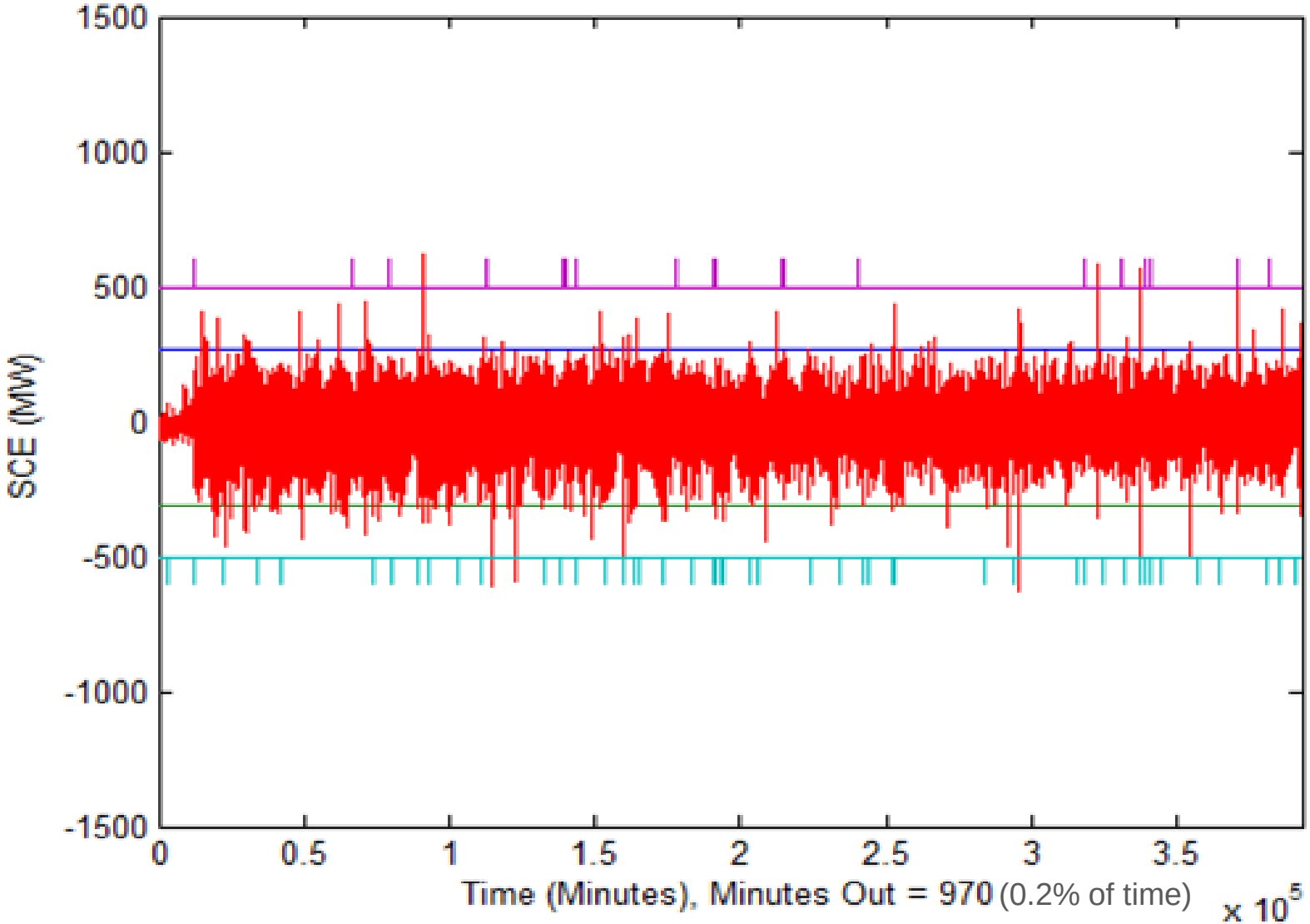
Combined Load, Non-AGC Hydro and Fed Thermal has a weak, slightly positive relationship to the total balancing reserve.

Non-Federal Thermals have almost no relationship to the total balancing reserve and least amount of variability.

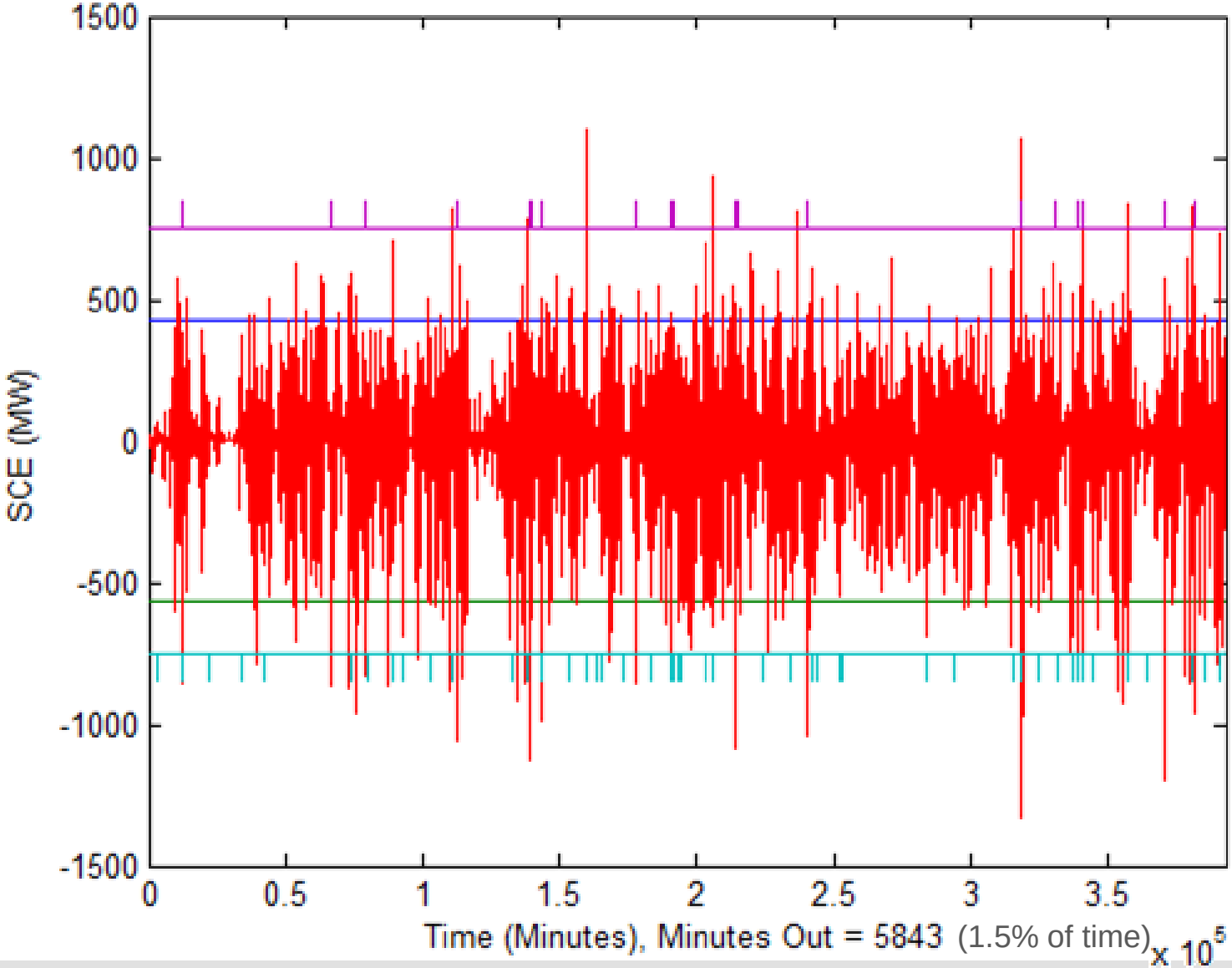
Usage and Allocation

- The following two charts are time series plots showing the load error and non-CSGI wind SCE plotted with their respective reserve allocation.
- Each of these charts were filtered for values exceeding 8 standard deviations.
- The sign convention for the wind and load charts have been matched so that negative error values for load or wind both represent the need to *dec* and vise-versa.
- The purple line indicates a DSO216 curtail event.
- The cyan line indicates a DSO216 feather event.
- The blue and green lines represent the wind or load allocated share of total *inc* and *dec* reserves.
- The minutes out reflect how often each component is outside their allocated share of total reserves (receiving pooling benefit).
- The minutes on the x axis are all minutes January – September 2013.

Load Error v Reserves Allocation



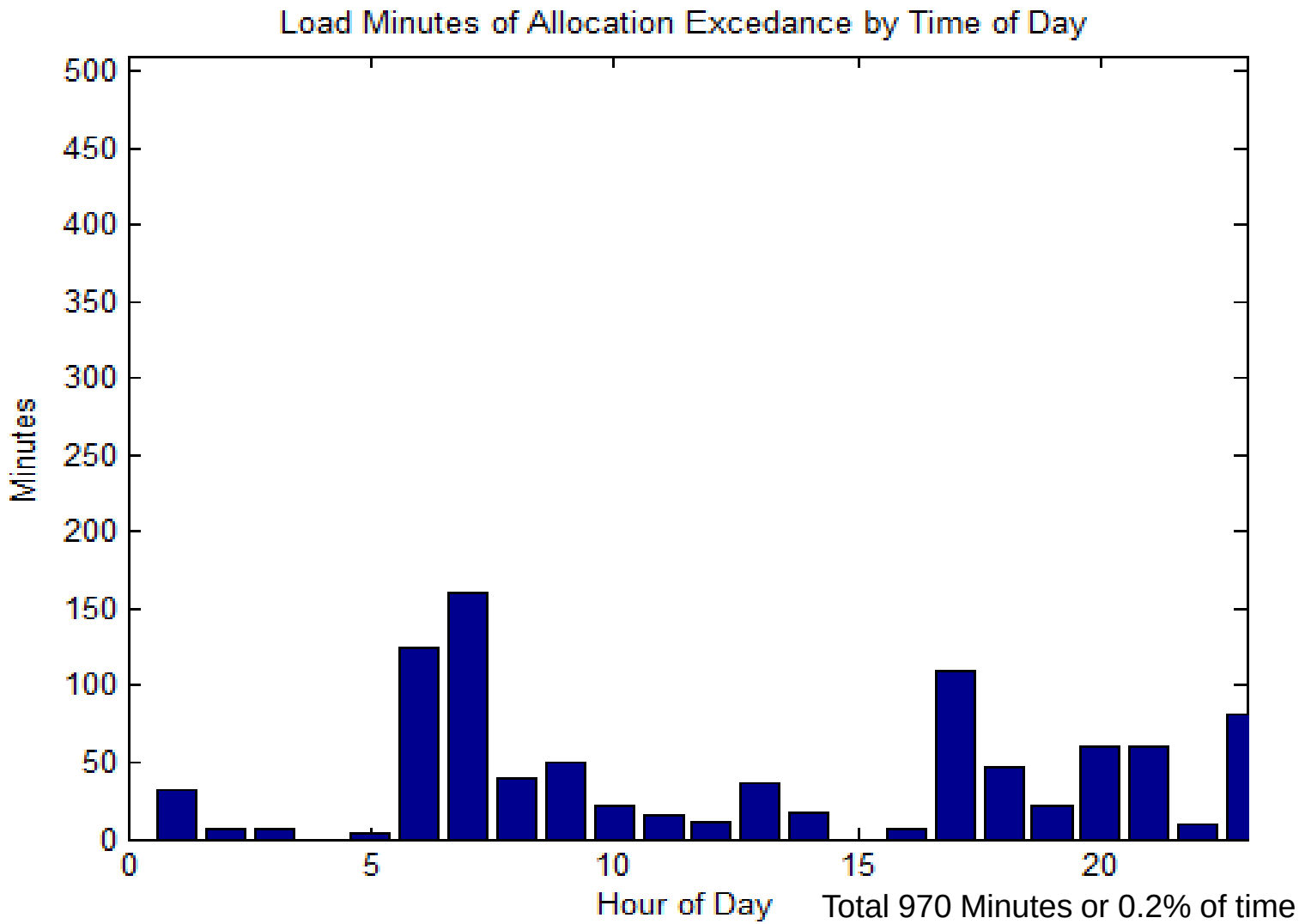
Wind Error v Reserves Allocation



Value of Pooled Reserves for Wind and Load

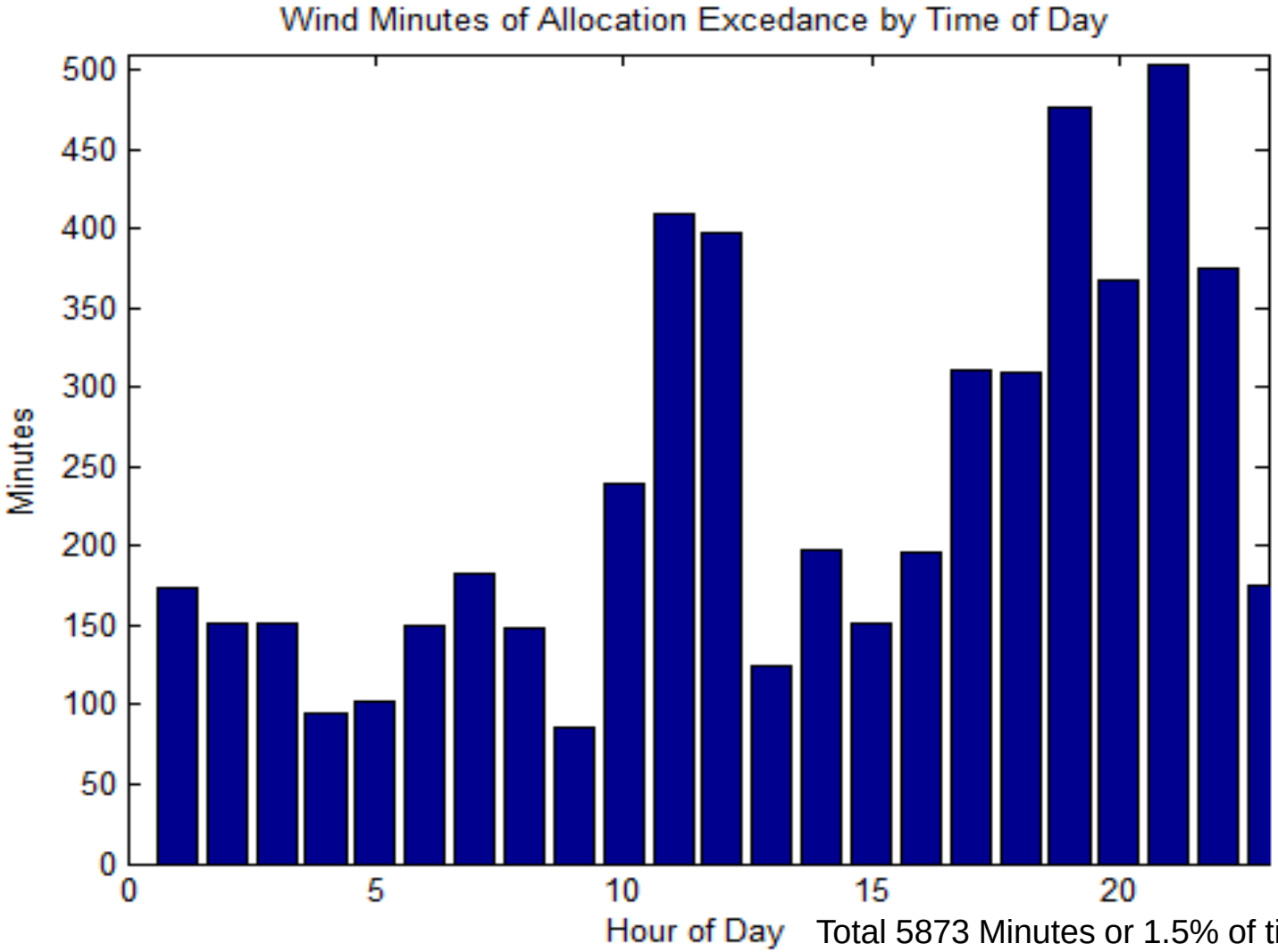
- The following two charts show for load and wind the number of minutes where reserve usage exceeded the allocated quantity (receiving pooling benefit).
- The minutes are shown by hour of day.

Pooling Diversity



Total 970 Minutes or 0.2% of time

Pooling Diversity (continued)



Total 5873 Minutes or 1.5% of time

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Acquisition and Scheduling of Balancing Reserve Capacity – Long-Term, Preschedule & Day-Ahead Markets

Purpose

- Outline the potential costs and hurdles associated with relying on daily and/or real-time energy markets for the acquisition of third-party balancing reserve capacity.
- Formalize the group's preliminary consensus that the workshops are best spent with a focus on preschedule solutions.

Background

- A discussion of these issues requires an understanding of:
  1. BPA's current processes for
     A. Identifying balancing reserve capacity available and/or needed, per the terms of the BP-14 Generation Inputs Rate Case Settlement
     B. Acquiring balancing reserve capacity in the monthly or quarterly forward markets
     C. Forecasting the ability of the FCRPS to meet operational objectives (e.g., flood control, BiOp, irrigation, navigation, etc.)
  2. WECC 5-Day Preschedule Calendar and related markets
  3. Challenges associated with planning, purchasing, and scheduling balancing reserve capacity Day-Ahead

Forecasting

- Each business day, PS performs a number of analyses which determine the amount of energy that needs to be bought or sold in order to achieve the operational objectives of the FCRPS.
- These studies include forecasts of a number of input parameters, such as:
  - Stream flows
  - Load forecasts
  - Contract demand
  - Unit outages, and
  - FCRPS operational objectives (e.g., flood control, BiOp, irrigation, navigation, etc.)
  - Existing 900 MW incremental and 1100 MW decremental reserve commitments

Forecasting

- BPA intends to use this forecast to make a determination of its ability to meet existing reserve commitments.
- This analysis is used by the Trading Floor in determining the marketing strategy necessary to meet the operational objectives of the FCRPS.
- The sales or acquisitions that result from this marketing strategy currently take place within the preschedule period.

Forecasting

- PS holds a daily meeting Monday through Friday at 1400 PST, where this forecast for the next purchase period is presented, and decisions are made.

Preschedule Period – 5-Day Process

- Preschedule energy trading is generally completed by 1000 PST on a given business day, based upon the previous business day's marketing strategy analysis.
- BPA (along with the rest of the NW) utilizes the WECC 5-day preschedule calendar, with preschedule personnel present only during the standard 5-day work week.
- BPA intends to implement requests for preschedule amounts of balancing reserve capacity at the end of preschedule energy trading.

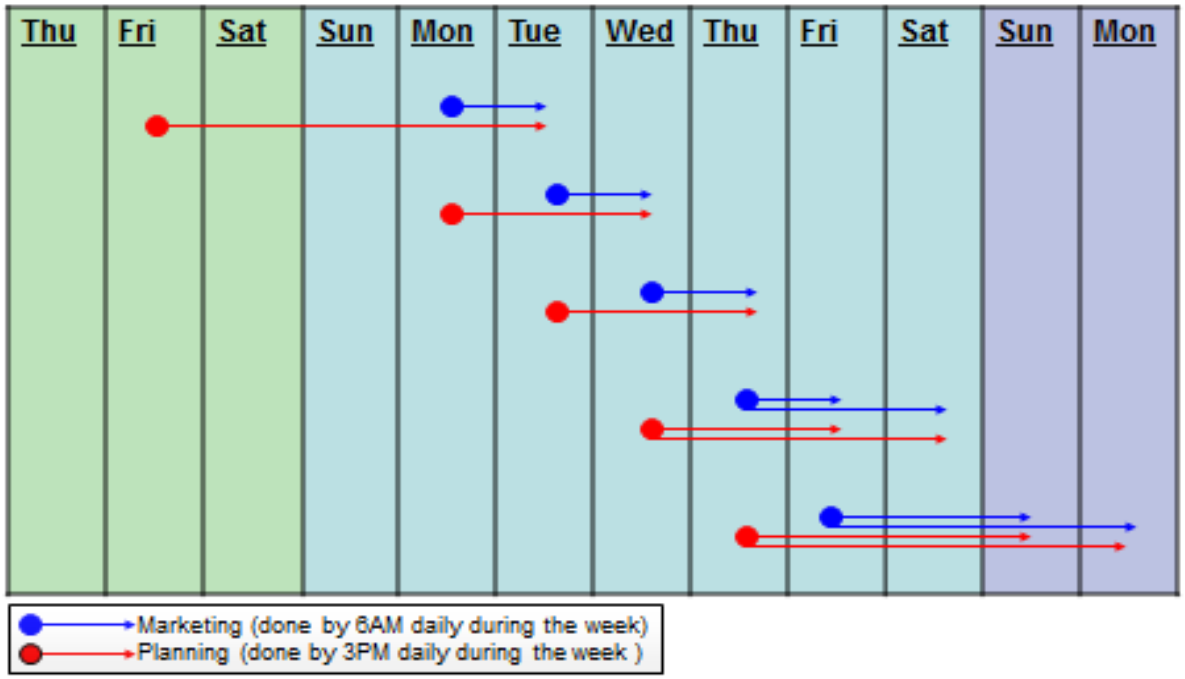
Preschedule Period – 5-Day Process

- The following table shows the timing of these activities:

Day of Analysis	Day of Trading/Scheduling	Day of Delivery
Friday	Monday	Tuesday
Monday	Tuesday	Wednesday
Tuesday	Wednesday	Thursday
Wednesday	Thursday	Friday/Saturday
Thursday	Friday	Sunday/Monday

Preschedule Period – 5-Day Process

- Alternately:



Preschedule Period – 5-Day Process

- NERC holidays and the start of a new month introduce additional delays between the day of analysis and the day of delivery.
- For example, the Thanksgiving holiday requires that market analysis is completed on the Tuesday prior to Thanksgiving for trading on Wednesday, for energy delivery the following Monday; six days later.

Balancing Reserve Capacity - Preschedule

- BPA is currently developing processes to begin attempting to acquire third party balancing reserve capacity in the preschedule period.
- Using the table above for reference, for these purchases BPA's current thinking is that PS will assess the need to reduce reserves supplied by the FCRPS at the 1400 PST meeting, on the Day of Analysis.
- Once determined, this information will be communicated to TS.
- On that same Day of Analysis, TS will use this information to determine if the acquisition of balancing reserve capacity is necessary.
- If so, TS will create a PO and transmit it to PS, communicating this need, prior to the close of business that same day.
- PS will then attempt to acquire the requested reserves on the Day of Trading for the Day(s) of Delivery.

Day-Ahead Scheduling Challenges

- Moving to a 7-day preschedule process (day-ahead) may shorten the time horizon between available forecast information and the day of delivery.
- Whether this information would result in reduced reserve requirements, however, depends on the scheduling behavior of the parties making use of those reserves.
  - Absent a change to committed scheduling, a reduced time horizon would not necessarily result in reduced purchase needs.
- Additionally, the majority of the utilities within WECC do not utilize day-ahead scheduling functions, but instead utilize the same 5-day preschedule window as BPA.
- As a result, there is currently no active, liquid day-ahead market outside of the standard preschedule days.

Day-Ahead Scheduling Challenges

- The WECC Preschedule Evaluation Task Force (PETF), when studying day-ahead scheduling in the WECC, determined:
  - "[Prescheduling seven days a week] would likely require significant and potentially costly increases in staffing or contractual resources and other fundamental changes in the market. If prescheduling were to become a seven-day a week process, it follows that power trading would need to become a seven-day a week process as well. Without natural gas changing to the same seven-day nomination/trading process, the concept of power prescheduling on a seven-day calendar could increase the disconnect that exists today. Some members believe that without concrete evidence of a significantly positive impact on reliability or economics, the case for change from status quo is very difficult to make, i.e., if companies are being asked to spend more dollars for pre-scheduling resources (either added personnel or contract dollars), there may need to be a clear-cut benefit to change."

Day-Ahead Scheduling Challenges

- In application, for BPA to acquire capacity on a day-ahead or shorter-term time basis would require, at a minimum, that the following functions to take place 7 days a week:
  - Daily process to update FCRPS availability to determine if PS needs to reduce planned reserves.
  - Daily reserve requirement studies (R3T) from TS.
  - Upon identifying additional need through study, TS authorization and communication of the required PO to PS (several hours' notice required).
  - Identification of staff to attempt to acquire balancing reserve capacity specified in daily PO.
  - Once acquired, PS would then be tasked with determining where to stack the deployment within the FCRPS response, based on the total cost of the resource (energy and capacity).

Conclusion

- Moving acquisition of reserves to a timeframe shorter than the WECC 5-day preschedule calendar would require a considerable staffing commitment from BPA, and likely from a number from other NW entities as well.
- In addition to this added cost, BPA has concerns about the liquidity of preschedule markets.
  - Moving the purchase of balancing reserve capacity to a daily or shorter time period would increase these liquidity concerns.
- However, once BPA establishes the pool of prequalified resources that are available in the preschedule period, it will be in a better position to assess the costs and benefits of purchasing on a shorter-term basis.
- Given the current state of a preschedule dominant market in the Pacific Northwest, the workshops will focus on preschedule solutions.

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Customer Presentations