DAY 1: RA Enhancements Working Group

September 15, 2020

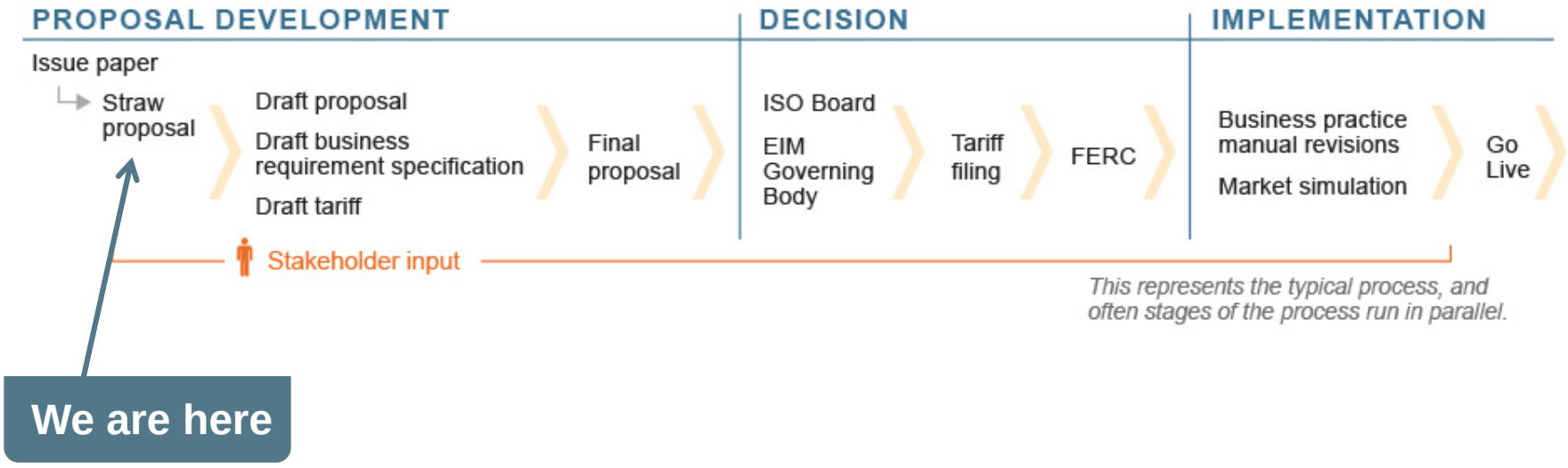
Agenda – Day 1

Time	Topic	Presenter
9:00 – 10:10	Welcome and Introduction	Isabella Nicosia
9:10 – 12:00	Unforced Capacity Evaluations	Bridget Sparks & Lauren Carr

Agenda – Day 2

Time	Topic	Presenter
9:00 – 9:10	Welcome and Introduction	Isabella Nicosia
9:10 – 11:10	RA Imports	John Goodin
11:10 – 11:30	Planned Outage Process Enhancements	Karl Meeusen
11:30 – 11:50	UCAP for Local	Karl Meeusen
11:50 – 12:00	Next Steps	Isabella Nicosia

Stakeholder Process



Resource Adequacy Enhancements Policy Development Schedule

Date	Milestone
September 15,17	Working Group
Oct 1	Stakeholder comments on Working Group due
Nov 3	Draft final proposal
Nov 10-12	Stakeholder meeting on draft final proposal
Dec 3	Stakeholder comments on draft final proposal
Aug 2020 - Q1 2021	Draft BRS and Tariff
January 2021	Final proposal
Q1 2021	Present proposal to CAISO Board

UNFORCED CAPACITY EVALUATIONS

CAISO BA and RC West outage processes are designed to work in tandem but outage definitions are different under these processes

- In the CAISO balancing authority (BA) outage process, generator owners (GO) and participating transmission owners (PTO) submit outages to the CAISO BA
- In the RC West outages process, BAs and transmission operators (TOP) submit outages to the RC on behalf of generator owners and transmission owners
- Both processes include a long-range, mid-range, and short-range study window process for planned outages and a real-time process for other outage types
- Currently, outage definitions differ in the CAISO BA outage process and the RC West outage process

Purpose of outage definition proposal

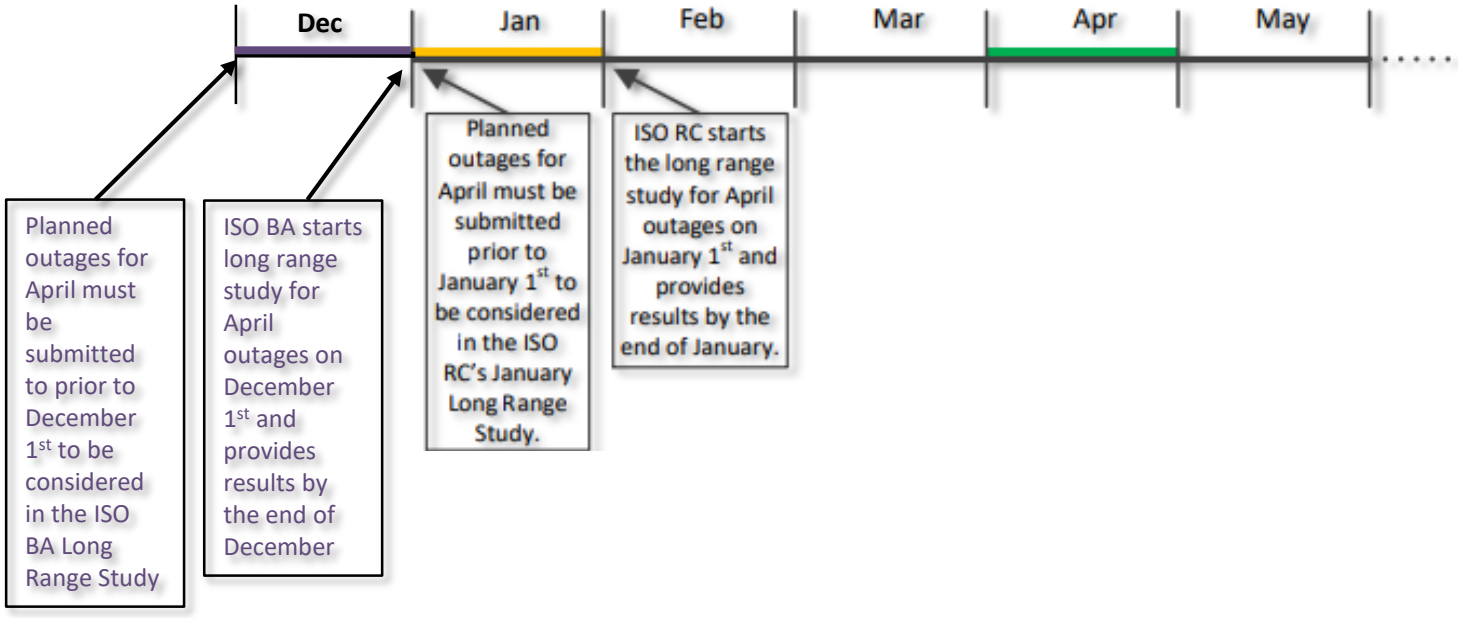
- Align CAISO BA outage definitions with existing RC outage definitions
- Classify outage definitions for UCAP purposes
- Maintain existing timelines for both the CAISO BA outage process and RC outage process, to the extent possible

EXISTING PLANNED OUTAGE STUDY WINDOWS AND EXAMPLES

Existing Long Range Study Window

- Long range study window process is optional
- Long range outage submission deadlines:
  - Generator Owners (GO) and Participating Transmission Owners (PTO) submit outages to CAISO BA: Prior to the first day of the month one full calendar month in advance of the Reliability Coordinator's (RC) Long-Range submission deadline
    - CAISO provides study results prior to the RC's Long-Range outage submission deadline
  - Balancing Authorities (BA) and Transmission Operators (TOP) submit outages to RC West: Prior to the first day of the month three months prior to the start of the month being studied
    - RC provides study results no later than the end of the month after outage submittal

Long Range Study Window Example

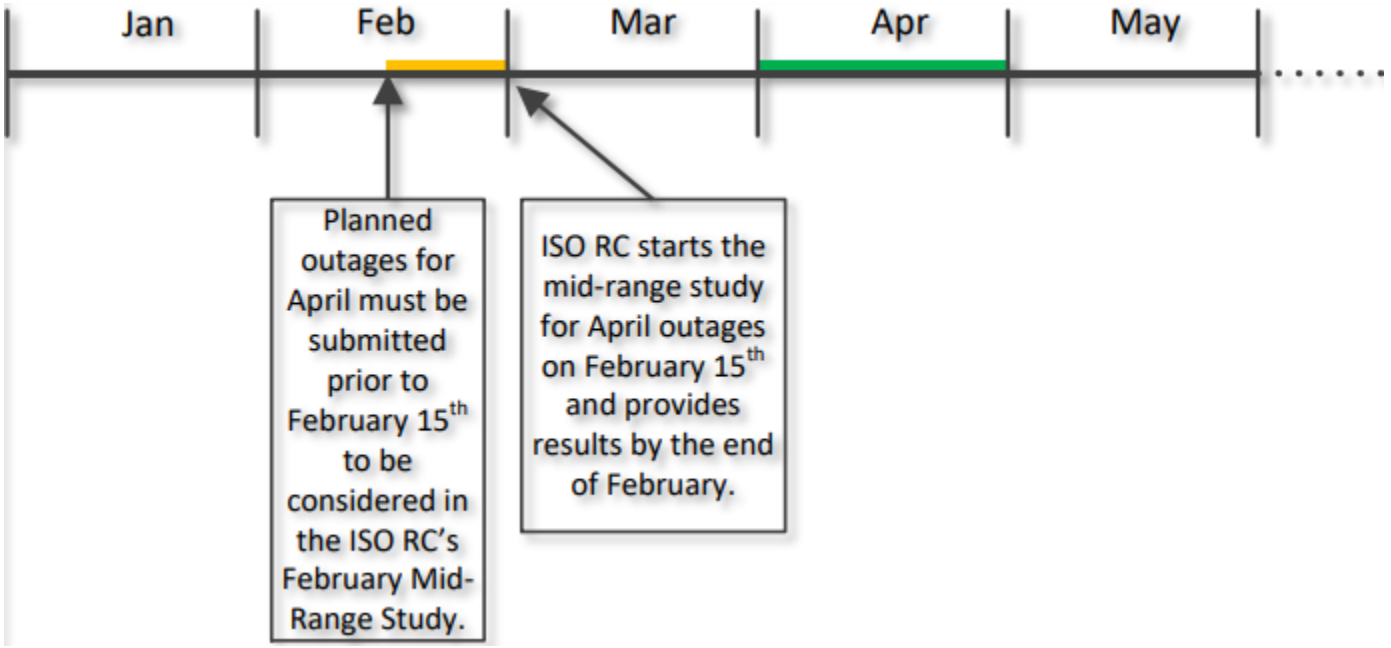


CAISO BA outage submission (GOs and PTOs submit to CAISO BA)
RC outage submission (TOPs and BAs submit to RC)

Existing Mid Range Study Window

- Mid range study window process is optional
- RC and CAISO BA study timelines are the same
- Mid range outage submission deadlines:
  - GO/PTO submit outages to CAISO BA and BAs/TOPs submit outages to RC West: prior to 45 days prior to the start of the month being studied (e.g., outages occurring in April must be submitted prior to 0001 on February 15th)
    - CAISO BA and RC provides study results no later than the end of the month of outage submittal

Mid-Range Study Window Example



CAISO BA outage submission (GOs and PTOs submit to CAISO BA) &
RC outage submission (TOPs and BAs submit to RC)

Existing Short Range Study Window

- Short range study process is mandatory
- Short range submission deadlines
  - GO/PTO submit outages to CAISO BA: No less than 5 full business days in advance of the Reliability Coordinator's Short-Range submission deadline
  - BA/TOP submit outages to RC West: one (1) week prior to the start of the week being studied

Short Range Study Window Example

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
June 4	5	6	7	8	9	10
Planned outages in the yellow colored week should be submitted to the CAISO BA by 0001 on Monday						
11	12	13	14	15	16	17
Planned outages in yellow colored week should be submitted by 0001 on Monday						
18	19	20	21	22	23	24
Planned outage start time (Monday)	Planned outage start time (Tuesday)	Planned outage start time (Wednesday)	Planned outage start time (Thursday)	Planned outage start time (Friday)	Planned outage start time (Saturday)	Planned outage start time (Sunday)

CAISO BA outage submission (GOs and PTOs submit to CAISO BA)

RC outage submission (TOPs and BAs submit to RC)

REAL-TIME STUDY WINDOW

Outages submitted after the Short Range Submission Deadline – Current process

- Today, BA/TOP outages submitted after the short range study window are either an planned if its submitted before T-7 (T = start of the outage) or forced if it is submitted T-7 or after
  - Planned outages that fall between short range window and T-7 are currently studied as opportunity outages in the RC study process
  - Forced outages (submitted at T-7 or after) are submitted when resource has increased risk of breaking, or if outage happens in real time
- Today, RC opportunity, urgent, and forced outages can be used after the short range study window closes

Outages submitted after the Short Range Submission Deadline – Proposed process

- If outages are not submitted as planned (i.e., before the short range window ends), outages should be submitted as opportunity, urgent, or forced in alignment with the RC outage definitions
  - Opportunity and urgent outages should not be abused to avoid submitting outages in the planned outage timeframe
    - CAISO will have discretion over whether a submitted opportunity outage is studied and approved
    - Planned outages will be prioritized over opportunity outages
    - Because urgent outages have the same priority as forced outages, they will be subject to UCAP

OUTAGE DEFINITIONS, PRIORITIES, AND UCAP IMPACTS

CAISO proposes to align CAISO BA outages with existing RC outage definitions (1 of 3)

- **Forced Outage** – Facility/equipment that is removed from service in real-time with limited or no notice
- **Urgent Outage** – Facility/equipment that is known to be operable, yet carries an increased risk of a Forced outage occurring
  - Facility/equipment remains in service until personnel, equipment and/or system conditions allow the outage to occur
  - Urgent outages allow facilities to be removed from service at an optimal time for overall system reliability
  - The work may or may not be able to wait for the Short Range outage window
  - An Urgent outage must have a justification of its urgency documented in the BA/TOP comments section of the outage submission

*Full requirements are documented in the RC0630 Procedure

CAISO proposes to align CAISO BA outages with existing RC outage definitions (2 of 3)

- **Planned Outage** – Facility/equipment outage with enough advance notice to meet short range submittal requirements
- **Opportunity Outage** – A Facility/equipment outage that can be taken due to a change in system conditions, weather or availability of field personnel
  - Opportunity outages did not meet the short range window requirements
  - Opportunity outages that cause reliability issues or conflict with other Submitted or Confirmed outages of a higher priority cannot be implemented
  - Opportunity outages should have an emergency return time of 8 hours or less

*Full requirements are documented in the RC0630 Procedure

CAISO proposes to align CAISO BA outages with existing RC outage definitions (3 of 3)

- **Operational Outage** – Transmission Facility/equipment that is removed from service in the normal course of maintaining optimal or reliable system conditions but remains available if needed upon short notice
  - For transmission only
- **Informational Outage** – Facility/equipment outage entered for informational reasons including increased situational awareness, for BA/TOP internal purposes or to satisfy the RC Data Specification in WebOMS
  - Do not cause derate or require engineering study
- These outages would also be adopted for the CAISO BA to ensure full alignment with RC outage definitions

Outage Priorities and UCAP impacts

- Outage priorities (from highest to lowest)
  - Forced Outage, Urgent Outage
  - Planned Outage
  - Opportunity Outage
- Forced and urgent outages will be considered in the UCAP calculation
- Planned and opportunity outages will not be considered in the UCAP calculation

CAISO previously proposed the following process for considering outage exemptions

- After the fact review process to exempt large outlier events that are outside normal utility operations, significantly affect the resource's UCAP value, and are unlikely to recur within the same UCAP calculation period
- **UCAP Exempt Outage**
  - An outage caused by a natural disaster, act of the public enemy, war, or insurrection. The cause must occur at the plant location and directly affect operability of a generating unit for 5 consecutive days or longer, has not occurred in the previous three years, and could not be avoided through the exercise of Good Utility Practice
- UCAP exempt outages submitted by the generator's SC with sufficient justification within 30 days of the conclusion of the outage will be reviewed by the CAISO, and if approved, exempted from the UCAP calculation for the season in which the outage occurred

Stakeholder feedback

- Stakeholders do not support including transmission-induced outages in UCAP
  - Inconsistent with cost causation principles
  - Does not provide the appropriate incentives to address and mitigate transmission outages
  - Resources should not be penalized for outages outside their control

CAISO will continue to examine the outage exemption proposal

- CAISO will evaluate the outage exemption proposal to ensure it:
  - Incentivizes resource maintenance and availability
  - Provides clear exemption criteria
- CAISO will re-evaluate forced outage nature of work categories to determine if modifications can be made to the exemption proposal to address stakeholder concerns
  - Nature of work categories as currently defined can lead to ambiguity with respect to RAAIM exemptions
  - Any modifications made to the exemption proposal should eliminate ambiguity and maintain incentives to be available

UCAP METHODOLOGY: SEASONAL AVAILABILITY FACTORS

CAISO has updated seasonal availability factor proposal for UCAP evaluations

- CAISO will develop and utilize a seasonal availability factor based approach for UCAP determinations during the tightest system conditions
- Resource availability factors will incorporate historical derates and forced and urgent outages
  - Excludes planned and approved opportunity outages
- CAISO believes this updated UCAP determination proposal, based on seasonal availability factors, is best applied to the following resource types:
  - Thermal, Hydro, and Storage resources
  - For resources with QC values calculated using an ELCC methodology, CAISO will use ELCC value as the UCAP value

CAISO proposes to calculate resource availability on a seasonal basis measured on tight supply cushion hours

- Considers different impacts of availability during seasons across the year to better reflect unit reliability
- A large supply cushion indicates less real-time system resource adequacy risk because more energy remains available to respond to unplanned market events
- A low supply cushion indicates the system has fewer assets available to react to unexpected outages or load increases, indicating a high real-time system resource adequacy risk
- Stakeholder comments generally support a seasonal approach

Continue to propose to assess forced outages during 20% of tightest supply cushion hours

- Today we assess 5 RAAIM hours per day, which is roughly 20% of all hours
- Using RAAIM as inspiration, we are proposing to calculate UCAP based on the top 20% of tightest supply cushion hours for peak and off peak months
- Advantages
  - Penalizing resources for being on a forced outage when the grid really needed them
  - Unlike RAAIM, these assessment hours can fall at any point in the day, and thus resources are incentivized to always be available
  - Simpler than an EFORd methodology, or weighting of all hours
  - Provides consistency across evaluation periods, and more predictable risk of any one outage on a resource's capacity value

Defining Top 20% Tightest Supply Cushion Hours

- **Supply Cushion = Daily Shown RA** (excluding wind and solar) **– Daily Planned Outage Impacts – Daily Forced Outage Impacts – Net Load – Contingency Reserves**
- Supply cushion represents how much shown RA MWs are leftover after we take into account outages, serving net demand, and covering contingency reserves
- Contingency Reserves represents Regulation Up, Spin and Non-Spin Reserves
- Measured in MWs
- Because net load is a 5 minute measure, to convert the supply cushion into an hourly value we take the mean of the supply cushion across all 12 RTD intervals to represent the supply cushion in each operating hour

Redefining Peak and Off Peak Months

- The CAISO initially proposed to define Peak Months as May-September and Off-Peak Months as October-April, this decision was made in part to align with CPUC's definition of summer months
- Operations has observed continued high loads and temperatures into October and suggested we re-define October as a Peak Month for the purposes of UCAP.
- Next slide presents the monthly hourly supply cushion distribution, and evidence supports reclassifying October as a Peak Month
- New proposal to calculate seasonal UCAP values for:
  - Peak Months- May- October
  - Off-Peak Months- November- April

Monthly distribution of the hourly supply cushion

P	1	2	3	4	5	6	7	8	9	10	11	12
1%	-692	-2641	-2268	-2127	1529	-3097	-4213	-2691	1937	-23	-3354	-3136
5%	1132	-597	-590	711	3704	955	-1518	1059	4650	2390	-1804	-720
10%	2158	626	662	2314	5229	3777	1050	3252	6884	4330	-609	400
20%	**4019**	**2444**	**2325**	**4924**	**7333**	**7228**	**4726**	**6678**	**10612**	**6648**	**1270**	**2432**
25%	4674	3308	3075	5855	8143	8230	6368	7981	11690	7634	2221	3279
50%	7801	6434	5798	9494	10949	11827	10836	12446	15627	11314	5257	6338
75%	10589	10624	9943	13299	14290	15630	16346	15942	18782	14353	7945	9469
90%	13697	14120	13794	17412	16958	19670	20620	18893	21739	17864	10827	12595
95%	15230	15570	15207	19164	17969	21436	23144	20680	23664	20227	12544	14348
99%	17753	18402	16842	20782	20325	23246	26594	24368	28161	22911	14710	17509
Mean	7857	6988	6549	9590	11068	11712	11097	11816	15099	11166	5178	6455

- The October distribution of hourly supply cushion looks more similar to Peak/Summer Months than an Off Peak Month.
  - It has a similar high mean of 11,000+ MWs, and
  - The 20th percentile tends to be above 5000 for Peak Months and under 5000 for Off Peak Month, and October is over 5000 MMs, and thus similar to Peak Months.

Distribution of Supply Cushion Hours (in MWs): October= Peak Month

Percentile	Peak Months 2018	Off Peak Months 2018-2019	Peak Months 2019	Off Peak Months 2019-2020
1.0	-2985	-2318	-1109	-2868
5.0	554	-439	3545	-697
10.0	2752	967	5866	628
20.0	5806	2878	8759	2734
25.0	6843	3639	9820	3573
50.0	10551	6687	14217	6715
75.0	13895	10030	17923	10790
90.0	16709	13478	21237	14322
95.0	18298	14993	23135	16741
99.0	20999	17376	26522	20018
Hours	4416	4344	4416	4367

Note: A negative value indicates there was a capacity shortfall- did not have enough Shown RA to cover Outages, Net Load, and Contingency Reserves

Distribution of the Top 20% of Supply Cushion Hours by Operating Hour: October as On Peak

HE	Peak Months 2018		Off Peak Months 2018-2019		Peak Months 2019		Off Peak Months 2019-2020	
	# of Obs.	% of Obs.	# of Obs.	% of Obs.	# of Obs.	% of Obs.	# of Obs.	% of Obs.
1	3	0.34	4	0.46	18	2.04	5	0.57
2	1	0.11	2	0.23	7	0.79	2	0.23
3	0	0.00	1	0.12	4	0.45	1	0.11
4	0	0.00	1	0.12	4	0.45	1	0.11
5	0	0.00	2	0.23	5	0.57	1	0.11
6	2	0.23	8	0.92	17	1.93	9	1.03
7	12	1.36	54	6.21	26	2.94	51	5.84
8	9	1.02	38	4.37	17	1.93	34	3.89
9	2	0.23	8	0.92	5	0.57	10	1.15
10	2	0.23	2	0.23	4	0.45	5	0.57
11	1	0.11	0	0.00	3	0.34	3	0.34
12	1	0.11	0	0.00	5	0.45	0	0.00
13	7	0.79	0	0.00	6	0.68	0	0.00
14	14	1.59	1	0.12	8	0.91	1	0.11
15	24	2.72	4	0.46	13	1.47	2	0.23
16	33	3.74	8	0.92	23	2.60	12	1.37
17	40	4.52	40	4.60	32	3.62	54	6.19
18	78	8.83	95	10.93	61	6.91	106	12.14
19	119	13.48	127	14.61	106	12.00	127	14.55
20	152	17.21	147	16.92	129	15.74	133	15.23
21	151	17.10	143	16.46	143	16.19	129	14.78
22	125	14.16	114	13.12	125	14.16	112	12.83
23	78	8.83	56	6.44	79	8.95	56	6.41
24	29	3.28	14	1.61	34	3.85	19	2.18
Total	883	100.0	869	100.0	883	100.0	873	100.0

- This table shows the distribution of the top 20% of tight supply conditions hours by operating hour.
- As expected, the majority of tight supply cushion hours are around the evening ramp/peak- HE 18-22, averages 69.34% of hours. In Off Peak Months, we also see a spike during the morning ramp.
- However, because there are hours that fall outside these ramps, it further incentivizes resources to be available for all hours, b/c there is a chance a tight supply cushion hour could fall outside these predictable periods.
- This approach will include a majority of the possible days (averages 82%)

Distribution UCAP Assessment hours per day: October as Peak

# of tight supply hours per day	Peak Months 2018		Off Peak Months 2018/2019		Peak Months 2019		Off Peak Months 2019/2020	
	# of Days	% of Days	# of Days	% of Days	# of Days	% of Days	# of Days	% of Days
0	25	13.59	28	15.47	36	19.57	46	25.27
1	8	4.35	2	1.10	7	3.80	2	1.10
2	13	7.07	8	4.42	10	5.43	4	2.20
3	26	14.13	24	13.26	23	12.50	10	5.49
4	20	10.87	19	10.50	25	13.59	13	7.14
5	34	18.48	29	16.02	21	11.41	22	12.09
6	9	4.89	23	12.71	15	8.15	29	15.93
7	9	4.89	13	7.18	7	3.80	18	9.89
8	13	7.07	12	6.63	11	5.98	17	9.34
9	6	3.26	14	7.73	12	6.52	6	3.30
10	8	4.35	2	1.10	4	2.17	5	2.75
11	3	1.63	0	0.00	3	1.63	3	1.65
12	4	2.17	4	2.21	1	0.54	3	1.65
13	3	1.63	3	1.66	0	0.00	1	0.55
14	1	0.54	0	0.00	1	0.54	1	0.00
15	1	0.54	0	0.00	1	0.54	0	0.00
16	0	0.00	0	0.00	0	0.00	1	0.55
17	1	0.54	0	0.00	1	0.54	0	0.00
18	0	0.00	0	0.00	3	1.63	0	0.00
19	0	0.00	0	0.00	2	1.09	1	0.55
20	0	0.00	0	0.00	0	0.00	0	0.00
21	0	0.00	0	0.00	0	0.00	0	0.00
22	0	0.00	0	0.00	0	0.00	0	0.00
23	0	0.00	0	0.00	0	0.00	0	0.00
24	0	0.00	0	0.00	1	0.54	0	0.00
Total	184	100.00	181	100.0	184	100.0	182	100.0

- This table shows the distribution of the number of days with how many UCAP assessment hours observed.
- 81.53% of days captured
- Peak Months have a median of 4 UCAP Assessment hours per day and Off Peak Months have a median of 5 UCAP Assessment hours Per day.

Stakeholder comments on UCAP Methodology

- Stakeholders generally supportive of top 20% of tightest supply cushion hours to measure UCAP values, and finds this methodology an improvement to Top 100 hours, but want data on fleet wide impact.
  - We provide rough estimates of the Weighted Seasonal Average Availability Factor by Fuel Type to give an idea of the RA Fleet's UCAP value, Appendix slides provide more detailed breakdowns.
- Calpine suggested looking at top 10% of supply cushion hours regardless of season
  - This approach would lead to too many hours being drawn from Off Peak Months, and would not reflect availability during summer months when Grid is more stressed, nor measure enough hours or days.
  - Appendix slides shows data analysis of top 10% of supply cushion hours

Stakeholder comments on UCAP Methodology

- SDG&E: Supply cushion should be calculated as based on a calculated threshold that is relative to demand
  - PRM – Average Forced Outage Rate) * Load > Daily Shown RA (excluding wind and solar) – Daily RA Planned Outages – Net Load
- Analysis shows that the current methodology for identifying the supply cushion is already strongly correlated with net loads, and unlikely that this formulation would identify radically different hours.
- The problem with identifying a fixed metric of “tightness” is this leads to variability in the number of hours selected to calculate UCAP each year, and provides a less robust estimation of the true average availability of the resource. By selecting a fixed percentage of hours, we have assurances of sample sizes each year will be adequately large, and while the actually supply cushion in each hour may vary, it will always be the top 20% of tightest conditions for that assessment period.
- This provides resource owners a greater incentive to perform maintenance b/c they know that roughly 800+ hours each season they could be assessed UCAP, whereas under a threshold methodology it could be 0 hours or 1000 hours. Impacts of any one outage will be even harder to calculate on part of resource operator.

Correlations with the average hourly supply cushion

Variables correlated with average supply cushion	Peak Months 2018	Off Peak Months 2018-2019	Peak Months 2019	Off Peak Months 2019-2020
Total Shown RA (excluding Wind and Solar)	0.0292	0.0399	0.2121	-0.1027
Forced Outage Impact	-0.2857	-0.2670	-0.4316	-0.2273
Planned Outage Impact	-0.0818	-0.1344	-0.1576	-0.1409
Gross Load	-0.6251	-0.6260	-0.4594	-0.6793
Net Load	-0.8173	-0.9054	-0.7787	-0.9374

Average hourly supply cushion has a strong inverse correlated with net loads, such that when net loads are high the hourly supply cushion is low

Summary of UCAP process steps

1. Determine UCAP Assessment Hours by identify which hours fall into the top 20% of tightest supply cushion hours for each season
2. Determine Hourly Unavailability Factors (HUF) for each UCAP assessment hours each season
3. Determine Seasonal Average Availability Factors (SAAF) using HUFs for each season of prior year
4. Determine Weighted Seasonal Average Availability Factors (WSAAF) using proposed weighting approach
5. Apply WSAAFs for each season of the prior 3 annual periods to determine monthly UCAP (On-peak and Off-peak) values for each resource

Proposed UCAP calculation steps

- CAISO will determine each resource's Hourly Unavailability Factor (HUF) for each of the 20% tightest supply cushion hours per season

$$\textbf{Hourly Unavailability Factor} = \frac{\textbf{Forced + Urgent Outage Impacts}}{\textbf{Pmax}}$$

- CAISO will utilize the average of Hourly Unavailability Factors (HUF) for each season for each of the past 3 years to create a Seasonal Average Availability Factor (SAAF) for each resource

$$\textbf{Seasonal Average Availaility Factor} = 1 - \frac{\sum \textbf{Hourly Unavailability Factors}}{\textbf{Number of Observed Hours}}$$

Proposed UCAP calculation steps (continued)

- CAISO also proposes a weighting method for determining a resource's UCAP values over three year period
- CAISO proposes the following percentage weights for the availability factor calculation by year from most recent to most historic: 45-35-20%
- In other words, the following percentage weights will be applied to the seasonal availability factors:
  - 45% weight for the most recent year's seasonal availability factor
  - 35% weight on the second year
  - 20% on the third year

Proposed UCAP calculation steps (continued)

- Seasonal Average Availability Factors (SAAF) will be calculated for each of the 3 prior historical years (for both on-peak and off-peak seasons)
- SAAFs will based on each Hourly Unavailability Factor (HUF) derived by assessing forced and urgent outages compared to the Pmax value for each resource
- CAISO will then apply proposed weighting to each of the five previous annual periods (for each on-peak and off-peak season) to create Weighted Seasonal Average Availability Factors (WSAAF)

$$\textbf{Weighted Seasonal Average Availability Factor} = \textbf{Annual Weighting} * \textbf{Seasonal Average Availability Factor}$$

Proposed UCAP calculation steps (continued)

- Once the Weighted Seasonal Average Availability Factors (WSAAF) are established for each season of each of prior 3 years, CAISO will sum the factors and apply them to each resource's NQC to determine the resource's seasonal UCAP ratings

$$\textbf{On Peak UCAP} = \sum \textbf{Weighted Seasonal Average Availability Factors}^{\textbf{Summer}} * \textbf{NQC}$$

$$\textbf{Off Peak UCAP} = \sum \textbf{Weighted Seasonal Average Availability Factors}^{\textbf{Winter}} * \textbf{NQC}$$

Pulled CIRA data to estimate the fuel type WSAAF to assess fleet impact

- Daily Outage rates where taken from CIRA and merged with the UCAP Assessment Hours for May 2018- April 2020.
- Year 3 was estimated as the average of Year 1 and 2
- While individual resource's outage data may vary from the fleet wide fuel type average, this data can provide some estimation of the impact of moving towards a UCAP paradigm.
- Appendix slides provide estimates for Bio-gas, Bio-mass, Coal, Natural Gas, Geothermal, and Storage (doesn't take into account EOH SOC impacts)

Estimating Fleet UCAP by Fuel Type: Natural Gas

$$\text{UCAP} = \sum \text{Weighted Seasonal Average Availability Factors}^{\text{Season}} * \text{NQC}$$

Year	Peak Months SAAF	Annual Weight	Weighted SAAF (Summer / On-Peak)
3	0.877	20%	0.175
2	0.886	35%	0.303
1	0.869	45%	0.391
		Total = 100%	0.869
Year	**Off Peak SAAF**	**Annual Weight**	**Weighted SAAF (Winter / Off-Peak)**
3	0.893	20%	0.179
2	0.901	35%	0.315
1	0.884	45%	0.398
		Total = 100%	0.892

Natural gas fleet WSAAF (Peak Months)	Natural gas fleet WSAAF (Off Peak Months)	Example NQC of Natural Gas resource	On-Peak UCAP	Off-Peak UCAP
0.869	0.892	500 MW	434.5 MW	446 MW

Note: Based on daily outage rates weighted by the number of UCAP Assessment Hours, actual resource UCAP values will vary

RA Showings converted to UCAP

Fuel Type	Peak Month WSAAF	June NQC Shown	June UCAP Estimate
Battery	0.969	110.00	106.60
Biomass	0.832	540.00	449.30
Coal	0.950	18.00	17.10
Demand Response*	0.977	235.00	229.60
Gas	0.877	27,002.00	23,680.80
Geothermal	0.869	984.00	855.10
Hydro*	0.863	5,544.00	4,784.50
Nuclear	0.992	1,640.00	1,626.90
Pump Hydro*	0.863	1,285.00	1,109.00
Interchange*		4,118.00	4,118.00
Solar	ELCC	3,303.00	3,303.00
Wind	ELCC	1,688.0	1,688.00
HRCV	0.915	29.00	26.50
Other	0.977	0.13	0.13
Pumping Load		59.00	59.00
Total		46,555.13	42,053.53

- Taking the RA showings for June 2020, we applied the Peak Month WSAAF to estimate the UCAP value of the June 2020 Showings
- Shows a 9.66% reduction, which matches the roughly 10% force outage rate of the system.
- Note DR, Hydro, and interchange resources are estimates based on forced outage rates, which differs from the methodologies covered in the next section

UCAP METHODOLOGIES FOR IMPORTS AND HYBRID RESOURCES

CAISO proposed the following UCAP methodologies (additional detail in 5th Revised Straw Proposal)

- Wind and Solar: Use ELCC values as UCAP
- Demand Response: Use ELCC if adopted, otherwise use performance metric
- Hydro: Longer term historical year weighted average assessment
- Storage: Consider state of charge constraints in UCAP calculation
- Following slides propose UCAP methodology for imports and hybrid resources

UCAP treatment for RA imports - Outage reporting obligations

	Outage Rule	
Import Type	RA	Non-RA
Pseudo-tie	Per Appendix A, this is a Generating Unit. Normal rules apply.	Per Appendix A, this is a Generating Unit. Normal rules apply.
Dynamic resource specific system resources	No reporting for planned outages. Notify ISO of forced outages within 60 minutes of discovery. §§ 9.3.10.3 & 9.3.10.3.1	No reporting for planned outages. Notify ISO of forced outages within 60 minutes of discovery. §§ 9.3.10.3 & 9.3.10.3.1
Non-dynamic resource specific system resources	No reporting for planned outages. Notify ISO of forced outages within 60 minutes of discovery. §§ 9.3.10.3 & 9.3.10.3.3	No reporting for planned outages. Notify ISO of forced outages within 60 minutes of discovery. §§ 9.3.10.3 & 9.3.10.3.3

UCAP treatment for RA imports*

Forced Outages		
Resource Outage? (OMS record)	**Transmission Cut? (E-tag record)**	**UCAP Evaluation**
Yes	N/A [fails before flow]	Yes
No	Yes - Non-firm	Yes
Yes	Yes - Firm [fails in hour]	Yes
No	Yes - Firm	No

UCAP for:

- Forced outages on import resource reported in OMS
- Non-firm transmission cut reported in E-tag

*Pseudo-ties treated as internal generation for UCAP calculation

UCAP treatment for RA imports – Resource Specific System Resources

- CAISO proposes to apply UCAP for resource specific system resources at the SC level, rather than an individual resource level
  - This SC-level approach enables the CAISO to track availability for RA imports with unique transaction IDs created when scheduled, as opposed to resource IDs
- UCAP would be assessed on an SC level using their shown RA and forced outages (and transmission cuts if using alternative non-firm transmission option)
  - For example, if an SC shows two import RA resources, 100 MW and 50 MW, then they would be evaluated on 150 MW subject to forced outages and transmission cuts in a given year

UCAP Treatment for Co-Located and Hybrid Resources

- Co-located: UCAP methodology applied to individual components (e.g. solar + storage: ELCC for solar component, storage UCAP for storage component)
- How will outages and dynamic limits be incorporated in the UCAP calculation for hybrid resources?
  - Hybrid resources should submit outages to the CAISO via the outage management system
    - Outage cards will be required for mechanical outages
  - Hybrid resources will have the ability to manage variable output through the ‘dynamic limit tool’
    - Ambient derates or absence of variable component can be submitted through the dynamic limit tool
    - Limits will be have 5-minute granularity and will be submitted every 5-minutes for a 3 hour period of expected availability

UCAP Treatment for Co-Located and Hybrid Resources (cont.)

- Forced and urgent outages and dynamic limit impacts on resource output will be considered during the 20% tightest supply cushion hours
- **Hourly Unavailability Factor =**

$$\frac{(\textbf{Forced + Urgent Outage Impacts}) + \textbf{Dynamic Limit Impacts}}{\boldsymbol{Pmax}}$$

  - Dynamic Limit Impacts submitted at 5 minute granularity will be averaged over the hour
  - Formula assumes QC equals the Pmax of the resource, coordination with LRA required to avoid double counting with QC methodology
  - This will not ‘double count’ outages

APPENDIX: WSAAF BY FUEL TYPE

Estimating Fleet UCAP by Fuel Type: Bio Gas

$$\text{UCAP} = \sum \text{Weighted Seasonal Average Availability Factors}^{\text{Season}} * \text{NQC}$$

Year	Peak Months SAAF	Annual Weight	Weighted SAAF (Summer / On-Peak)
3	0.850	20%	0.170
2	0.854	35%	0.299
1	0.819	45%	0.369
		Total = 100%	0.838
Year	**Off Peak SAAF**	**Annual Weight**	**Weighted SAAF (Winter / Off-Peak)**
3	0.891	20%	0.178
2	0.882	35%	0.287
1	0.857	45%	0.386
		Total = 100%	0.851

Bio-gas fleet WSAAF (Peak Months)	Bio-gas fleet WSAAF (Off Peak Months)	Example NQC of Bio-gas resource	On-Peak UCAP	Off-Peak UCAP
0.838	0.851	30 MW	25.14 MW	45.53 MW

Note: Based on daily outage rates weighted by the number of UCAP Assessment Hours, actual resource UCAP values will vary

Estimating Fleet UCAP by Fuel Type: Bio Mass

$$\text{UCAP} = \sum \text{Weighted Seasonal Average Availability Factors}^{\text{Season}} * \text{NQC}$$

Year	Peak Months SAAF	Annual Weight	Weighted SAAF (Summer / On-Peak)
3	0.834	20%	0.167
2	0.848	35%	0.297
1	0.846	45%	0.381
		Total = 100%	0.850
Year	**Off Peak SAAF**	**Annual Weight**	**Weighted SAAF (Winter / Off-Peak)**
3	0.838	20%	0.168
2	0.819	35%	0.308
1	0.901	45%	0.405
		Total = 100%	0.891

Bio-mass fleet WSAAF (Peak Months)	Bio-mass fleet WSAAF (Off Peak Months)	Example NQC of Bio-mass resource	On-Peak UCAP	Off-Peak UCAP
0.850	0.891	50 MW	42.5 MW	44.55 MW

Note: Based on daily outage rates weighted by the number of UCAP Assessment Hours, actual resource UCAP values will vary

Estimating Fleet UCAP by Fuel Type: Coal

$$\text{UCAP} = \sum \text{Weighted Seasonal Average Availability Factors}^{\text{Season}} * \text{NQC}$$

Year	Peak Months SAAF	Annual Weight	Weighted SAAF (Summer / On-Peak)
3	0.947	20%	0.189
2	0.915	35%	0.320
1	0.979	45%	0.441
		Total = 100%	0.950
Year	**Off Peak SAAF**	**Annual Weight**	**Weighted SAAF (Winter / Off-Peak)**
3	0.942	20%	0.188
2	0.901	35%	0.315
1	0.984	45%	0.443
		Total = 100%	0.946

Coal fleet WSAAF (Peak Months)	Coal fleet WSAAF (Off Peak Months)	Example NQC of Coal resource	On-Peak UCAP	Off-Peak UCAP
0.950	0.946	10 MW	9.5 MW	9.46 MW

Note: Based on daily outage rates weighted by the number of UCAP Assessment Hours, actual resource UCAP values will vary

Estimating Fleet UCAP by Fuel Type: Natural Gas

$$\text{UCAP} = \sum \text{Weighted Seasonal Average Availability Factors}^{\text{Season}} * \text{NQC}$$

Year	Peak Months SAAF	Annual Weight	Weighted SAAF (Summer / On-Peak)
3	0.877	20%	0.175
2	0.886	35%	0.303
1	0.869	45%	0.391
		Total = 100%	0.869
Year	**Off Peak SAAF**	**Annual Weight**	**Weighted SAAF (Winter / Off-Peak)**
3	0.893	20%	0.179
2	0.901	35%	0.315
1	0.884	45%	0.398
		Total = 100%	0.892

Natural gas fleet WSAAF (Peak Months)	Natural gas fleet WSAAF (Off Peak Months)	Example NQC of Natural Gas resource	On-Peak UCAP	Off-Peak UCAP
0.869	0.892	500 MW	434.5 MW	446 MW

Note: Based on daily outage rates weighted by the number of UCAP Assessment Hours, actual resource UCAP values will vary

Estimating Fleet UCAP by Fuel Type: Geo-Thermal

$$\text{UCAP} = \sum \text{Weighted Seasonal Average Availability Factors}^{\text{Season}} * \text{NQC}$$

Year	Peak Months SAAF	Annual Weight	Weighted SAAF (Summer / On-Peak)
3	0.871	20%	0.174
2	0.893	35%	0.313
1	0.848	45%	0.382
		Total = 100%	0.869
Year	**Off Peak SAAF**	**Annual Weight**	**Weighted SAAF (Winter / Off-Peak)**
3	0.788	20%	0.158
2	0.877	35%	0.307
1	0.699	45%	0.315
		Total = 100%	0.780

Geo-thermal fleet WSAAF (Peak Months)	Geo-thermal fleet WSAAF (Off Peak Months)	Example NQC of Geo-thermal resource	On-Peak UCAP	Off-Peak UCAP
0.869	0.780	35 MW	30.42 MW	27.3 MW

Note: Based on daily outage rates weighted by the number of UCAP Assessment Hours, actual resource UCAP values will vary

Estimating Fleet UCAP by Fuel Type: HRCV (Heat Recovery)

$$\text{UCAP} = \sum \text{Weighted Seasonal Average Availability Factors}^{\text{Season}} * \text{NQC}$$

Year	Peak Months SAAF	Annual Weight	Weighted SAAF (Summer / On-Peak)
3	0.919	20%	0.184
2	0.959	35%	0.336
1	0.879	45%	0.400
		Total = 100%	0.920
Year	**Off Peak SAAF**	**Annual Weight**	**Weighted SAAF (Winter / Off-Peak)**
3	0.876	20%	0.175
2	0.809	35%	0.283
1	0.944	45%	0.425
		Total = 100%	0.883

HRCV fleet WSAAF (Peak Months)	HRCV fleet WSAAF (Off Peak Months)	Example NQC of HRCV resource	On-Peak UCAP	Off-Peak UCAP
0.920	0.891	15 MW	13.8 MW	13.25 MW

Note: Based on daily outage rates weighted by the number of UCAP Assessment Hours, actual resource UCAP values will vary

Estimating Fleet UCAP by Fuel Type: LESR (Energy Storage)

$$\text{UCAP} = \sum \text{Weighted Seasonal Average Availability Factors}^{\text{Season}} * \text{NQC}$$

Year	Peak Months SAAF	Annual Weight	Weighted SAAF (Summer / On-Peak)
3	0.969	20%	0.194
2	0.975	35%	0.341
1	0.964	45%	0.434
		Total = 100%	0.969
Year	**Off Peak SAAF**	**Annual Weight**	**Weighted SAAF (Winter / Off-Peak)**
3	0.948	20%	0.190
2	0.969	35%	0.339
1	0.927	45%	0.417
		Total = 100%	0.946

Storage fleet WSAAF (Peak Months)	Storage fleet WSAAF (Off Peak Months)	Example NQC of Storage resource	On-Peak UCAP	Off-Peak UCAP
0.969	0.946	25 MW	24.23 MW	23.65 MW

Note: Based on daily outage rates weighted by the number of UCAP Assessment Hours, actual resource UCAP values will vary. Does not take into account impacts of EOH SOC parameter which hasn't been implemented yet

Estimating Fleet UCAP by Fuel Type: Nuclear

$$\text{UCAP} = \sum \text{Weighted Seasonal Average Availability Factors}^{\text{Season}} * \text{NQC}$$

Year	Peak Months SAAF	Annual Weight	Weighted SAAF (Summer / On-Peak)
3	0.991	20%	0.198
2	0.983	35%	0.344
1	0.999	45%	0.450
		Total = 100%	0.992
Year	**Off Peak SAAF**	**Annual Weight**	**Weighted SAAF (Winter / Off-Peak)**
3	0.957	20%	0.191
2	0.946	35%	0.331
1	0.968	45%	0.436
		Total = 100%	0.958

Nuclear fleet WSAAF (Peak Months)	Nuclear fleet WSAAF (Off Peak Months)	Example NQC of Nuclear resource	On-Peak UCAP	Off-Peak UCAP
0.992	0.958	800 MW	793.6 MW	766.4 MW

Note: Based on daily outage rates weighted by the number of UCAP Assessment Hours, actual resource UCAP values will vary

Estimating Fleet UCAP by Fuel Type: Waste

$$\text{UCAP} = \sum \text{Weighted Seasonal Average Availability Factors}^{\text{Season}} * \text{NQC}$$

Year	Peak Months SAAF	Annual Weight	Weighted SAAF (Summer / On-Peak)
3	0.907	20%	0.181
2	0.957	35%	0.335
1	0.857	45%	0.386
		Total = 100%	0.902
Year	**Off Peak SAAF**	**Annual Weight**	**Weighted SAAF (Winter / Off-Peak)**
3	0.865	20%	0.173
2	0.894	35%	0.313
1	0.835	45%	0.376
		Total = 100%	0.862

Waste fleet WSAAF (Peak Months)	Waste fleet WSAAF (Off Peak Months)	Example NQC of Waste resource	On-Peak UCAP	Off-Peak UCAP
0.902	0.862	15 MW	13.53 MW	12.93 MW

Note: Based on daily outage rates weighted by the number of UCAP Assessment Hours, actual resource UCAP values will vary

APPENDIX: TOP 10% SUPPLY CUSHION, UCAP ASSESSMENT HOURS

Distribution of Supply Cushion Hours (in MWs): October= Peak Month

Percentile	2018 Peak Months	2018-2019 Off-Peak Months	2019 Peak Months	2019-2020 Off Peak Months
1.0	-2985	-2318	-1109	-2868
5.0	554	-439	3545	-697
10.0	2752	967	5866	628
20.0	5806	2878	8759	2734
25.0	6843	3639	9820	3573
50.0	10551	6687	14217	6715
75.0	13895	10030	17923	10790
90.0	16709	13478	21237	14322
95.0	18298	14993	23135	16741
99.0	20999	17376	26522	20018
Hours	4416	4344	4416	4367

Calpine suggested using the top 10% to tightest supply cushion hours, the following analysis shows the impact this would have

Distribution of the Top 10% of Supply Cushion Hours by Operating Hour: October as On Peak

HE	Peak Months 2018		Off Peak Months 2018-2019		Peak Months 2019		Off Peak Months 2019-2020	
	# of Obs.	% of Obs.	# of Obs.	% of Obs.	# of Obs.	% of Obs.	# of Obs.	% of Obs.
1	0	0.00	1	0.23	2	0.45	1	0.23
2	0	0.00	1	0.23	1	0.23	0	0.00
3	0	0.00	1	0.23	1	0.23	0	0.00
4	0	0.00	1	0.23	0	0.00	0	0.00
5	0	0.00	1	0.23	1	0.00	0	0.00
6	0	0.00	0	0.00	1	0.00	1	0.23
7	1	0.23	13	3.00	4	0.90	14	3.20
8	1	0.23	8	1.84	2	0.45	12	2.75
9	1	0.23	0	0.00	1	0.23	4	0.92
10	0	0.00	0	0.00	0	0.00	0	0.00
11	0	0.00	0	0.00	0	0.00	0	0.00
12	0	0.00	0	0.00	1	0.23	0	0.00
13	0	0.00	0	0.00	1	0.23	0	0.00
14	3	0.68	0	0.00	4	0.90	0	0.00
15	9	2.04	0	0.00	6	1.36	0	0.00
16	13	2.94	2	0.26	11	2.49	2	0.46
17	22	4.98	24	5.53	18	4.07	22	5.03
18	33	7.47	56	12.90	32	7.24	68	15.56
19	73	16.52	84	19.35	65	14.71	95	21.74
20	98	22.17	98	22.58	95	21.49	97	22.20
21	98	22.17	83	19.12	101	22.85	68	15.56
22	66	14.93	51	11.75	63	14.25	42	9.61
23	22	4.98	8	1.84	25	5.66	10	2.29
24	2	0.45	2	0.46	7	1.58	1	0.23
Total	442	100.0	434	100.0	442	100.0	437	100.0

- This table shows the distribution of the top 10% of tight supply conditions hours by operating hour.
- As expected, the majority of tight supply cushion hours are around the evening ramp/peak- HE 18-22, averages 83.54% of hours. In Off Peak Months, we also see fewer hours that capture the morning ramp.
- Because less hours fall outside of the evening ramp, this would diminish the incentive to be available 24x7

# of tight supply hours per day	Peak Months 2018		Off Peak Months 2018/2019		Peak Months 2019		Off Peak Months 2019/2020	
	# of Days	% of Days	# of Days	% of Days	# of Days	% of Days	# of Days	% of Days
0	75	40.76	72	39.78	77	41.85	73	40.11
1	13	7.07	11	6.08	9	4.89	5	2.75
2	16	8.70	15	8.29	19	10.33	25	13.74
3	27	14.67	22	12.15	30	16.30	24	13.19
4	18	9.78	15	8.29	16	8.70	17	9.24
5	11	5.98	22	12.15	8	4.35	15	8.24
6	6	3.26	16	8.84	10	5.43	11	6.04
7	5	2.72	4	2.21	3	1.63	4	2.20
8	3	1.63	3	1.66	5	2.72	5	2.75
9	7	3.80	1	0.55	2	1.09	1	0.55
10	2	1.09	0	0.00	1	0.54	1	0.55
11	1	0.54	0	0.00	3	1.63	0	0.00
12					0	0.00	0	0.00
13					0	0.00	0	0.00
14					0	0.00	1	0.55
15					0	0.00		
16					0	0.00		
17					0	0.00		
18					0	0.00		
19					1	0.54		
20								
21								
22								
23								
24								
Total	184	100.00	181	100.0	184	100.0	182	100.0

Distribution top 10% UCAP Assessment hours per day: October as Peak

- Only covers 59% of days
- The median number of UCAP Assessment Hours per day is 2

- By selecting the top 20% of tightest supply cushion, we can capture a greater percentage of days, and more hours outside of the evening ramp which will increase the incentives to perform proper maintenance to avoid a UCAP reduction.

DAY 2: RA Enhancements Fifth Revised Straw Proposal

September 15, 2020

Agenda – Day 2

Time	Topic	Presenter
9:00 – 9:10	Welcome and Introduction	Isabella Nicosia
9:10 – 11:10	RA Imports	John Goodin
11:10 – 11:30	Planned Outage Process Enhancements	Karl Meeusen
11:30 – 11:50	UCAP for Local	Karl Meeusen
11:50 – 12:00	Next Steps	Isabella Nicosia

RA IMPORTS

CAISO's proposal balances the need for reliable and dependable RA imports against the fact that California competes for supply in a west-wide market

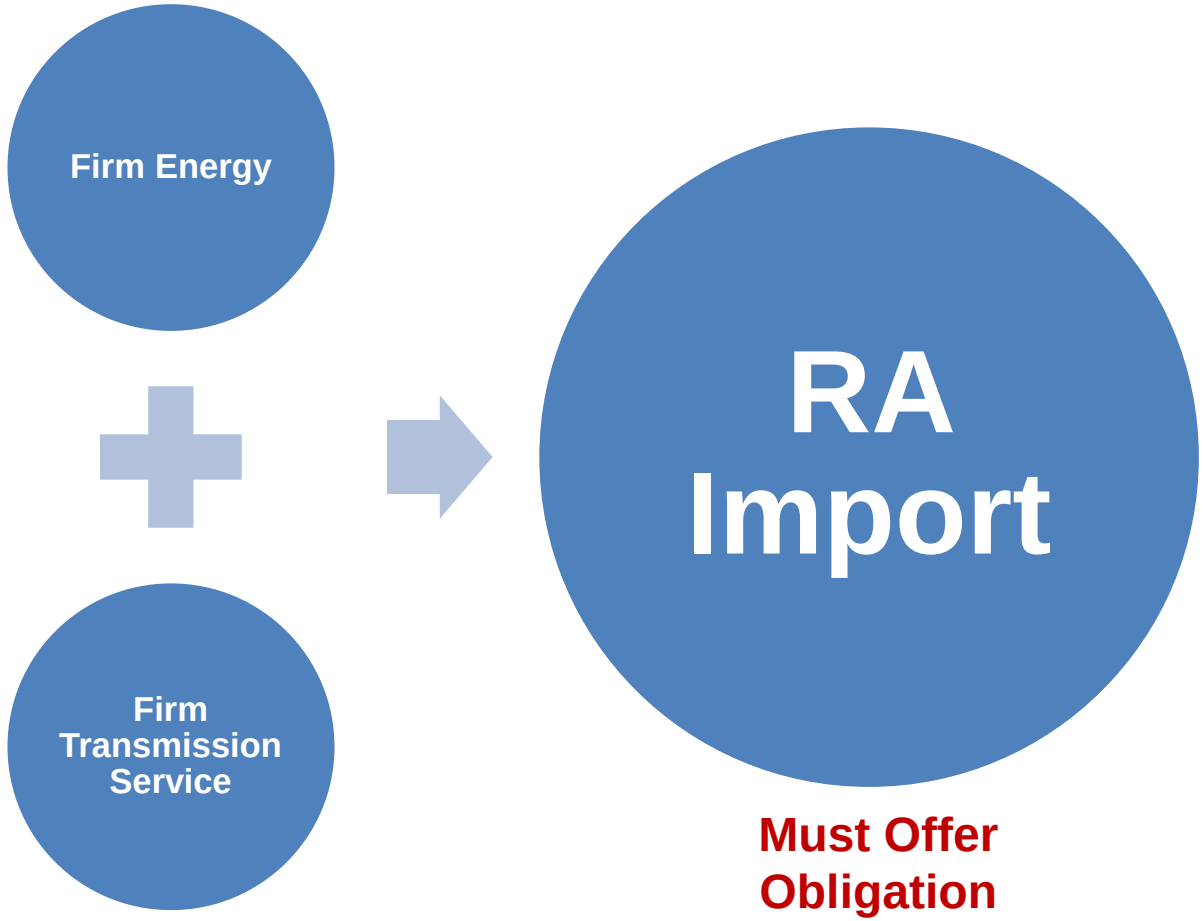
Three primary elements:

1. **Dedicated source**: RA import capacity must be source specific and dedicated to serving CAISO reliability needs
2. **Delivery assurance**: RA import capacity must be dependable and deliverable on high priority transmission service
3. **Offer obligation**: RA Imports must abide by must offer obligations like all other RA resources

RA imports require firm energy AND transmission

Dedicated Source

Delivery Assurance



Must Offer Obligation

Dedicated Source

Stakeholder comments on dedicated source requirement

Brookfield:

✓ Opposes prohibition on firm energy contracts; more reliable; WSPP Sch. C

Morgan Stanley

✓ Non-dynamic RSSR should include pool of resources from multiple BAAs

NCPA:

- Supports resource specification

PG&E:

- Opposes resource specific requirement other than identifying BAA; discusses transition plan if disallow firm energy

Powerex:

- Forward swap is not the same as firm physical energy
  - Collect price premium by not securing physical energy in advance
- Will be push to allow resource substitution up to DA market

✓ If entity has excess physical capacity, no reason not to show it

- Palo Verde NGS, Intermountain, Hoover- largely support imports from southwest; little to no surplus available to serve California beyond this

SMUD:

- Supports continuing firm energy deliveries; still obligated to deliver

Dedicated source: RA imports must be resource specific and dedicated to the CAISO

- a single resource
- a specified portfolio of resources within a single BAA
- BAA's pool of resources

- Backed by WSPP Sched B or C or equivalent agreement

Excess capacity dedicated to CAISO

Securing firm capacity and energy from specified resources

WSPP Agreement Service Schedules:

- **Schedule A-** details Economy Energy Service. The energy is subject to interruption upon notification.
  - Not suitable for RA; OK for energy hedging

- **Schedule B-** details Unit Commitment Service which is a sale from a specified unit. Other than through force majeure, Unit Commitment Service may be curtailed based upon mutually agreed to recall provisions. Stipulated damages provision applies to failure to deliver or receive power.
  - OK for RA contracts that are unit specific, not aggregate resources or BAA system resources

Securing firm capacity and energy from specified resources

WSPP Agreement Service Schedules:

✓ • **Schedule C-** firm sales or exchange service. Like Service Schedule B, the Firm capacity is deemed a capacity sale from the Seller's resources and backed by the Seller's capacity reserves. Firm service may be curtailed within mutually agreed to recall times, due to force majeure, or to meet public utility or statutory obligations. If seller interrupts, it will pay damages consistent with the terms of the WSPP Agreement.

  – Schedule C OK for RA imports; apply to RA contracts for aggregate or BAA system resources. Key provision is it's a sale backed by the seller's capacity reserves

? • What other equivalent contracts with comparable provisions are out there that we can include as default eligible contracts?

Resource aggregation across BAAs

Morgan Stanley stated:

- The definition of non-dynamic resource specific resources should include specified pool of resources in multiple BAAs.
- Much better risk management to have a diverse set of suppliers and the rules should be designed to encourage competition.

CAISO response:

- Under CAISO Full Network Model Phase 2 and EDAM, BAA generation will be modeled at generation nodes, not as import/export transactions at BAA interties
- Prices derived at each BAA in network model
- Transmission must be procured for an external resource to count toward a BAA's resource sufficiency evaluation
- EDAM transactions can be individual or system resources which impact that BAA's resource sufficiency evaluation
- Transactions must be at each BAA, not aggregated across BAAs

Delivery Assurance

Stakeholder comments on delivery assurance

BPA:

- Believes firm PTP source to sink is necessary
- ✓ Upstream network flows can be constrained, not just AC or DC

Brookfield:

- Opposes firm source to sink; supports alternative option
- ✓ Southwest is challenging given firm not released until after native load need is assessed and then transmission released

CalCCA

- Opposes firm PTP source to sink
- If significant derates, both firm and non-firm transmission will be cut and the remaining transmission is likely to be fully utilized.

Calpine:

- Supports firm PTP source to sink and early demonstration at time of showing

LS Power

- Support firm PTP source to sink

Stakeholder comments on delivery assurance

Morgan Stanley:

- Source to sink firm will squeeze out competition, reduce diversity of supply, and harm reliability
- Observed transmission queue flooding with long term requests
- ✓ Firm Transmission is sold point to point; challenge with multi-sources
- ✓ Not requiring source to sink firm will remove the incentive for competitors to hoard transmission in the first place.
- Support alternative proposal; include historic flowgate data to support last leg proposal

PG&E

- Opposes firm PTP source to sink

Powerex:

- Must identify physical resources and have firm PTP;
  - Opposes alternative option
- ✓ CAISO BAA needs to demonstrate available and deliverable capacity to participate in EDAM
- ✓ Specific POD and POR contract paths not as relevant on BPA network given firm re-directs based on flowgate flows
- ✓ New firm rights are available (600 MW in 2019), current rights are expiring, active secondary market, and enter long-term service queue

Stakeholder comments on delivery assurance

NRG:

- Supports firm PTP source to sink

SCE:

- Opposes firm source to sink; more stringent than current requirement

✓ Market power of transmission service

SDGE:

- Opposes firm transmission requirement

✓ Can't lock down every possible path as firm transmission

- Only apply to SCs that fail to deliver

Six Cities:

- Supports conceptual RA import elements; backed by physical capacity and OK with firm transmission

SMUD:

- Opposes firm source to sink; more stringent than current requirement

✓ No supporting data to demonstrate need for firm transmission

- Requiring firm transmission my exclude viable RA suppliers; market power concerns

✓ ATC is set; get what you get; how much firm is for wheel-throughs?

Open Access Transmission Tariffs and Market Power

- Transmission market power is addressed in the context of OATT provisions and market based rate sales authorizations as approved by FERC
- FERC is the proper authority to raise concerns if there is evidence of misconduct or exercise of market power under a transmission service provider's OATT
- A firm transmission requirement for RA imports is precedential and consistent with the practices of other ISOs and RTOs

BPA workshop slide on system curtailments

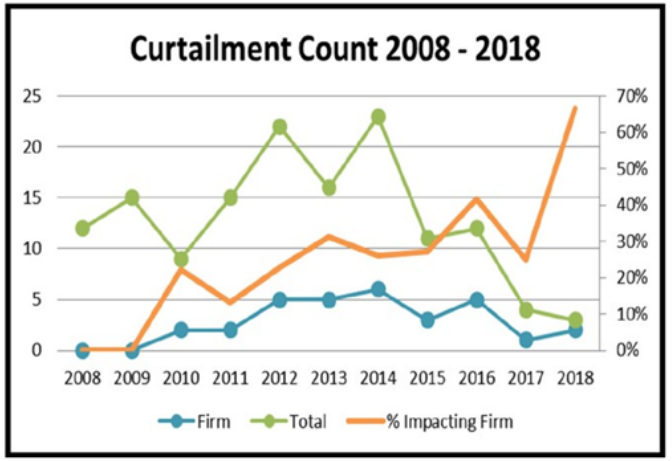
SMUD states “[t]his slide is from a BPA presentation in its TC-20 proceeding workshop on 8/21/18 which shows fewer than 5 curtailments across the entire BPA system in a single year.”*

BONNEVILLE POWER ADMINISTRATION

Reliable System Operations/Curtailment Priority

More Reasons for Concern

- The total number of curtailments are decreasing. However, the I-5 no build decision is a leading indicator that we will not be able to build our way out of congestion so the decreasing trend is likely to reverse as system utilization increases.
- The % of curtailments impacting firm and the amount of firm as a % of the total cut in each event has been on the rise since 2009.
- Removal of Hourly Firm from our product portfolio will be the most effective in enabling curtailment priority to function as intended and to provide clear congestion signals (if everyone is firm, no one is firm).



Graphic and quote taken from SMUD’s comments to 5th Revised RAE straw proposal

NERC Transmission Reservation Priorities

NERC Transmission Service Reservation Priorities		
Priority	**Acronym**	**Name**
0	NX	Next-hour Market Service
1	NS	Service over secondary receipt and delivery points
2	NH	Hourly Service
3	ND	Daily Service
4	NW	Weekly Service
5	NM	Monthly Service
6	NN	Network Integration Transmission Service from sources not designated as network resources
7	F	Firm Point-to-Point Transmission
	FN	Network Integration Transmission Service from Designated Resources

https://www.nerc.com/pa/rrm/TLR/Pages/Transmission-Service-Reservation-Priorities-.aspx

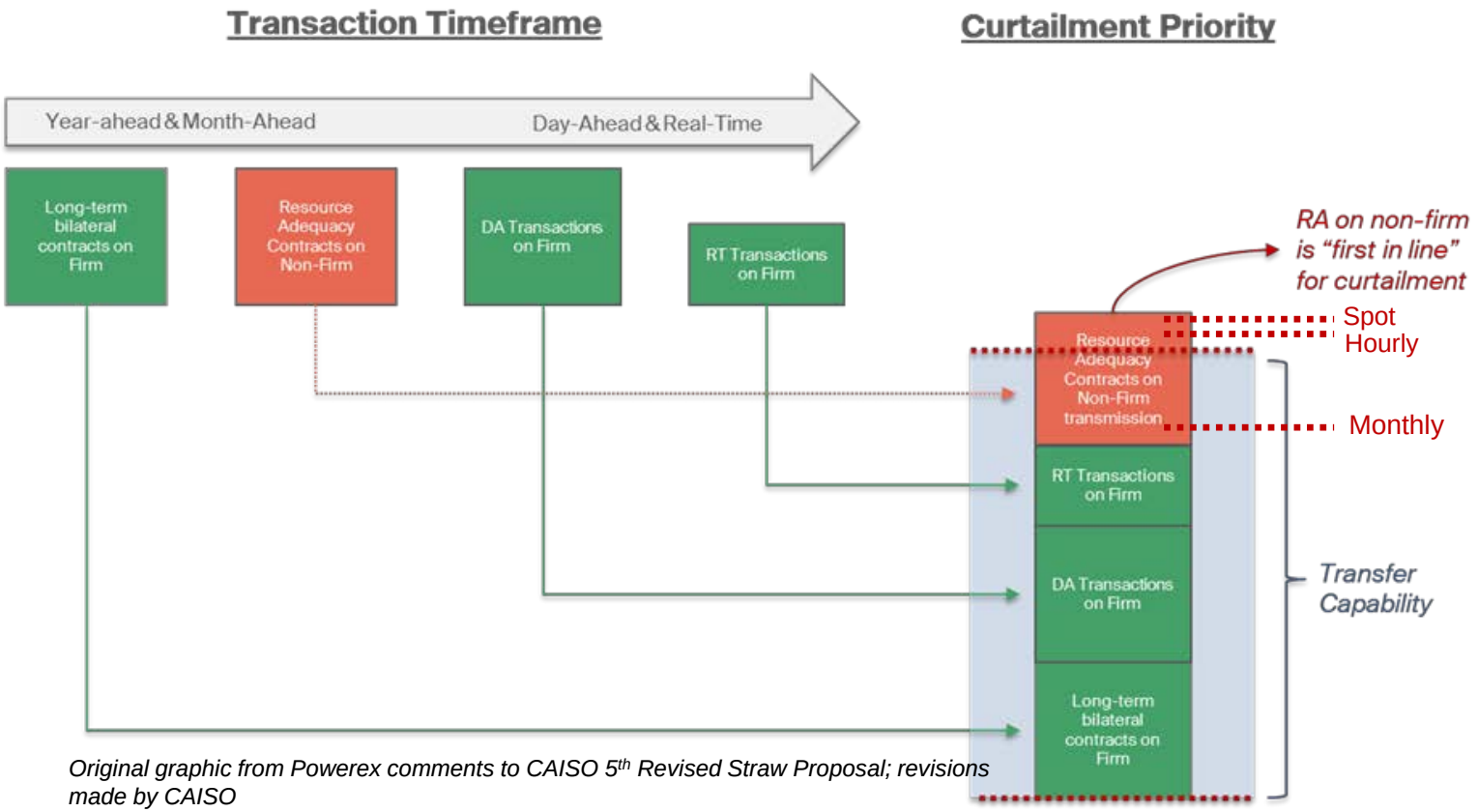
Transmission Service Requirement:

- ✓ Preferred Priority: 7-F Firm PTP across entire path
- ✓ Minimum: 7-F PTP on last leg and 5-MN PTP on all other intervening lines of interest

Non-firm transmission can put the delivery of RA imports in jeopardy

- Non-firm transmission service can be interrupted or curtailed for:
  1. A request for firm transmission service
  2. A request for non-firm transmission service of greater duration
  3. A request for non-firm transmission service of equal duration with a higher price
  4. Transmission service for network customers from non-designated resources, or
  5. Transmission service for firm transmission service during conditional curtailment periods
- Non-firm provides no assurance of delivery, especially in periods when the west is tight on supply; compete with wheel-throughs on firm transmission
- Neither resource specificity nor an energy contract resolves the potential for non-delivery if non-firm

Portraying Curtailment Priority



Original graphic from Powerex comments to CAISO 5th Revised Straw Proposal; revisions made by CAISO

Delivery assurance: High priority transmission service to ensure firm energy is delivered to the CAISO

Preferred Option:

- Require firm transmission service point-to-point (PTP) source to sink
  - Firm (7-F) PTP transmission service across entire path
  - Eligible to procure firm service intra-RA compliance month

Transmission Service	Priority	Reservation Window
Firm yearly PTP	7	10 years to 60 days before flow month
Short-term firm monthly PTP	7	365 days before delivery up to 20 min prior to flow
Short-term firm weekly PTP	7	14 days before delivery up to 20 min prior to flow
Short-term firm daily PTP	7	7 days before delivery up to 20 min prior to flow

https://www.bpa.gov/transmission/Doing%20Business/bp/tbp/Requesting-Transmission-Service-BP-V38.pdf

- Must demonstrate firm service PTP on E-tag
- No UCAP evaluation for firm transmission service cut

Delivery assurance: High priority transmission service to ensure firm energy is delivered to the CAISO (cont'd)

Alternative Option:

- Firm service on last leg and monthly non-frim service on all other intervening lines of interest
  - Non-firm monthly service (5-NM) on all lines but last leg to CAISO BAA, which must be firm (7-F) PTP
  - Monthly service (5-MN) PTP appropriately aligns with monthly RA planning construct and better assures delivery over spot market and lower priority service

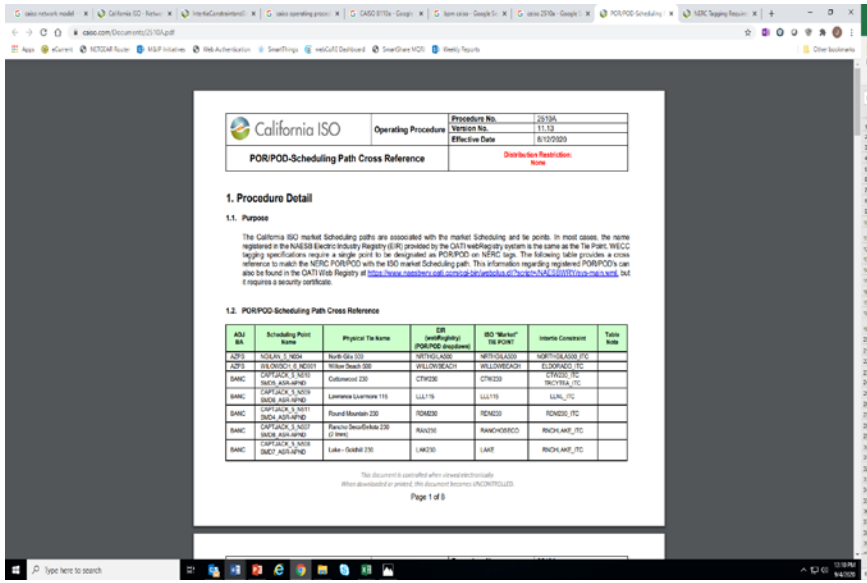
Transmission Service	Priority	Reservation Window
Short-term non-firm monthly PTP	5	60 days before delivery up to 20 min prior to flow

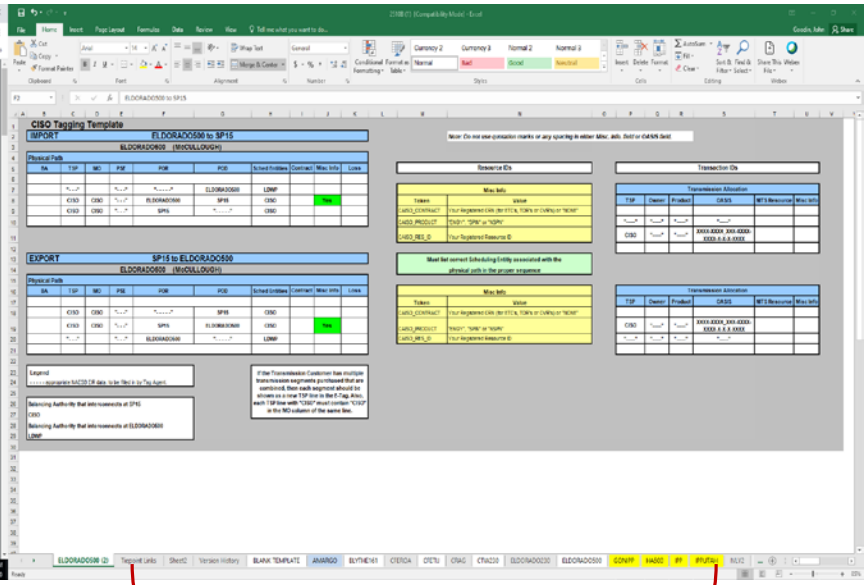
https://www.bpa.gov/transmission/Doing%20Business/bp/tbp/Requesting-Transmission-Service-BP-V38.pdf

- Risk UCAP evaluation if transmission service curtailed

Identifying the last lines of interest

- Reference Operating Procedures 8110A and 8110B





Tabular form of last lines of interest

Tabs show all last lines of interest in E-tag format

Identifying transmission service reservation type in E-tag

- The E-Tag is the tool used to track energy delivery from one from one BAA to another from the source to the sink
- The responsible SC/Purchasing-Selling Entity must submit an E-Tag to physically schedule energy or capacity delivery.
- Note special E-tag rules for dynamic resource-specific and pseudo tie resources
- Will use E-tag to validate compliance with transmission service reservation priority for RA imports

CISO Tagging Template:

List transmission service type

- Firm (7-F)
- Non-firm (5-MN)

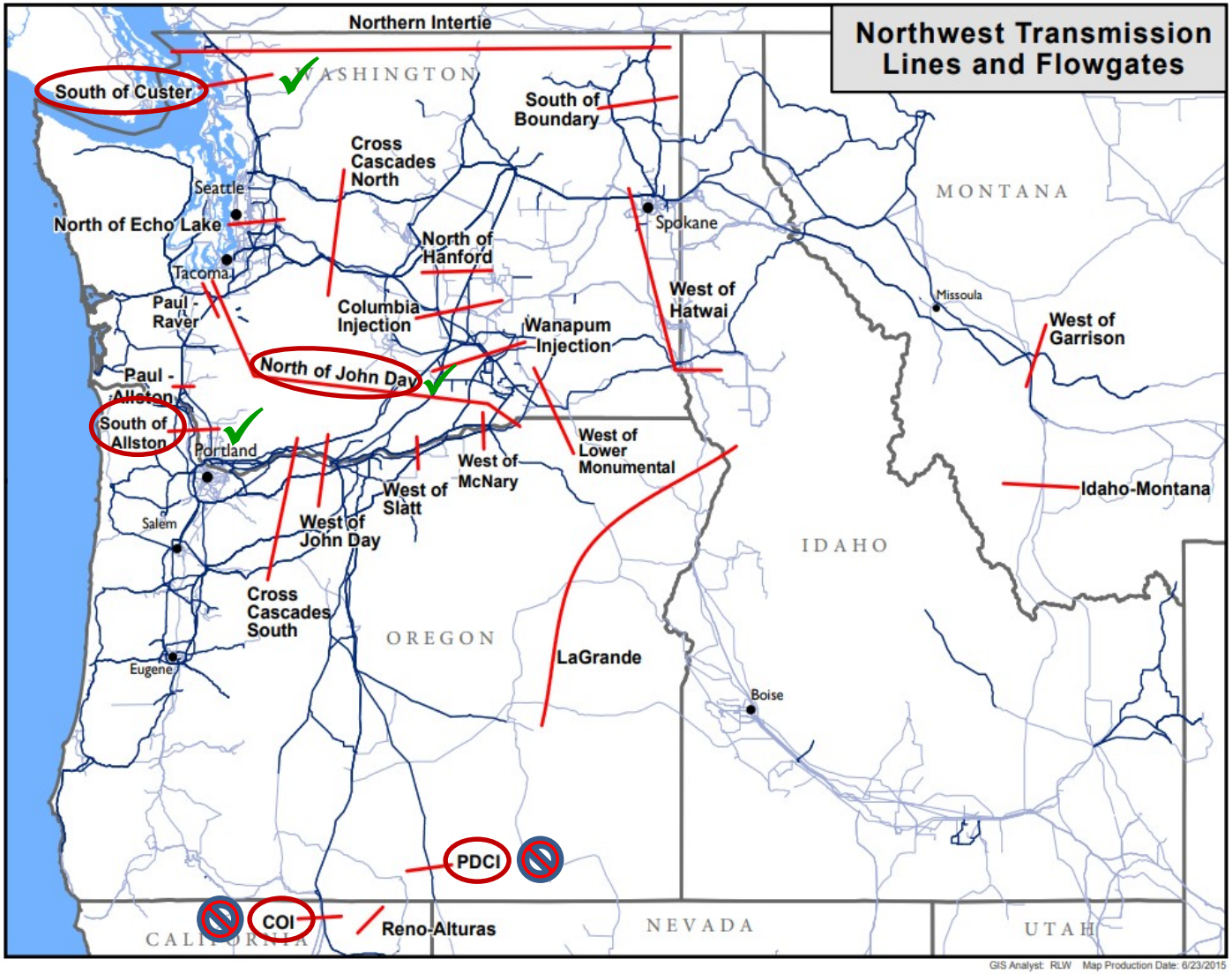
Transmission Allocation					
TSP	Owner	Product	OASIS	NITS Resource	Misc Info
CISO	"-----"	"-----"	XXXX-XXXX_XXX-XXXX-XXXX-X-X-X-XXXX		
"-----"	"-----"	"-----"	"-----"		

Proposed E-tag timing requirements for RA Imports

- RA program is a monthly construct with showings due at T-45 days before the RA compliance month
- All RA import resources have a day-ahead MOO and should be firmed-up prior to DA market opening
  - Allows unscheduled imports to be sold off as non-firm DA
- Proposed RA import tagging timelines:
  - Firm (7-F): before 10 AM day-ahead market opening
  - Non-firm (5-NM): by T-45 days aligned with showings

Delivery Assurance:
Transmission Availability

Northwest Transmission Lines and Flowgates



Aug 2020 Heat Wave:

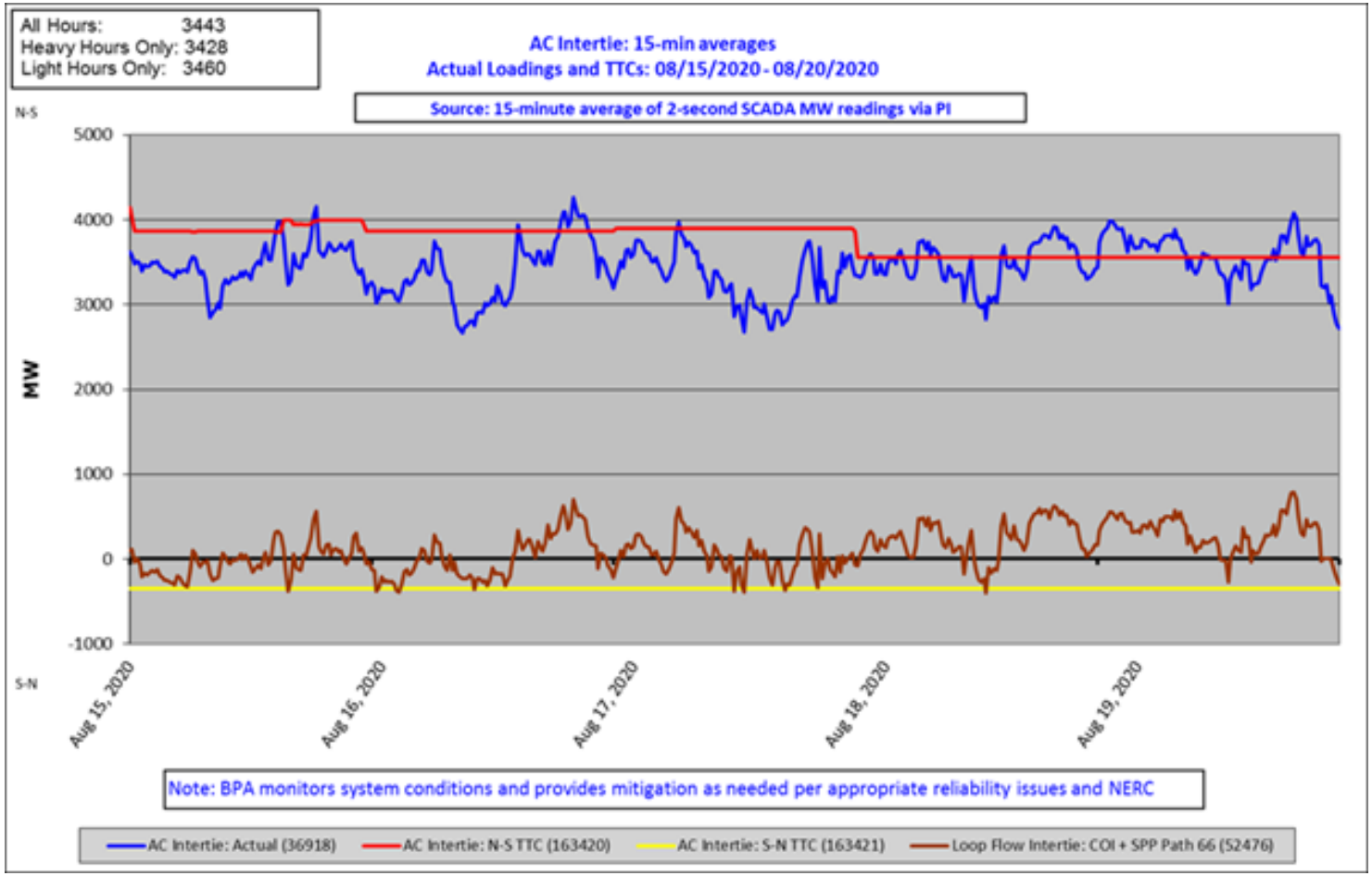
Limited available transfer capability

✓ Available transfer capability

BPA manages 18 internal network flowgates in addition to its external interties

California-Oregon Interface (AC intertie)

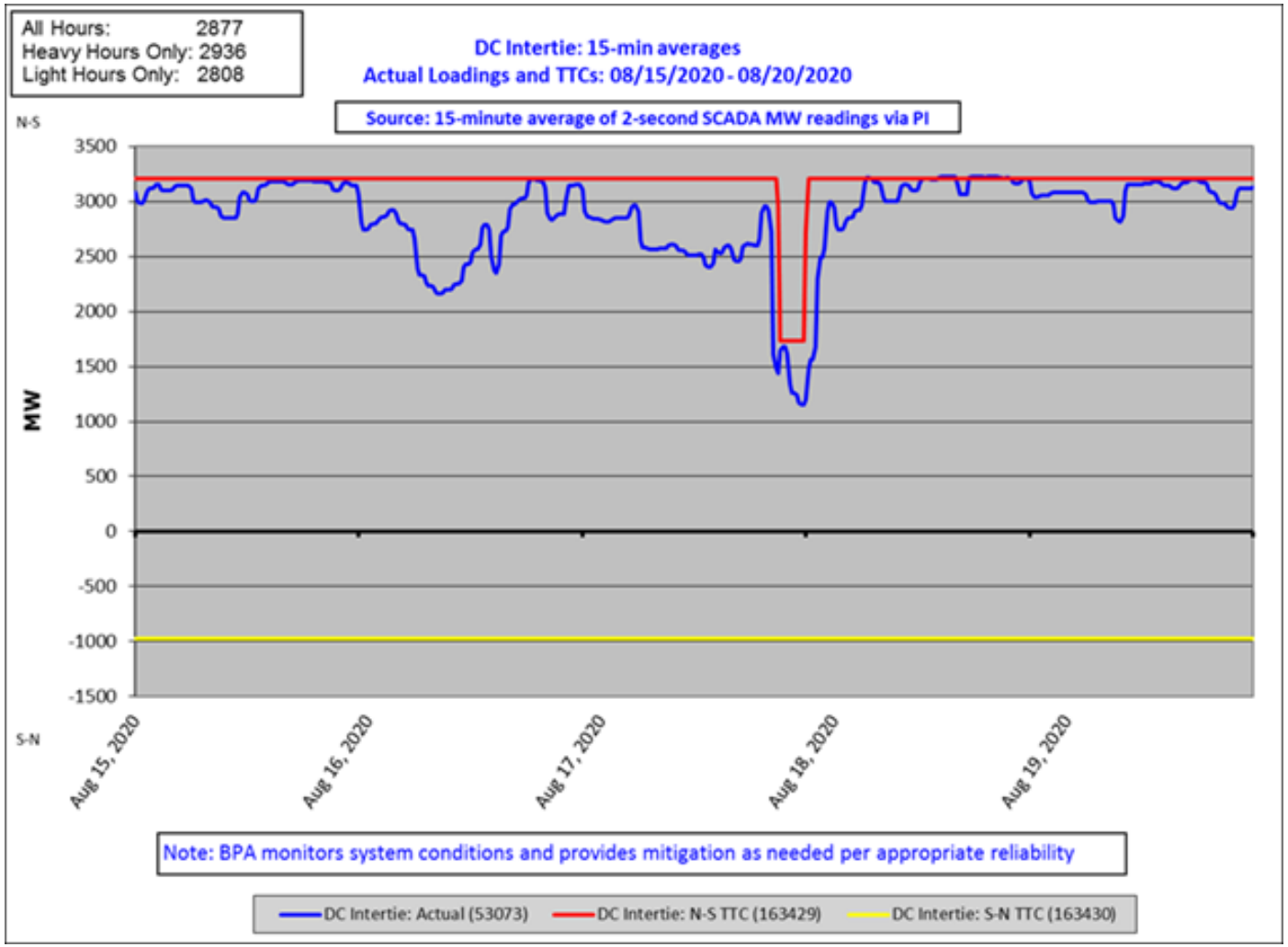
Courtesy of Morgan Stanley



Underlying 15-min interval data averaged into hourly values from BPA website, found here: https://transmission.bpa.gov/Business/Operations/Paths/

Nevada – Oregon Border (NOB or DC Intertie)

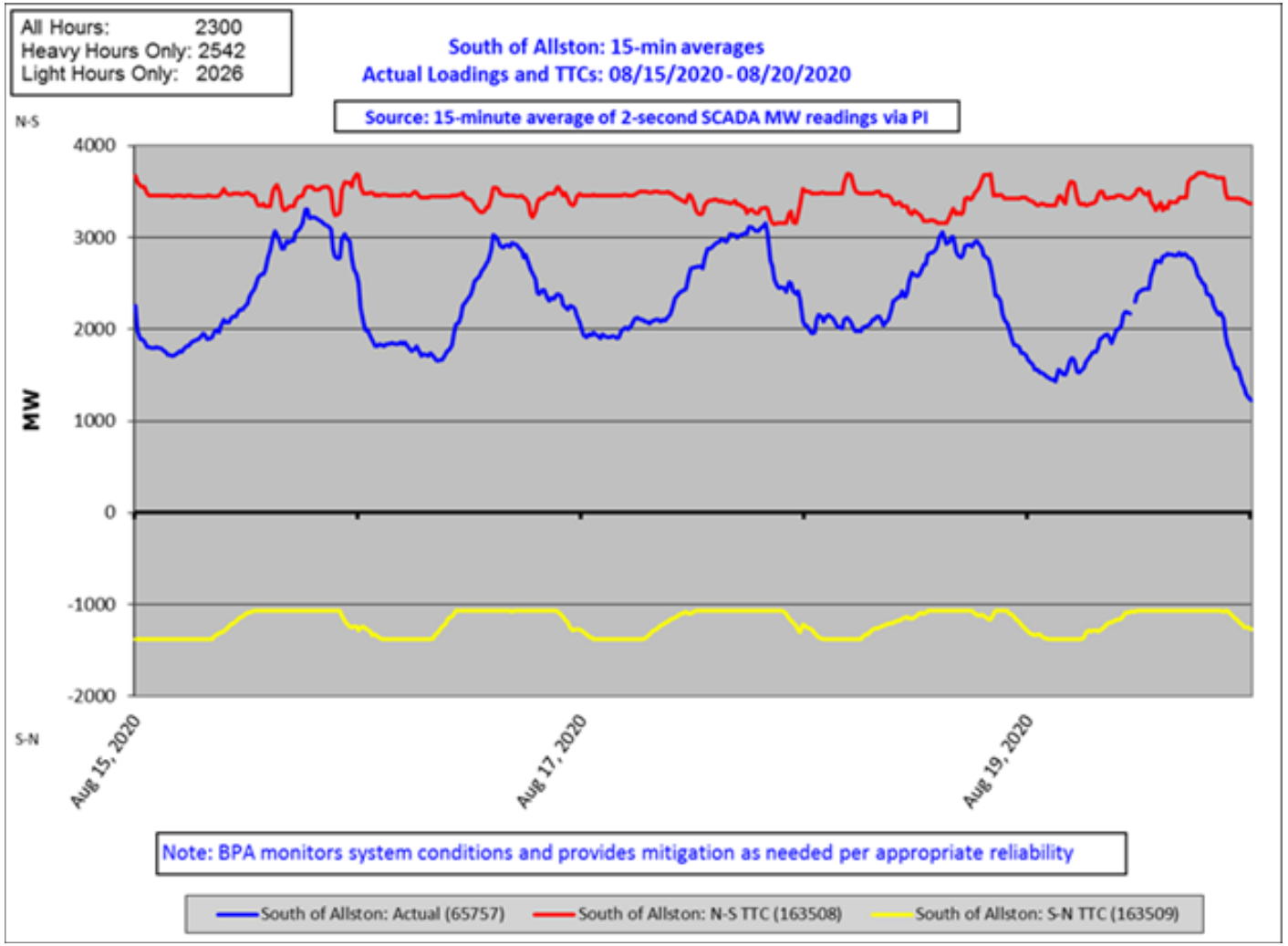
Courtesy of Morgan Stanley



Underlying 15-min interval data averaged into hourly values from BPA website, found here: https://transmission.bpa.gov/Business/Operations/Paths/

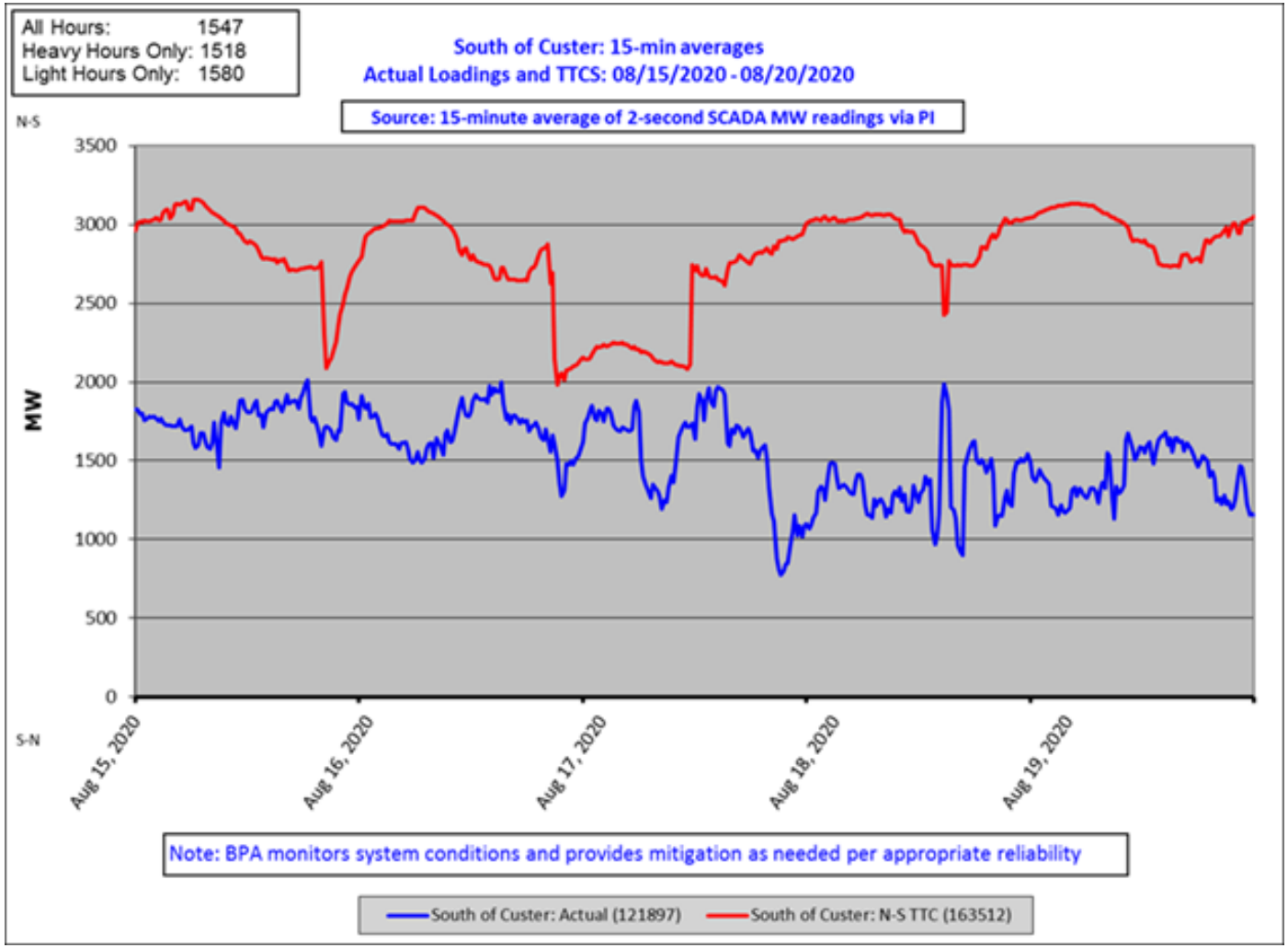
South of Allston Flowgate

Courtesy of Morgan Stanley



Underlying 15-min interval data averaged into hourly values from BPA website, found here: https://transmission.bpa.gov/Business/Operations/Paths/

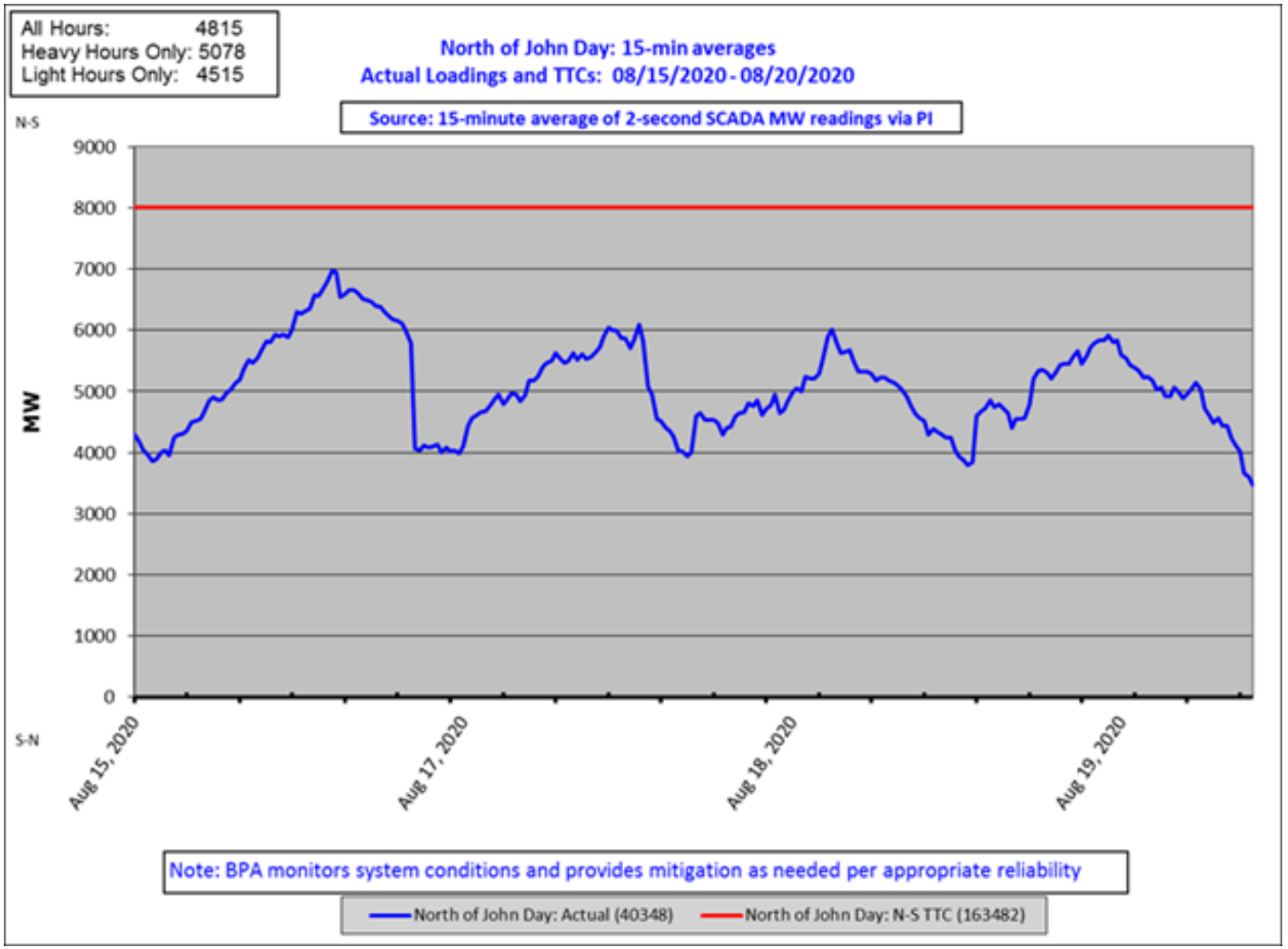
South of Custer Flowgate (Northern Intertie/Puget Sound Area) *Courtesy of Morgan Stanley*



Underlying 15-min interval data averaged into hourly values from BPA website, found here: https://transmission.bpa.gov/Business/Operations/Paths/

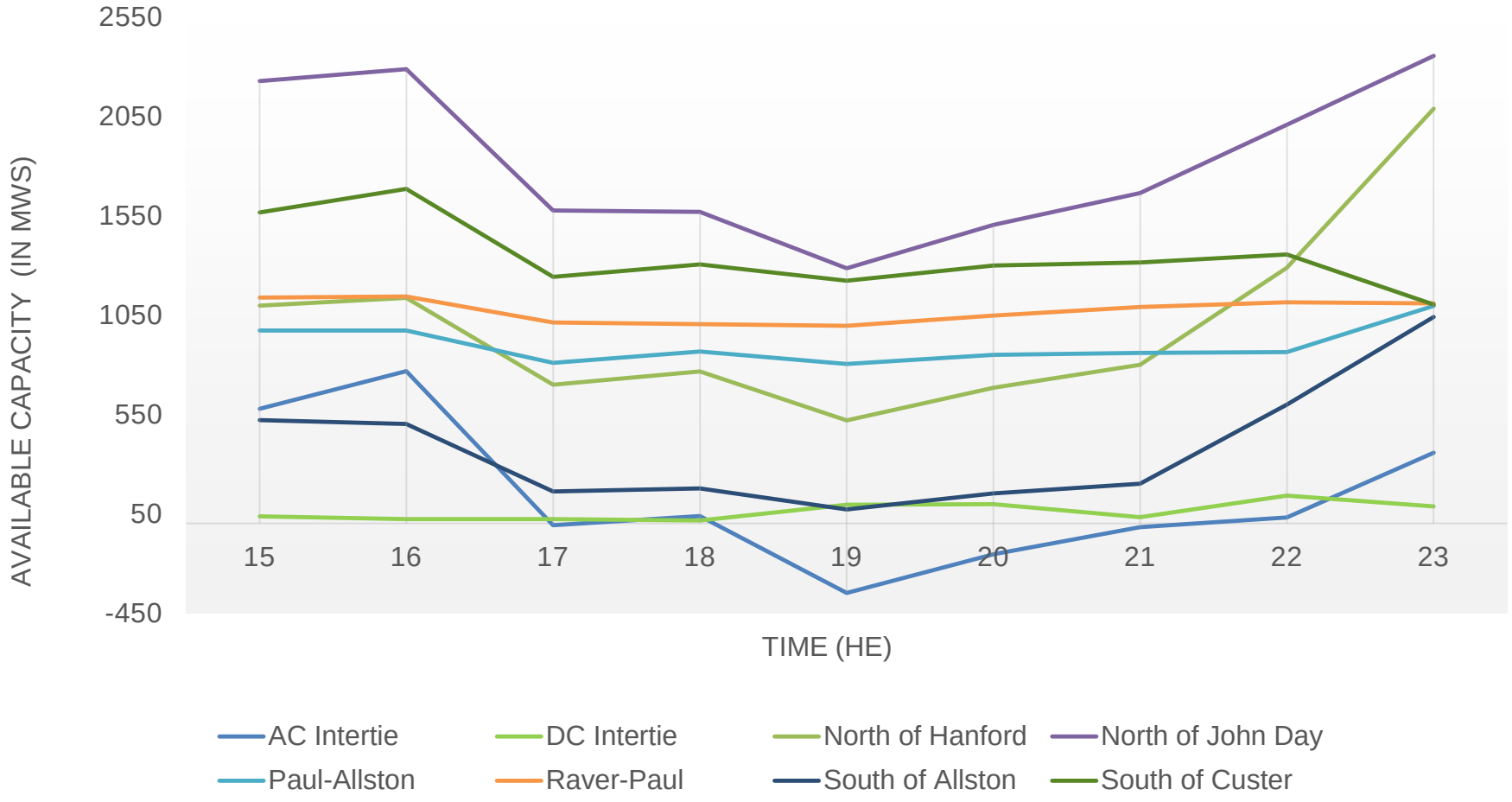
North of John Day Flowgate

Courtesy of Morgan Stanley

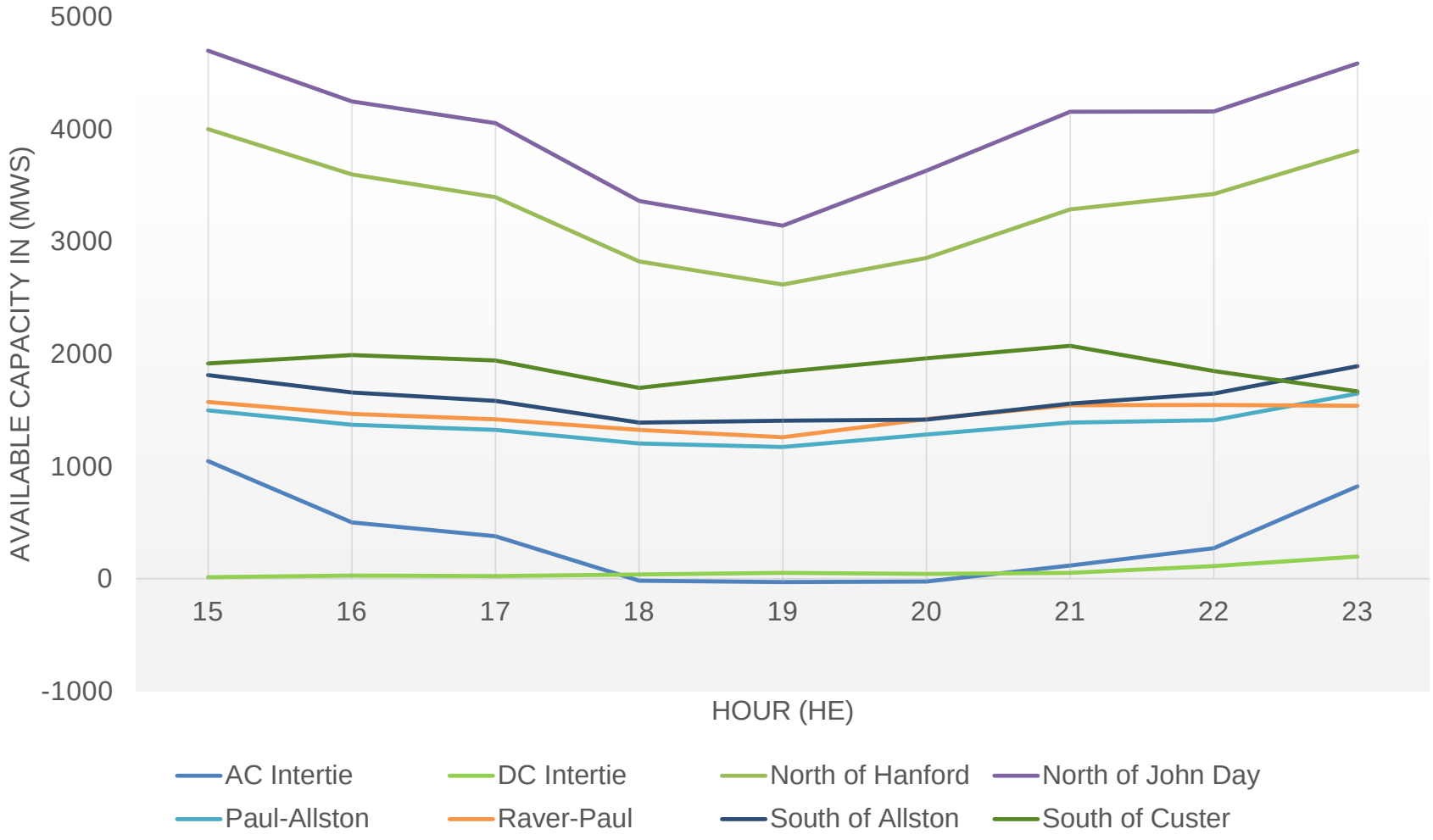


Underlying 15-min interval data averaged into hourly values from BPA website, found here: https://transmission.bpa.gov/Business/Operations/Paths/

8/14/2020 Average Hourly Availability: How much transmission capacity remains

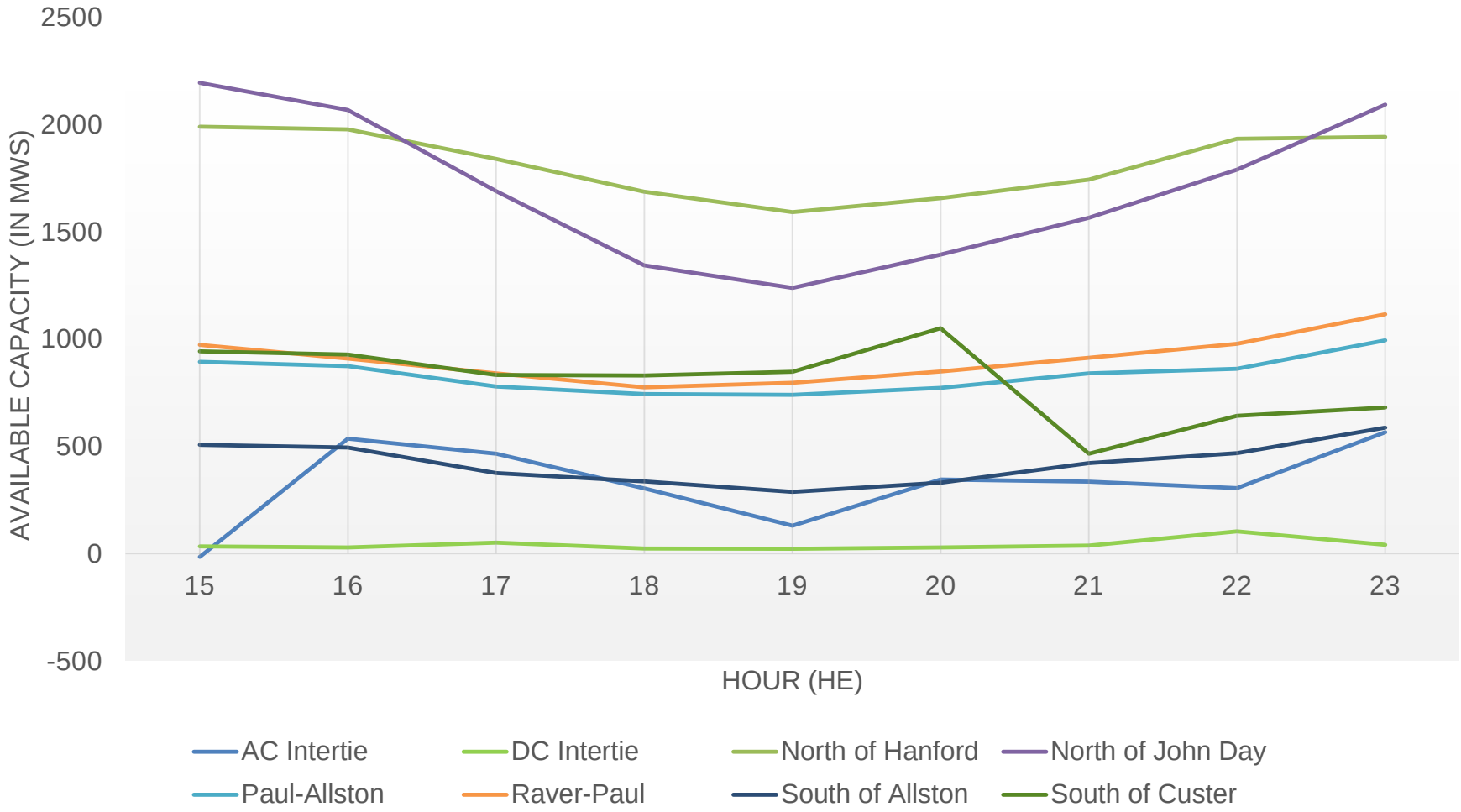


9/5/2020 Average Hourly Availability: How much transmission capacity remains?

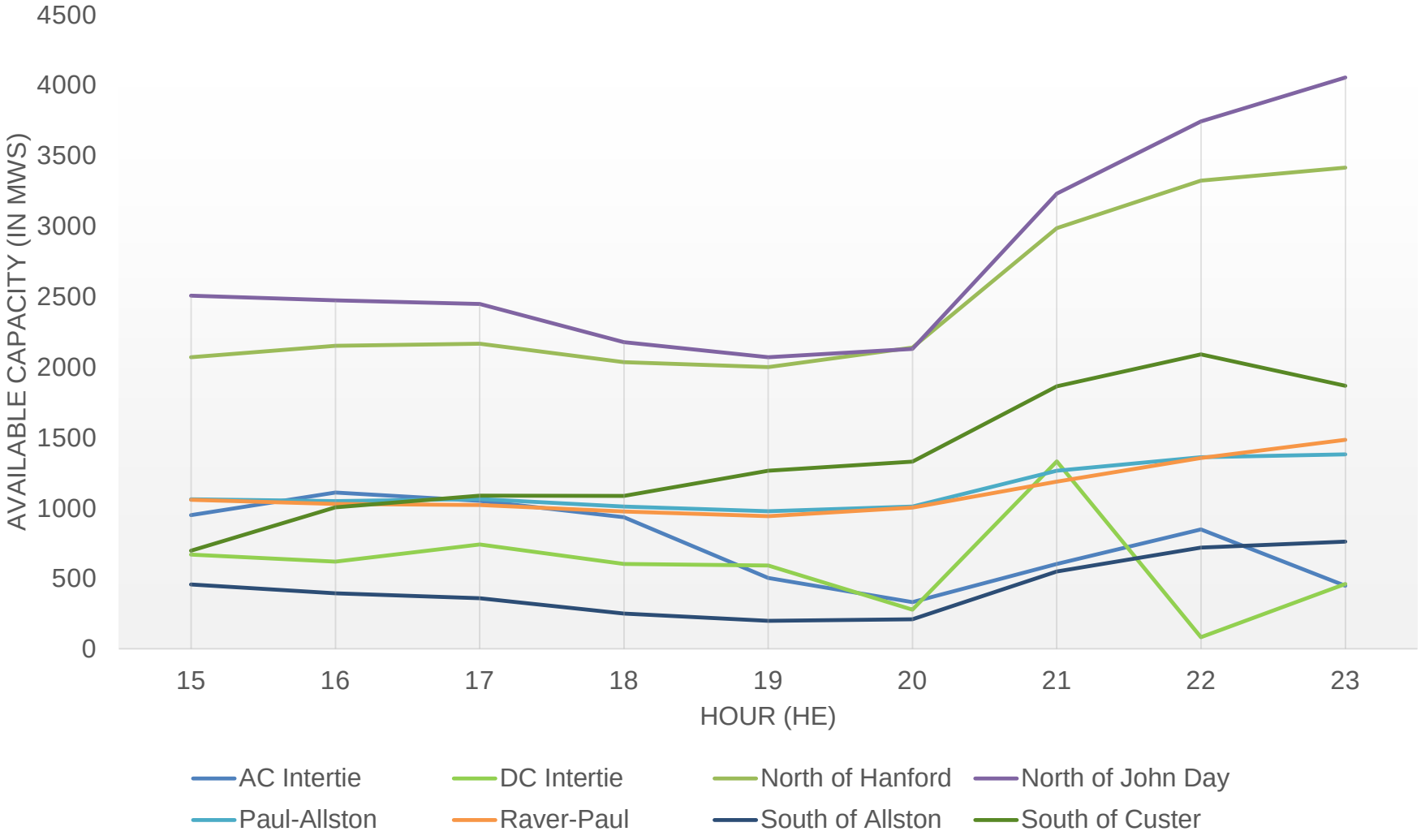


Delivery Assurance: Transmission Availability (Appendix)

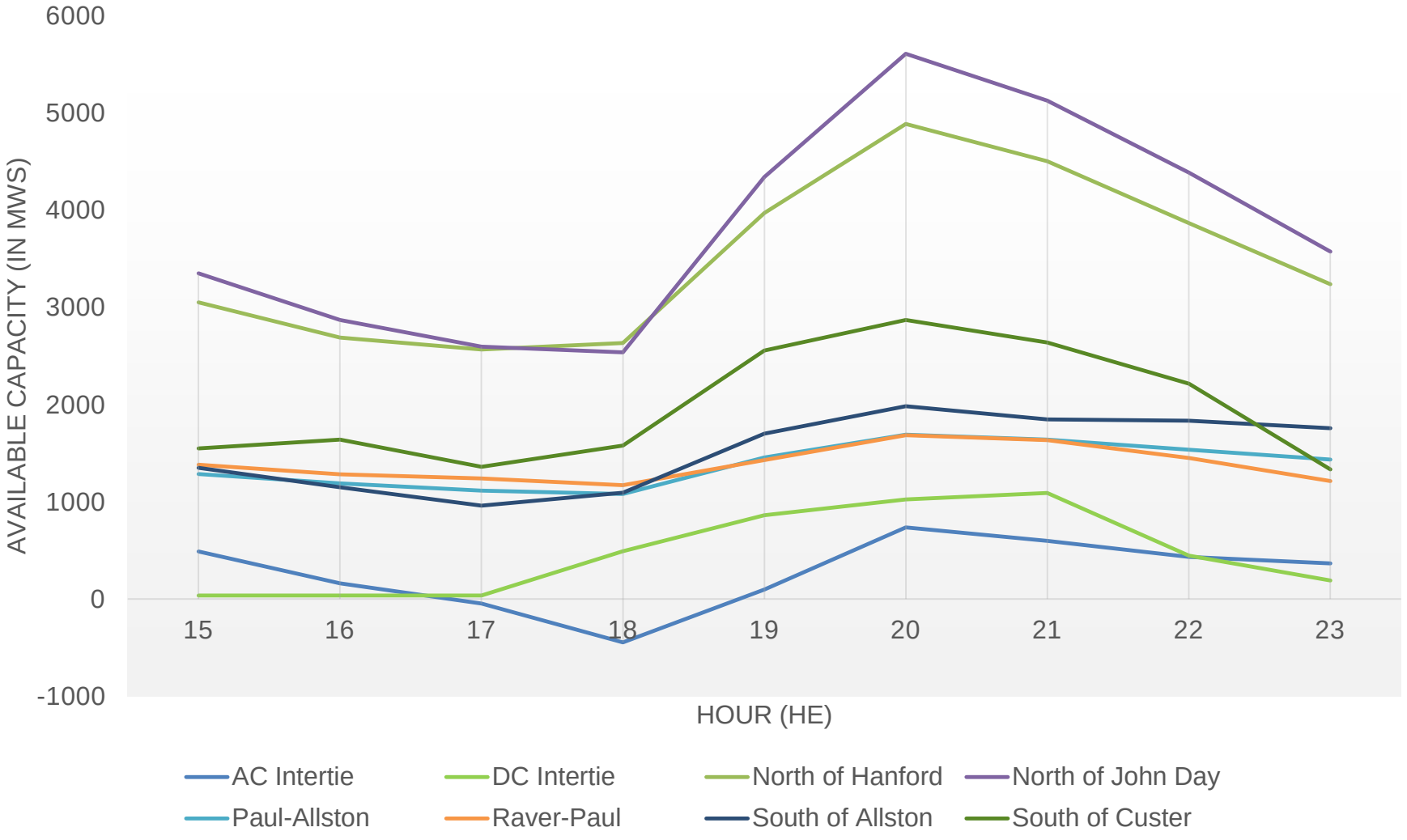
8/15/2020 Average Hourly Availability: How much transmission capacity remains?

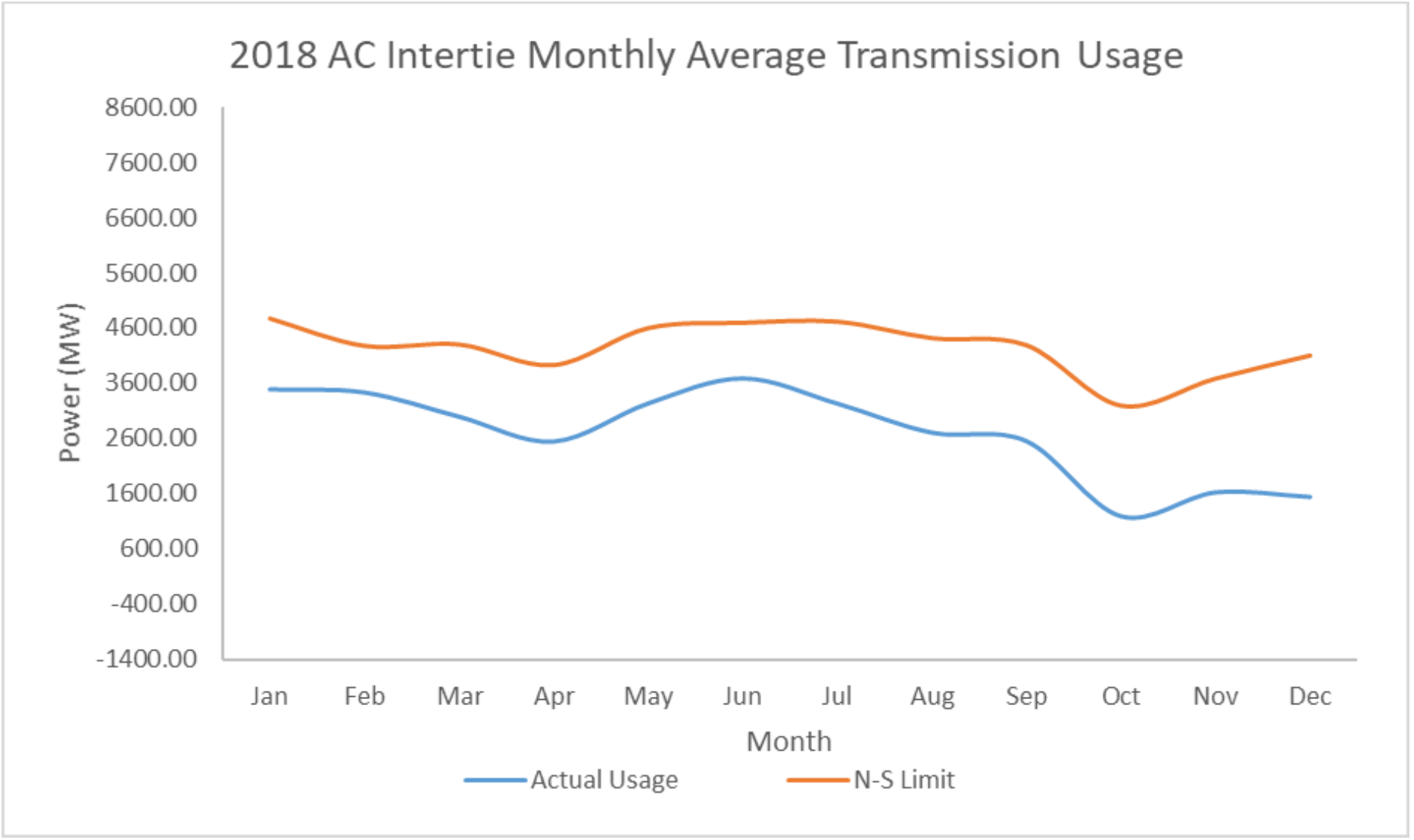


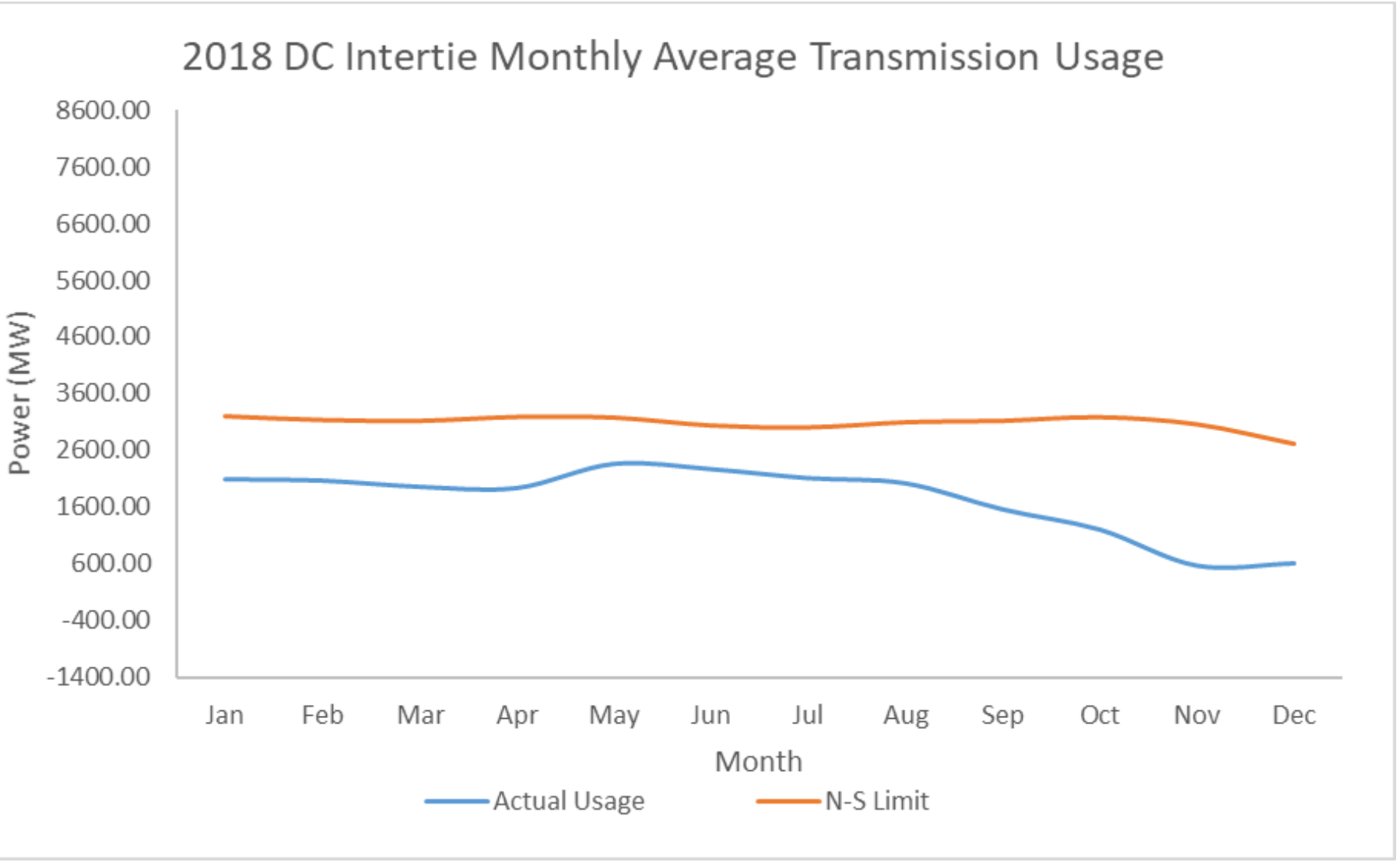
8/17/2020 Average Hourly Availability: How much transmission capacity remains?



9/6/2020 Average Hourly Availability- How much transmission capacity remains?




2018 AC Intertie Monthly Average Transmission Usage
8600.00
7600.00
6600.00
5600.00
4600.00
3600.00
2600.00
1600.00
600.00
-400.00
-1400.00
Power (MW)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
Actual Usage
N-S Limit


2018 DC Intertie Monthly Average Transmission Usage
8600.00
7600.00
6600.00
5600.00
4600.00
3600.00
2600.00
1600.00
600.00
-400.00
-1400.00
Power (MW)
Jan
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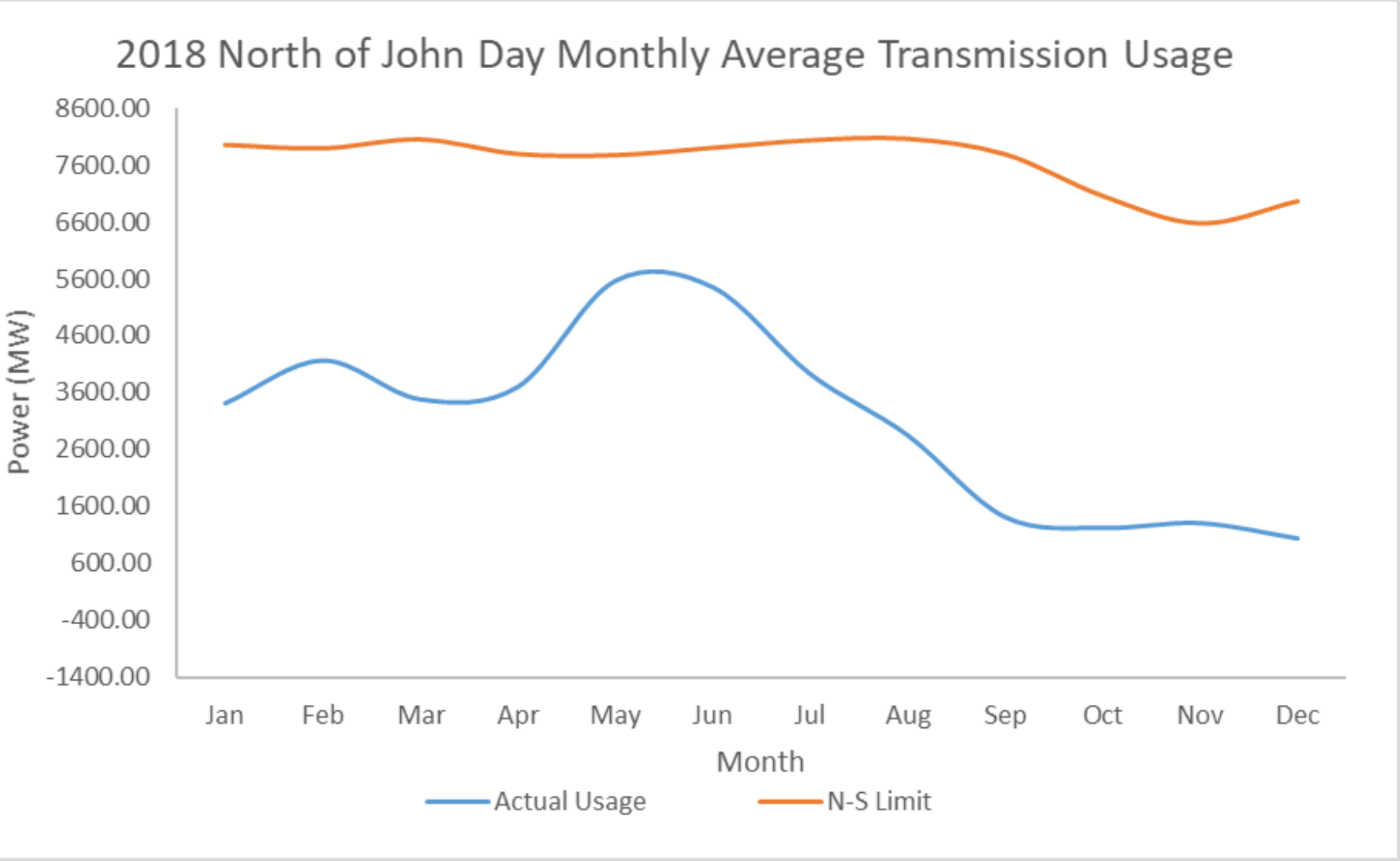
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
Actual Usage
N-S Limit


2018 North of John Day Monthly Average Transmission Usage
8600.00
7600.00
6600.00
5600.00
4600.00
3600.00
2600.00
1600.00
600.00
-400.00
-1400.00
Power (MW)
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Feb
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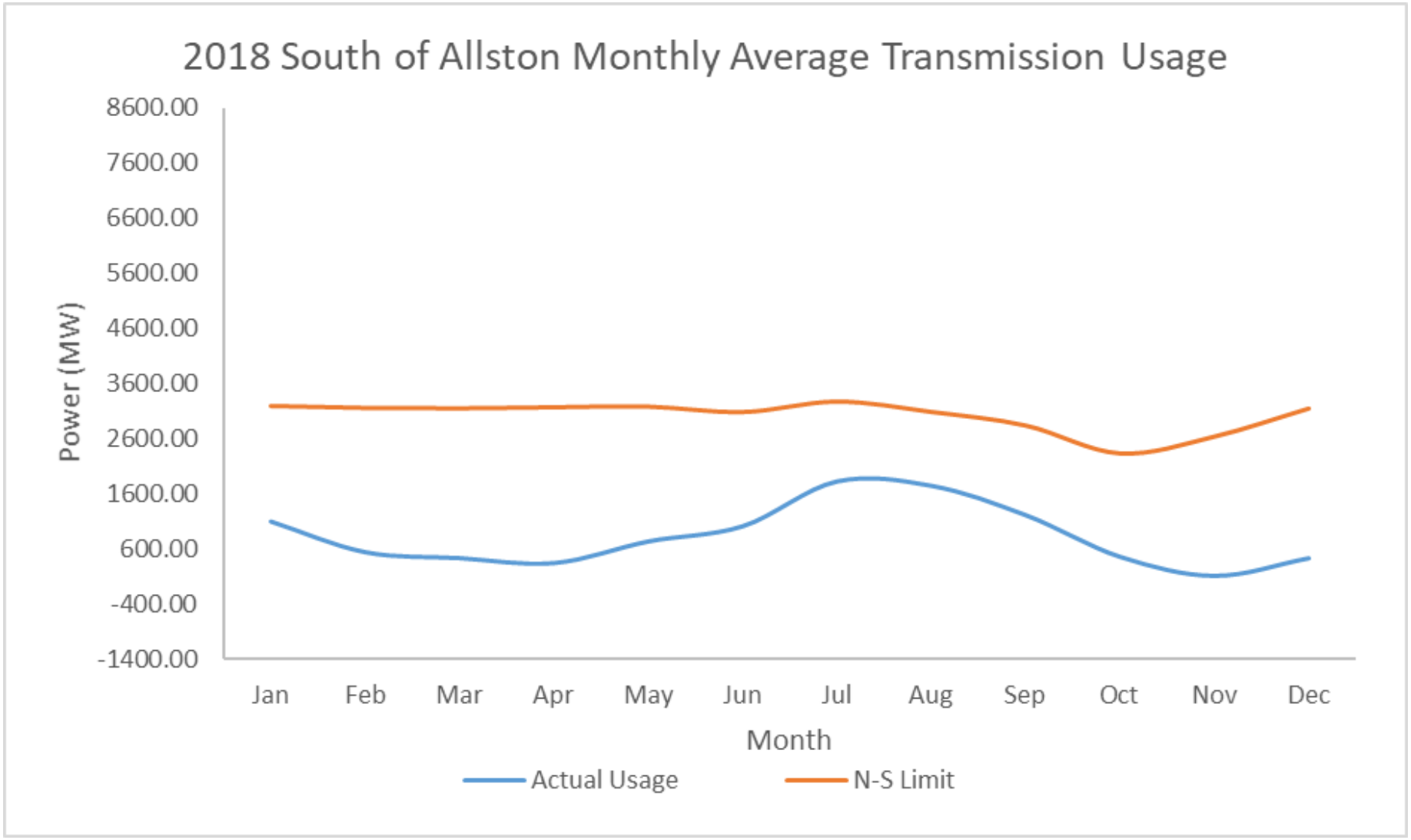
Oct
Nov
Dec
Month
Actual Usage
N-S Limit


2018 South of Allston Monthly Average Transmission Usage
8600.00
7600.00
6600.00
5600.00
4600.00
3600.00
2600.00
1600.00
600.00
-400.00
-1400.00
Power (MW)
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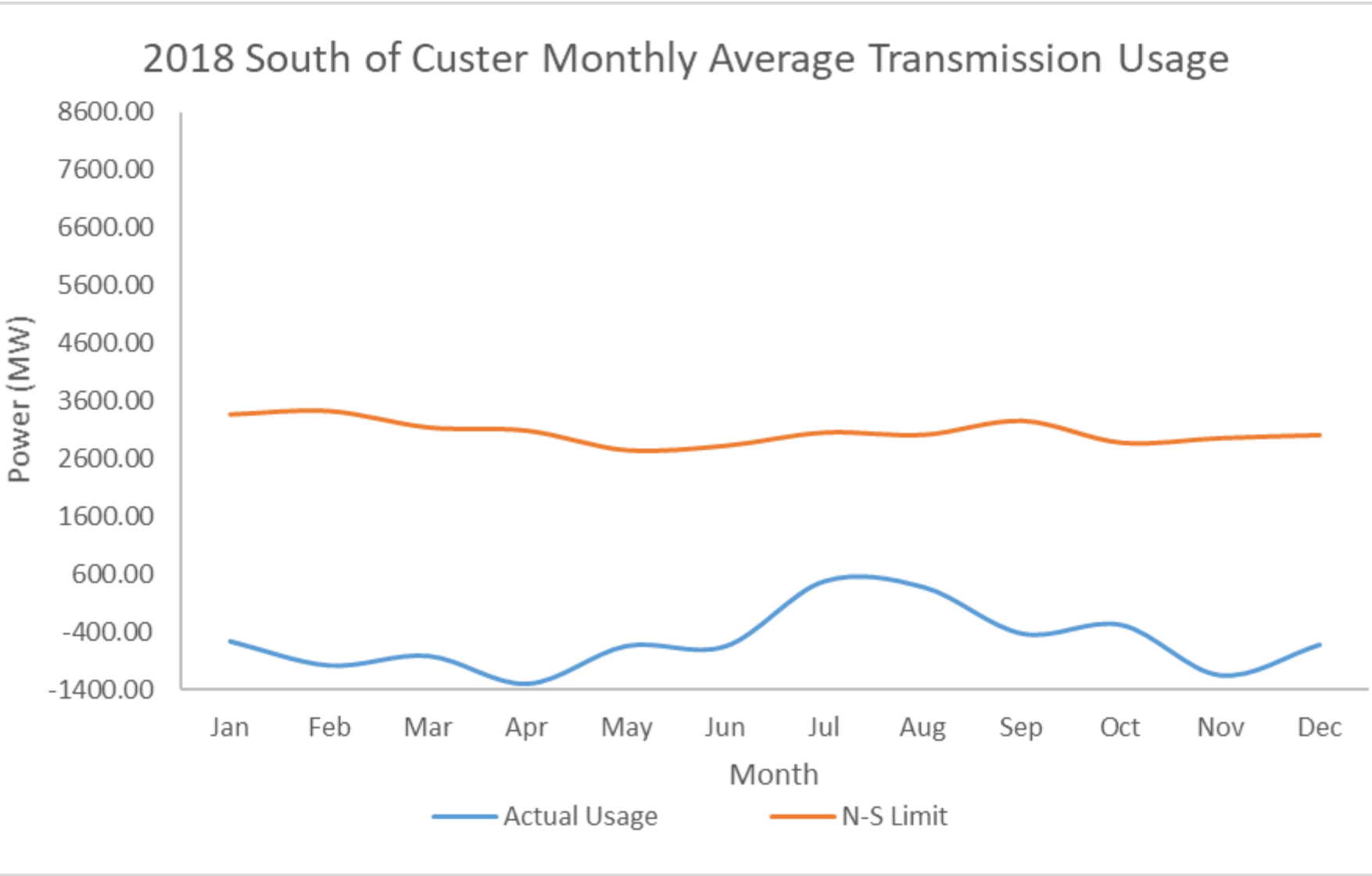
Month
Actual Usage
N-S Limit


2018 South of Custer Monthly Average Transmission Usage
8600.00
7600.00
6600.00
5600.00
4600.00
3600.00
2600.00
1600.00
600.00
-400.00
-1400.00
Power (MW)
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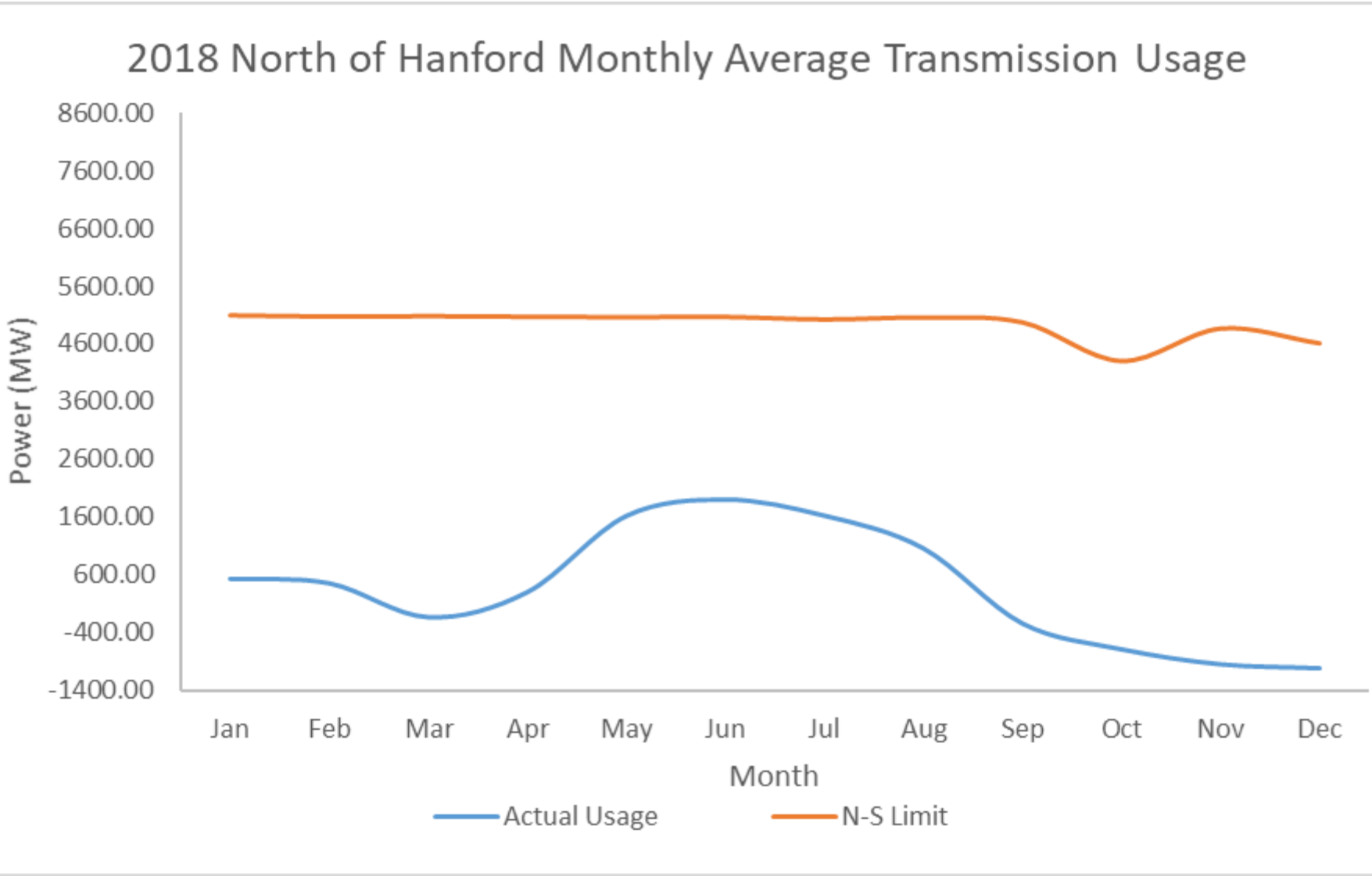
Month
Actual Usage
N-S Limit


2018 North of Hanford Monthly Average Transmission Usage
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7600.00
6600.00
5600.00
4600.00
3600.00
2600.00
1600.00
600.00
-400.00
-1400.00
Power (MW)
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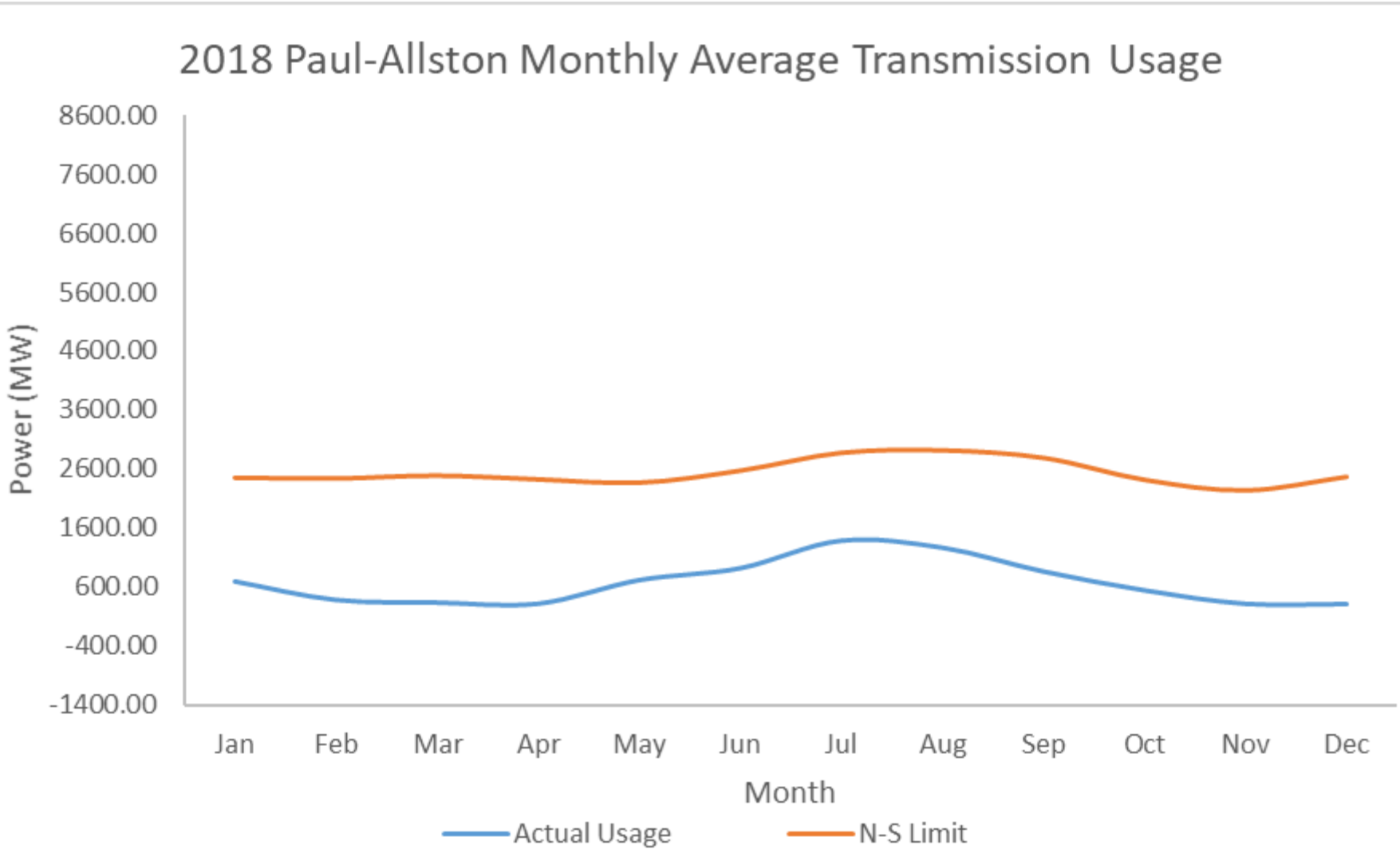
Actual Usage
N-S Limit


2018 Paul-Allston Monthly Average Transmission Usage
8600.00
7600.00
6600.00
5600.00
4600.00
3600.00
2600.00
1600.00
600.00
-400.00
-1400.00
Power (MW)
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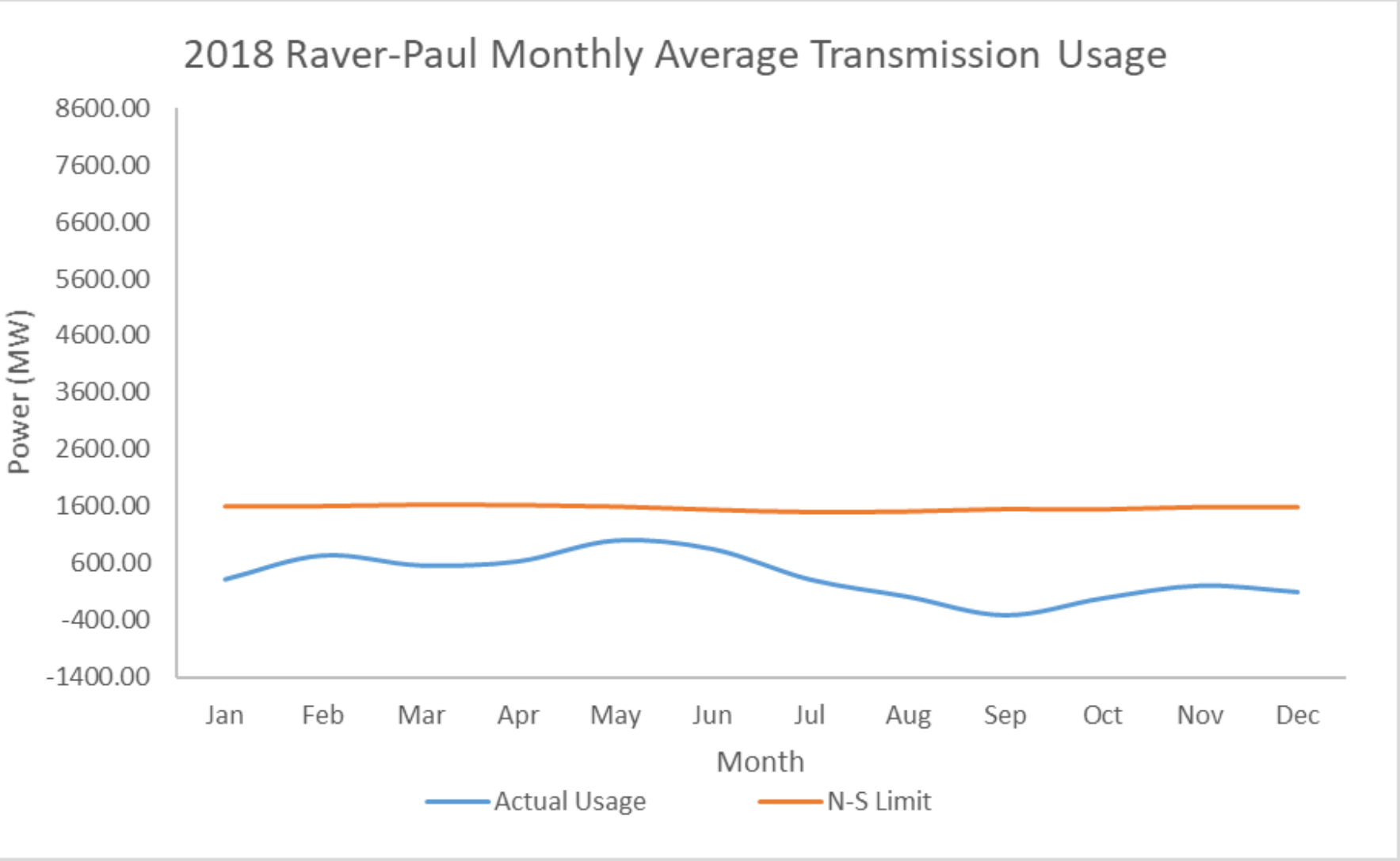
Dec
Month
Actual Usage
N-S Limit


2018 Raver-Paul Monthly Average Transmission Usage
8600.00
7600.00
6600.00
5600.00
4600.00
3600.00
2600.00
1600.00
600.00
-400.00
-1400.00
Power (MW)
Jan
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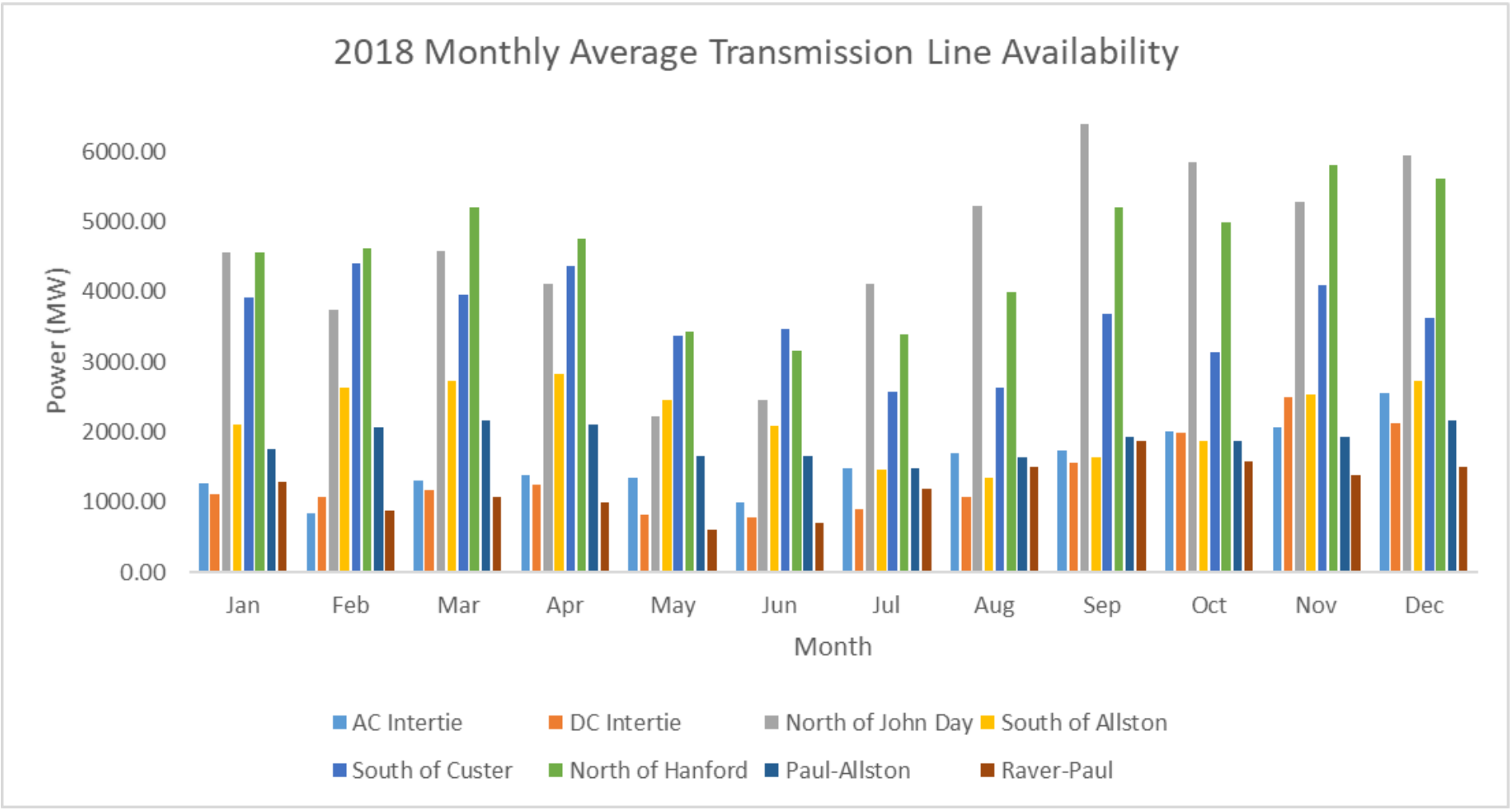
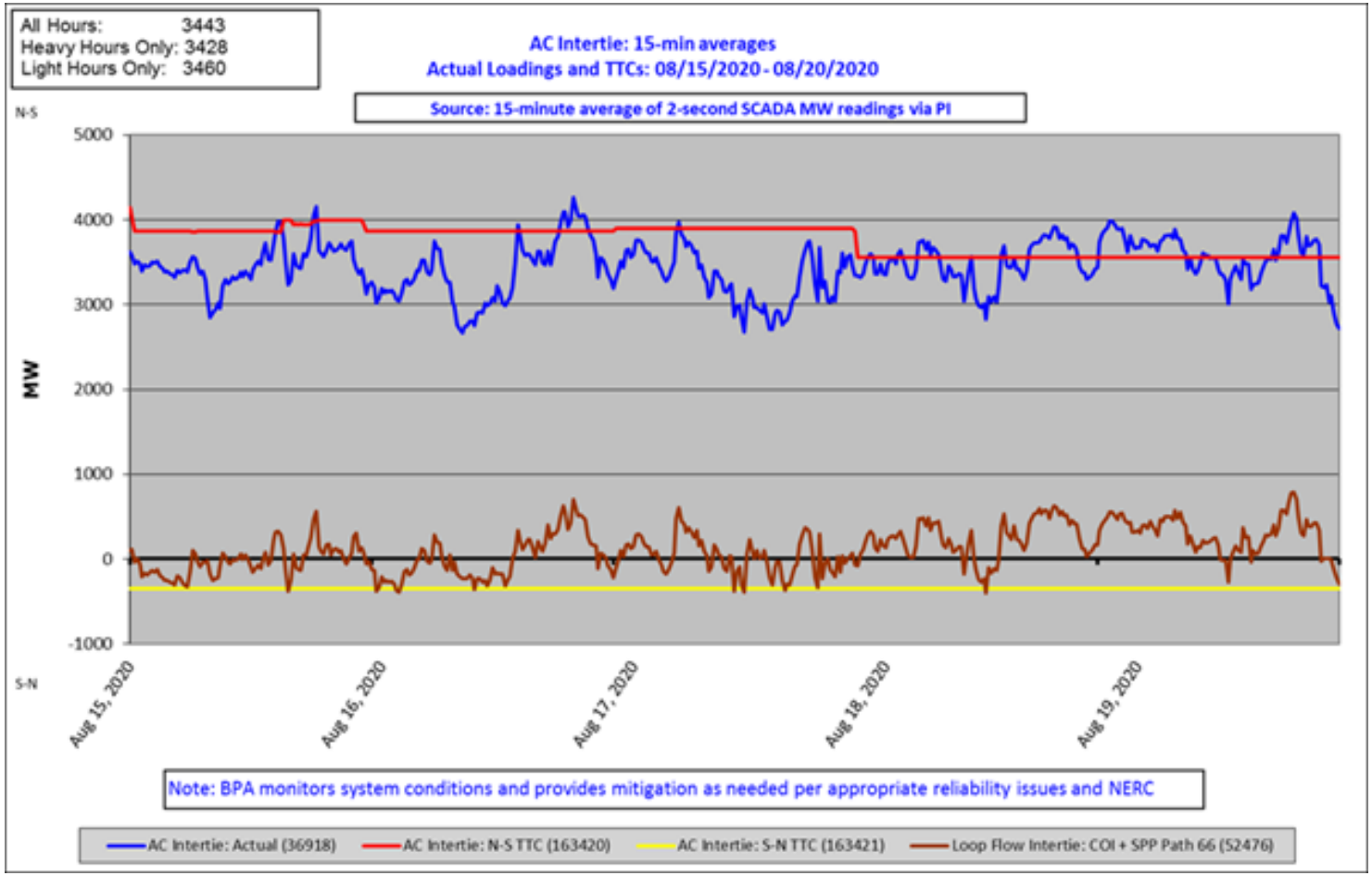
Nov
Dec
Month
Actual Usage
N-S Limit

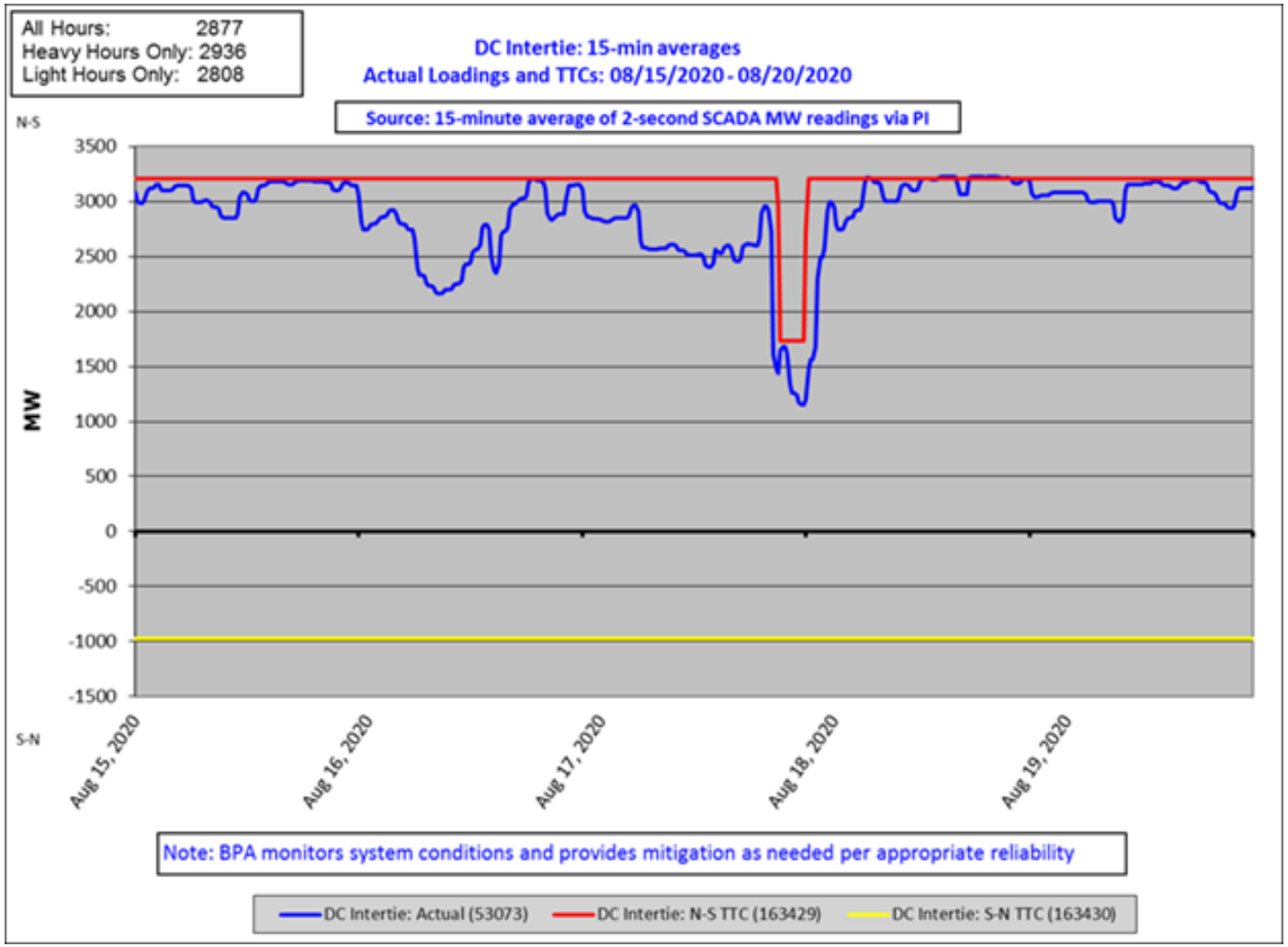


California-Oregon Interface (AC intertie)



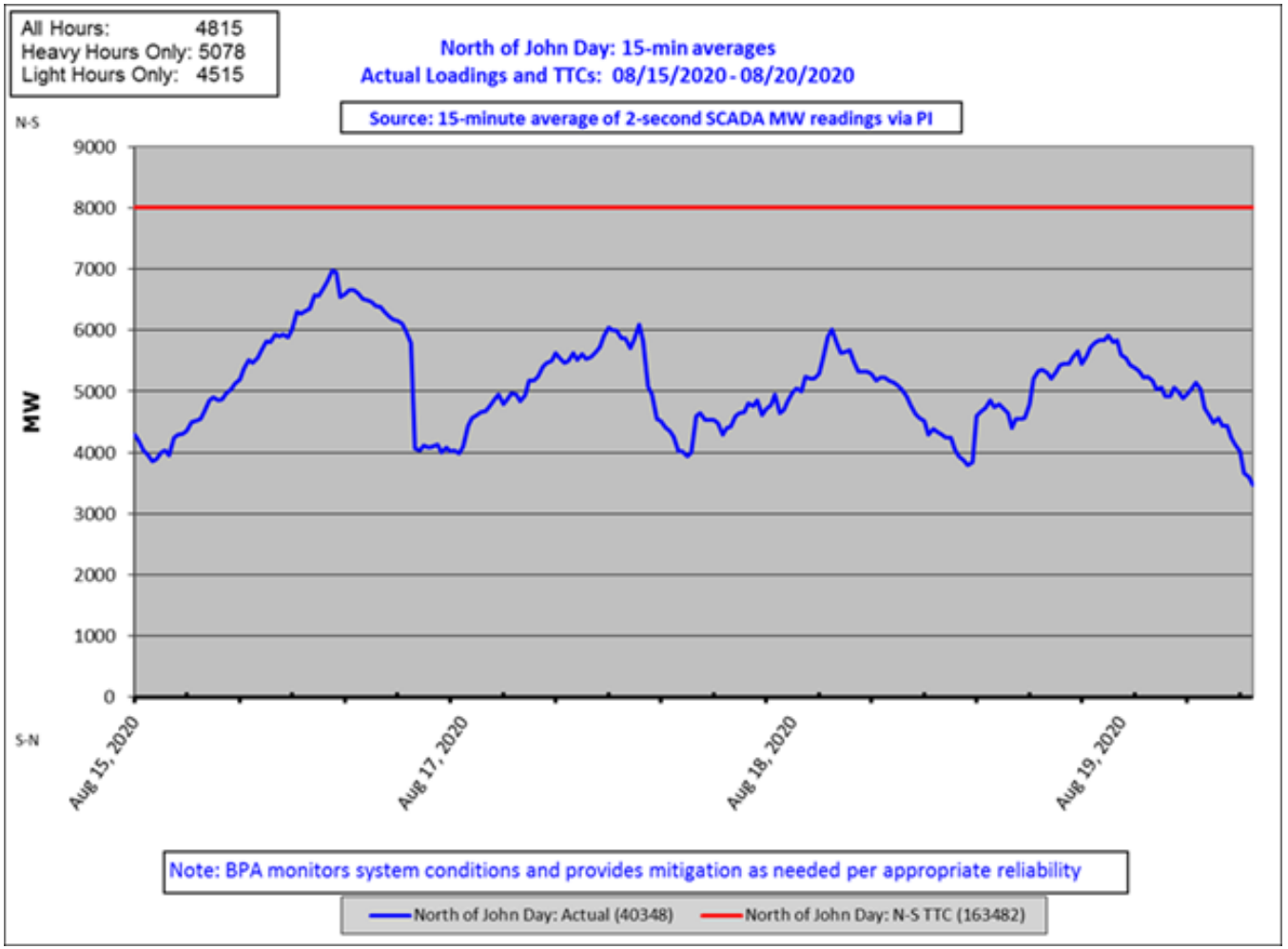
Underlying 15-min interval data averaged into hourly values from BPA website, found here: https://transmission.bpa.gov/Business/Operations/Paths/

Nevada – Oregon Border (NOB or DC Intertie)



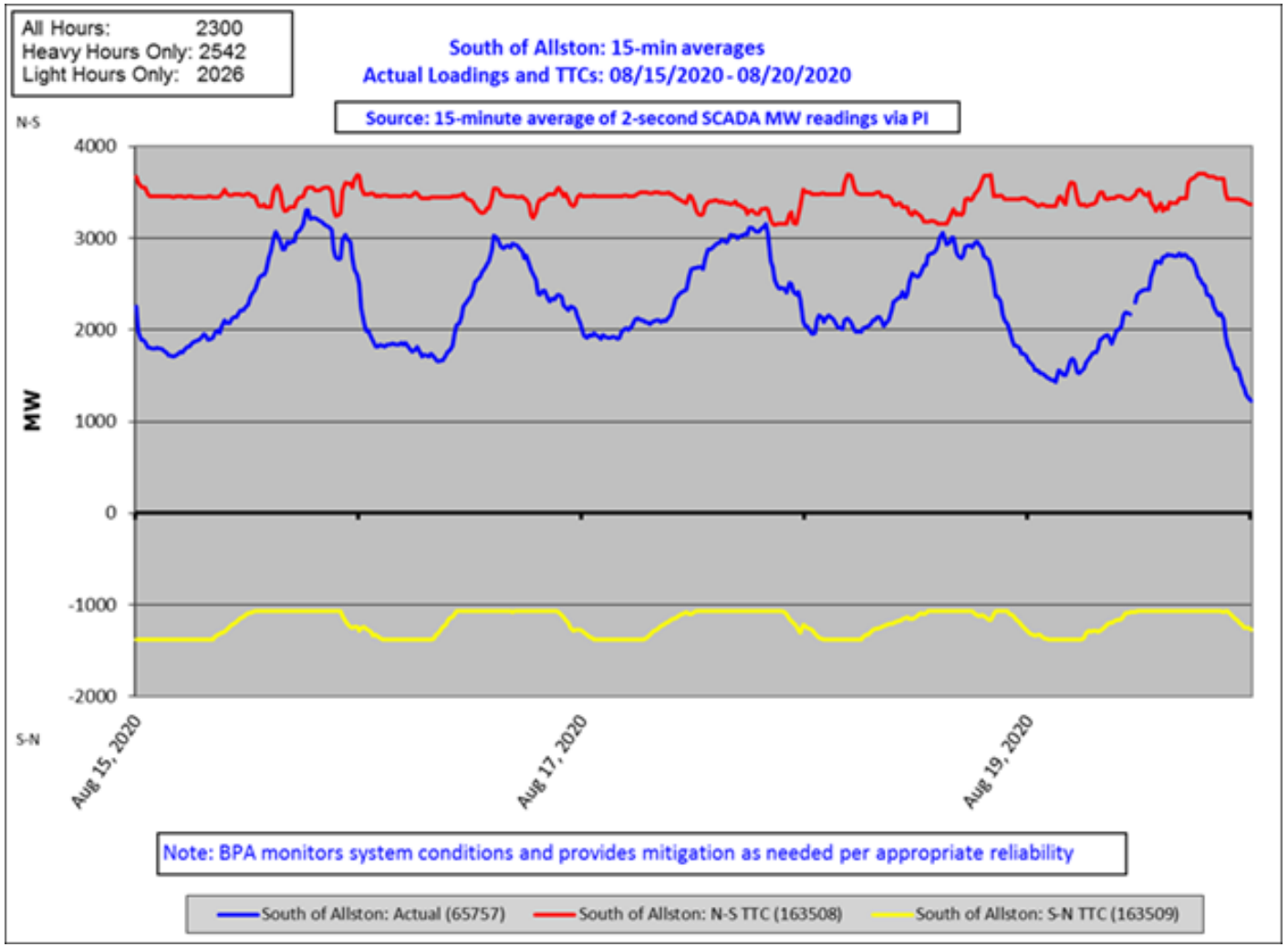
Underlying 15-min interval data averaged into hourly values from BPA website, found here: https://transmission.bpa.gov/Business/Operations/Paths/

North of John Day Flowgate



Underlying 15-min interval data averaged into hourly values from BPA website, found here: https://transmission.bpa.gov/Business/Operations/Paths/

South of Allston Flowgate



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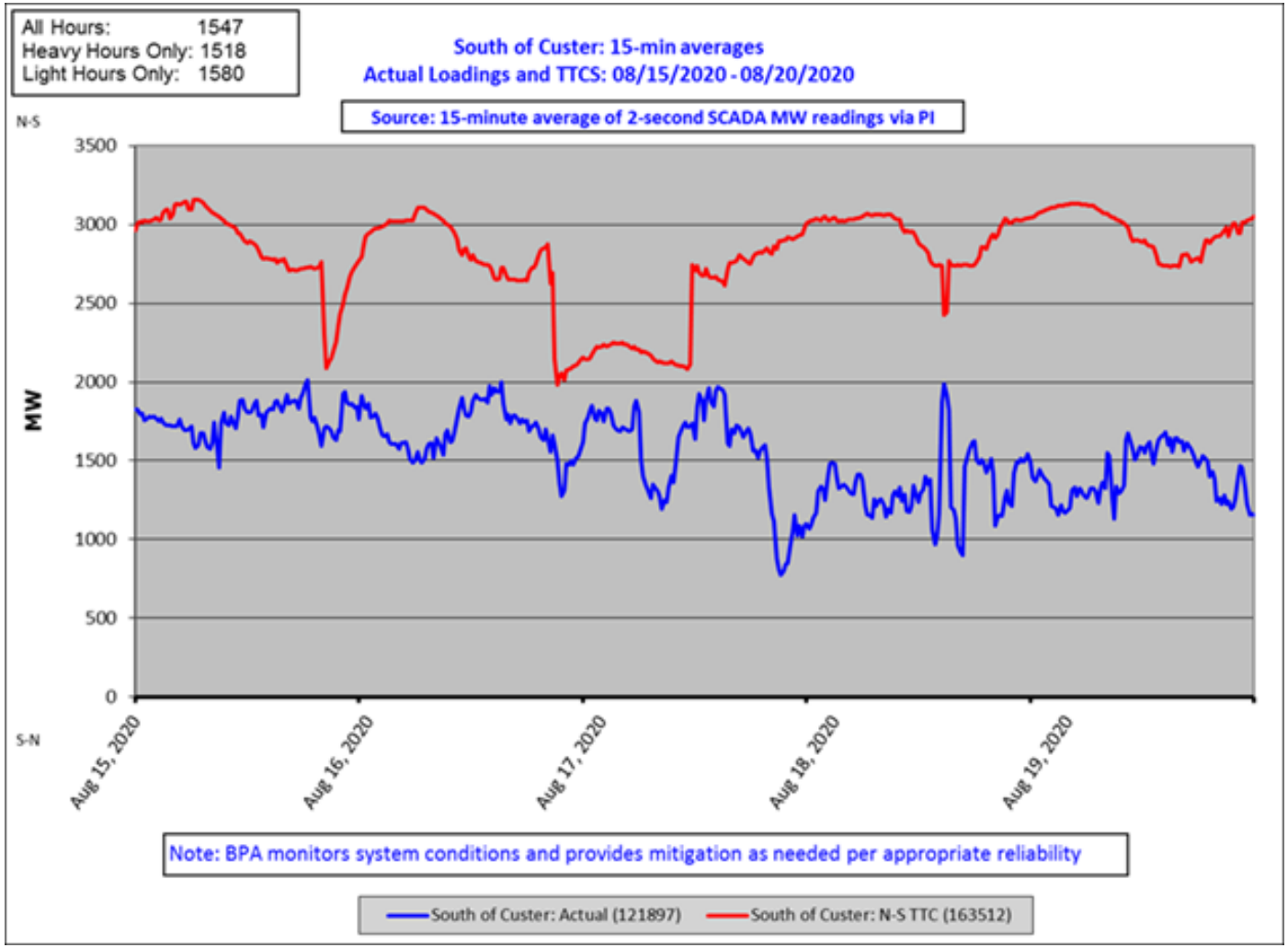
South of Custer Flowgate (Northern Intertie/Puget Sound Area)



Underlying 15-min interval data averaged into hourly values from BPA website, found here: https://transmission.bpa.gov/Business/Operations/Paths/

PLANNED OUTAGE PROCESS ENHANCEMENTS

Although the existing process has it challenges, it is the best that can be done under the current monthly RA program

- A planned outage reserve margin would
  - Eliminate need for substitute capacity for approved planned outages
  - Add simplicity to the planned outage process
  - Remove embedded costs to cover planned outage replacement
  - Eliminate incentive to withhold capacity from bilateral market
- This option was generally opposed by the stakeholder community
- The CAISO will maintain the existing planned outage replacement requirements with minor enhancements
  - Align with RC outage definitions
  - Address “planned-to-forced” outages
  - Include UCAP value

Planned outage cancellations are infrequent and typically small in both duration and MW

- Approved planned outages are subsequently cancelled less than two percent of the time
- Most cancelled planned outages are less than 2 days in duration and/or for less than 100 MW
- All cancelled planned outages have been for failure to provide substitute capacity
- SC should anticipate substitution obligation when planning an outage and selling RA capacity
  - SCs should be able to procure substitute capacity in the bilateral market

All RA capacity requesting planned outages will have a substitution obligation

- Outages conditionally approved in long and mid-range outage windows that occur prior to RA showings
  - Conditionally approved subject to RA status and substitution obligation
  - Substitution must be made at the time of the RA showing or it will be denied
  - Substitution needed for validation and RA portfolio assessment
  - Outage may still be cancelled subject to reliability assessment
- Outages requested in mid- or short-range window after RA showings have been made –
  - Substitution must be made at the time the outage request is submitted otherwise, outage will be automatically denied
  - Outage may still be denied subject to reliability assessment
- All substitute capacity will be measured in terms of comparable UCAP values
- All outage requests submitted after the short range study window submission deadline will be treated as forced, urgent, or opportunity

Based on the CAISO's review of other ISO/RTOs, CAISO is uniquely situated

- CAISO's planned outage options are constrained by the monthly nature of the RA program
  - Other ISOs/RTOs conduct RA procurement annually, potentially including seasonally different RA requirements
- Other ISO/RTOs can require up to two years of notice for planned outages
  - Because of much longer visibility into the RA obligations of resources, the planned outage procedures are much cleaner
  - CAISO does not know which resources will be RA resources until 45 days prior to the month
- Creates a complicated overlap between the CAISO's planned outage and RA processes

UCAP FOR LOCAL

CAISO outlined a proposal to apply UCAP calculations for local capacity counting

- CAISO continues to prefer local RA procurement be done with NQC values
- Numerous parties supported the CAISO's proposal to apply a conversion factor after the local capacity studies have been completed
  - SDG&E objects to the use of UCAP for local
  - PG&E and SCE asks for additional example to clarify how the CAISO would apply the various options for UCAP in local areas

The CAISO will continue running the local capacity studies exactly as is done today using NQC

- CAISO will publish the local capacity requirements in terms of NQC
- The CAISO will provide a translation table from NQC local requirements to UCAP local requirements
  - Translations will be done by TAC
- For each TAC, the total local UCAP requirement will be defined as follows:
- $$\boldsymbol{Total\ TAC\ UCAP\ responsibility} =$$

$$\left(\sum \boldsymbol{of\ TAC\ wide\ NQC\ requirements}\right) \times \left[\frac{\sum\ \boldsymbol{of\ TAC\ wide\ UCAP\ values}}{\sum\ \boldsymbol{of\ TAC\ wide\ NQC\ values}}\right]$$

NQC and UCAP *values* used in the conversion factor are given by all available values in the previous year's NQC/UCAP list for resources already in-service

- Using the NQC and UCAP values from the current year is both an infeasible and undesirable result
  - The LCR studies run from December-May
  - The annual NQC deliverability study is done in June-July
  - NQC list is currently completed August/September
- LCT study and UCAP translation needs to be final by May 30 – 120 days before the showings get here
  - CPUC requires draft LCR study April 1 and final by May 1
- Avoids complications derived from including estimated NQC and estimated UCAP values for new resources

The CAISO will calculate LSEs' local load-share ratio responsibility in terms of UCAP at the TAC level

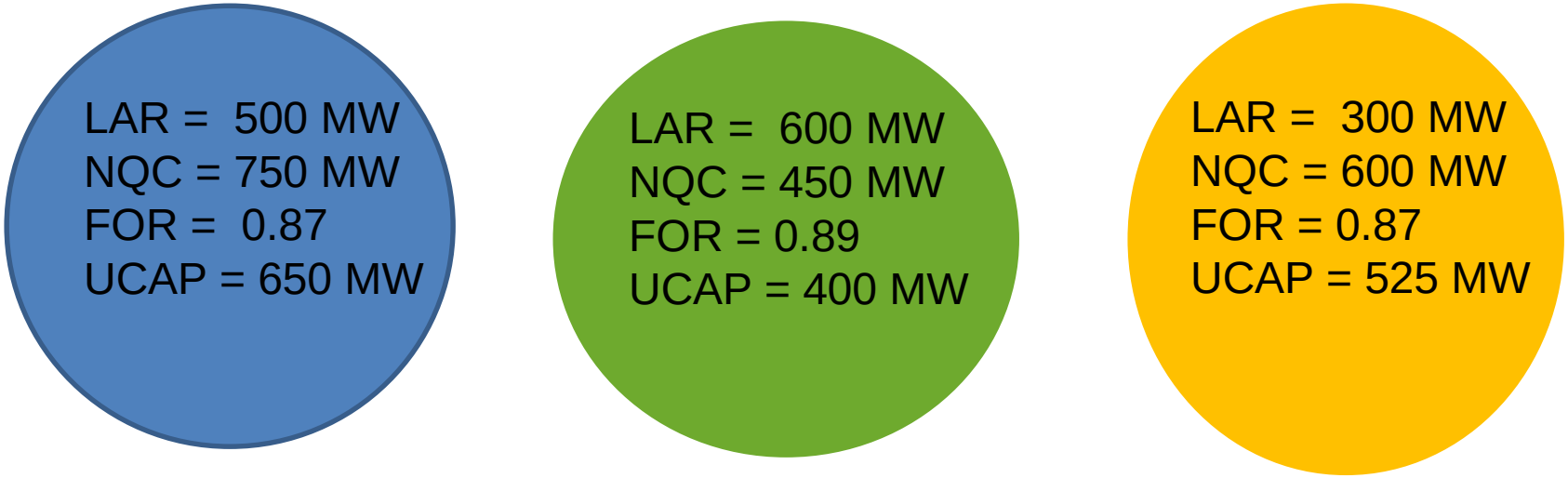
- LRAs will be given their share UCAP to allocate to their LSEs
  - The LRA may allocate these responsibilities using its preferred methodology
  - If the LRA does not allocate their entire responsibility to their jurisdictional LSEs the CAISO will allocate the difference
- LSEs' individual compliance in meeting their given local allocation is calculated in UCAP
  - An LSE will be determined to be individually adequate if its shown UCAP is equal or greater than its allocated share

CAISO will convert UCAP values back into NQC values and run its compliance studies of all RA showings with local technical criteria and requirements

- In addition to deficiencies caused by effectiveness factors that exist today, the CAISO must also ensure there are adequate MWs in a given area
  - For example, the CAISO may receive adequate UCAP to meet individual obligations, but not enough MW to serve peak load in a local capacity area
- Deficiencies will be defined as either
  - Insufficient MW of NQC to meet the LCR
  - Insufficiently effective capacity

UCAP for local: Example 1

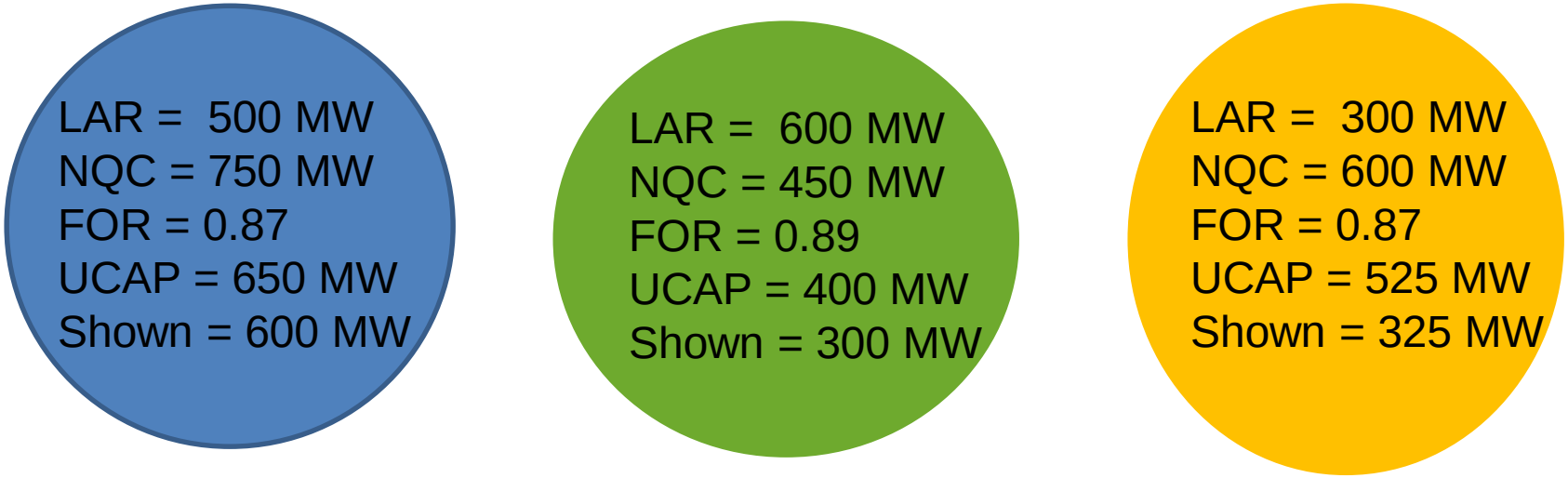
- 1 TAC, 3 local areas in the TAC, 3 generators



- TAC UCAP LCR = (500+600+300) x ((650+400+525)/(750+450+600)
  = 1,400 x (1,575/1,800)
  = 1,225

UCAP for local: Example 1

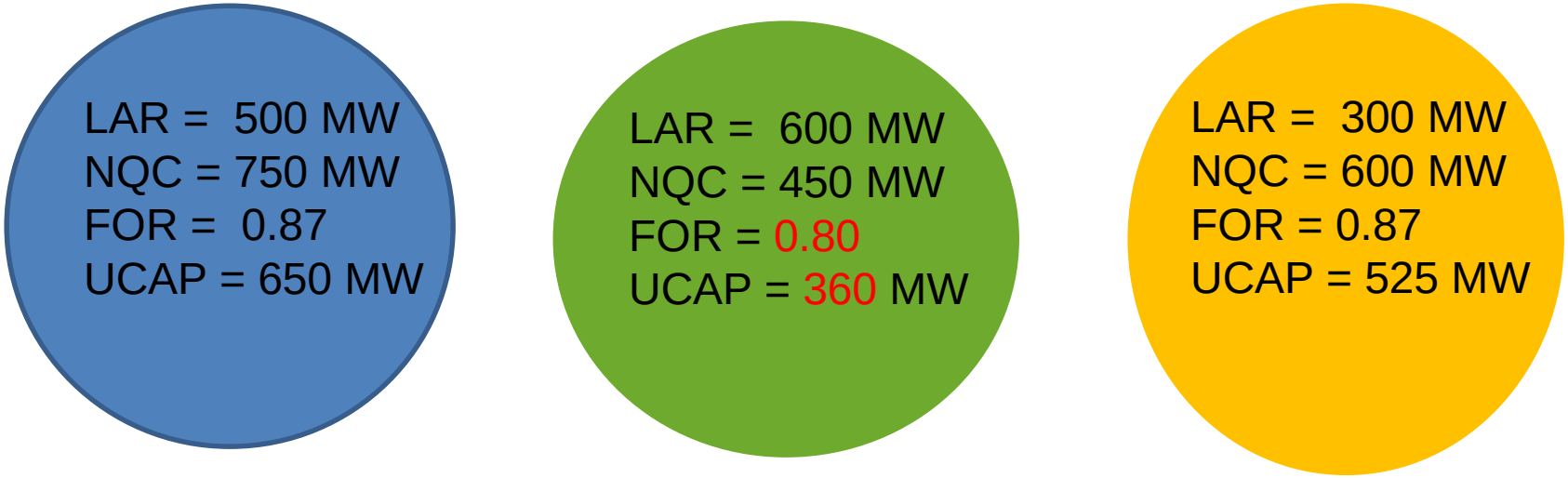
- 1 TAC, 3 local areas in the TAC, 3 generators



- Shown UCAP = 600+300+325 = 1225
- Available peak capacity = 600/.87 + 300/.89 + 325/.87
  690+337+374 = 1401 > 1400
-

UCAP for local: Example 2

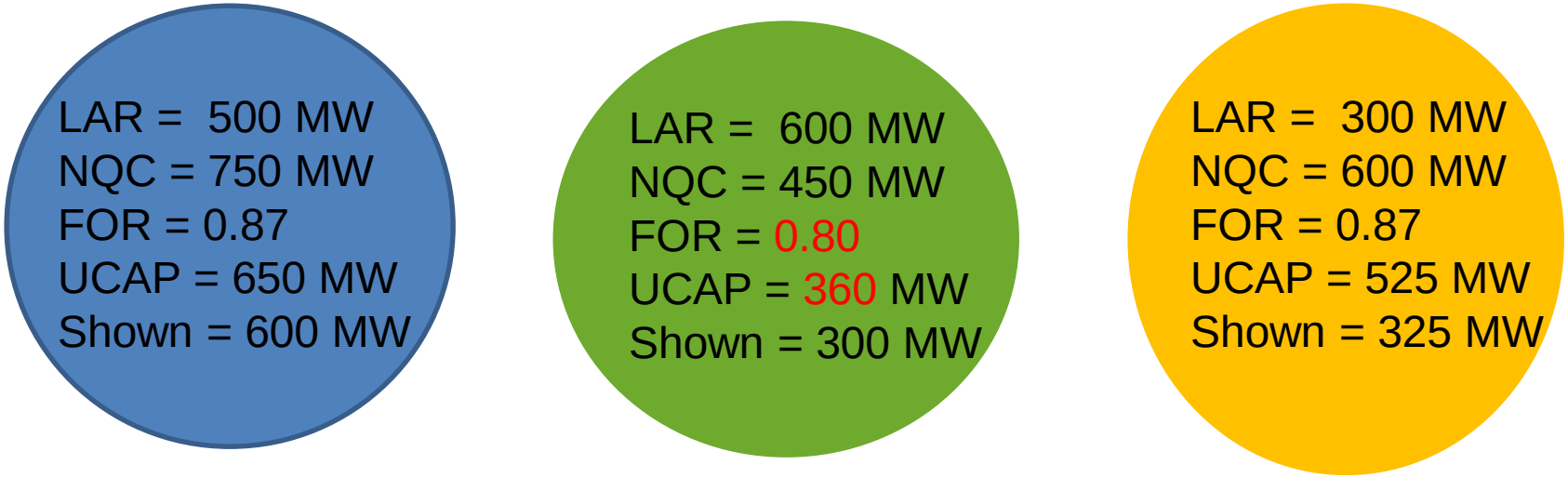
- 1 TAC, 3 local areas in the TAC, 3 generators



- TAC UCAP LCR = (500+600+300) x ((650+360+525)/(750+450+600)
  = 1,400 x (1,535/1,800)
  = 1,194

UCAP for local: Example 2

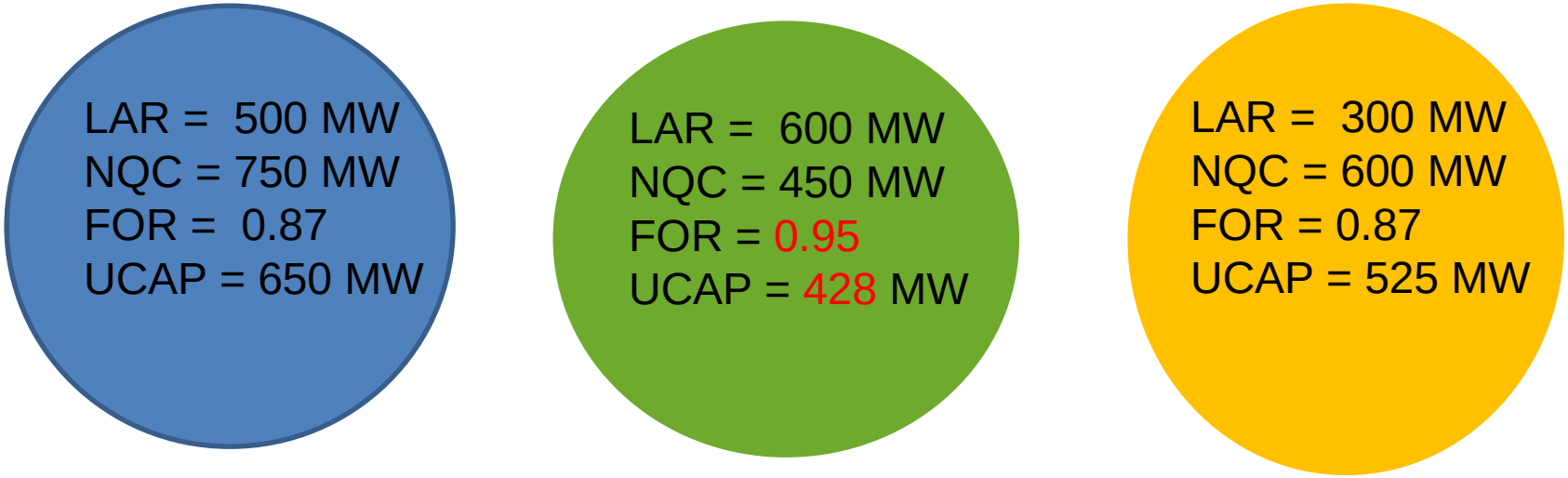
- 1 TAC, 3 local areas in the TAC, 3 generators



- Shown UCAP = 600+300+325 = 1225
- Available peak capacity = 600/.87 + 300/.80 + 325/.87
  690+375+374 = 1439 > 1400
-

UCAP for local: Example 3

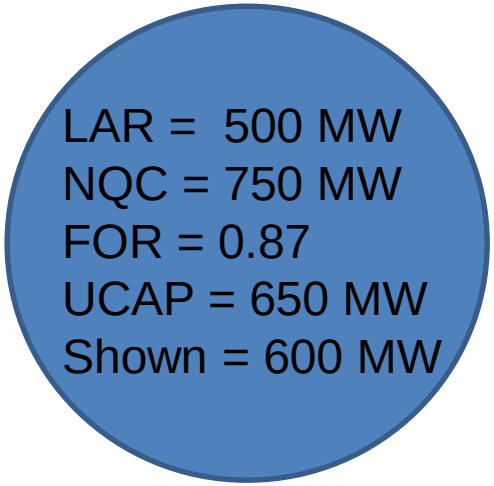
- 1 TAC, 3 local areas in the TAC, 3 generators

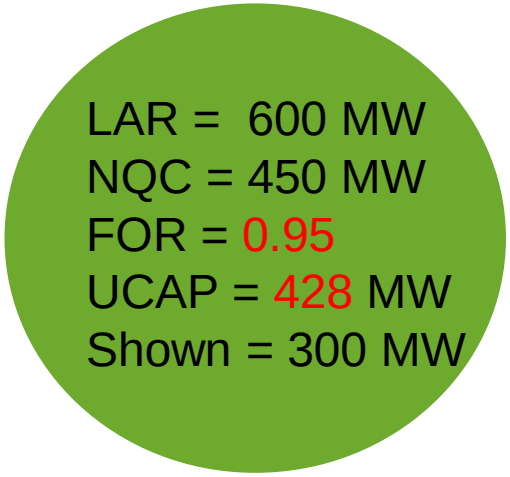


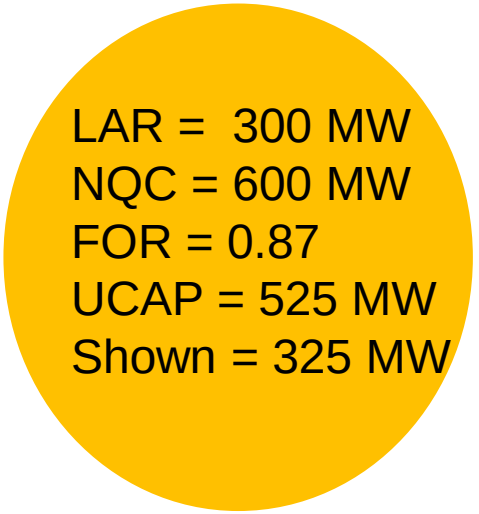
- TAC UCAP LCR = (500+600+300) x ((650+428+525)/(750+450+600)
  = 1,400 x (1,535/1,800)
  = 1,246

UCAP for local: Example 3

- 1 TAC, 3 local areas in the TAC, 3 generators







- Shown UCAP = 600+300+325 = 1225
- Available peak capacity = 600/.87 + 300/.95 + 325/.87
  690+316+374 = 1380 < 1400
-

The CAISO will notify LSEs of any deficiencies and provide them an opportunity to cure

- If still short, the CAISO may purchase capacity from remaining non-RA resources through its CPM authority cure the deficiency
- The cost will be allocated
    1. Pro rata to each LSE SC based on the ratio of its LCR Deficiency to the sum of all LSEs LCR deficiencies within a TAC Area, then
    2. If anything else is required the cost allocation will be based on the LSE's proportionate share of Load in such TAC Area(s)

The CAISO may assess a number of variables to determine which resources to offer CPM designations to cure deficiencies

- Variables include, but are not limited to
  - Cost
  - Effectiveness, and
  - Reliability
- The CPM cost will be divided to the LSEs per the different varieties of CPM
- The LSEs that receive cost allocation for the CPM will get a capacity credit commensurate with their CPM cost ratio allocation
  - The amount of the credit is based on the quantity of UCAP purchased, not the NQC value

NEXT STEPS

Resource Adequacy Enhancements Policy Development Schedule

Date	Milestone
September 15,17	Working Group
Oct 1	Stakeholder comments on Working Group due
Nov 3	Draft final proposal
Nov 10-12	Stakeholder meeting on draft final proposal
Dec 3	Stakeholder comments on draft final proposal
Aug 2020 - Q1 2021	Draft BRS and Tariff
Q1 2021	Final proposal
Q1 2021	Present proposal to CAISO Board

* Dates are tentative and subject to change

Comments

- All related information for the Resource Adequacy Enhancements initiative is available here: https://stakeholdercenter.caiso.com/StakeholderInitiatives/Resource-adequacy-enhancements

- Please submit written comments on working group discussion by October 1, 2020.

Important – *Please review new process for submitting comments*

- Provide comments using the new stakeholder commenting tool

- First-time users must register using their email address in order to submit comments on initiatives

- The commenting tool is located on the Stakeholder Initiatives landing page (click on the “commenting tool” icon): https://stakeholdercenter.caiso.com/StakeholderInitiatives