



California ISO

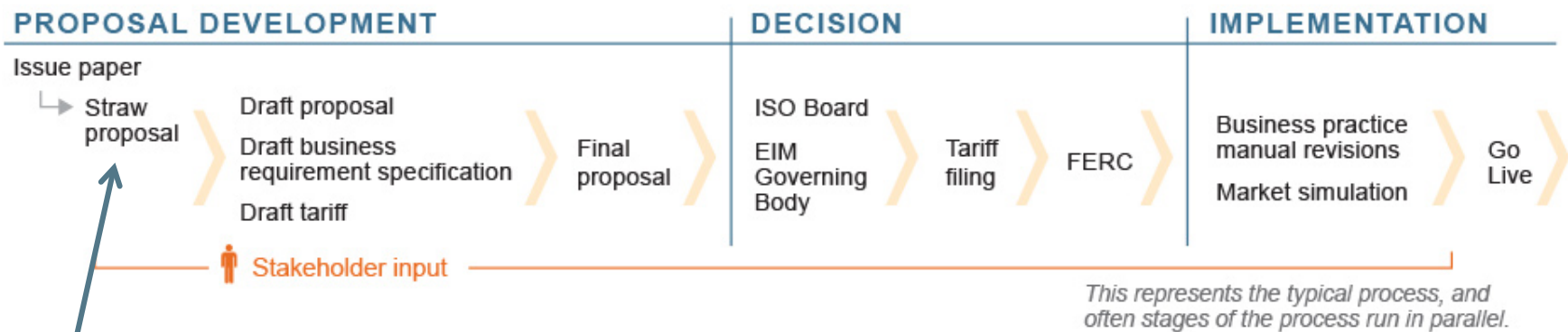
Resource Adequacy Enhancements Working Group

June 10, 2020

Agenda

Time	Topic	Presenter
9:00 – 9:10	Welcome and Introduction	Isabella Nicosia
9:10 – 9:30	Production simulation: Determining UCAP needs and portfolio assessment	Karl Meeusen
9:30 – 10:00	Transitioning to UCAP Paradigm	Karl Meeusen
10:00 – 11:50	Unforced Capacity Evaluations	Bridget Sparks & Lauren Carr
11:50 – 12:00	Next Steps	Isabella Nicosia

Stakeholder Process



We are here

PRODUCTION SIMULATION: DETERMINING UCAP NEEDS AND PORTFOLIO ASSESSMENT

Stakeholder feedback

- Most stakeholders support the CAISO developing a portfolio assessment for only RA resources
- Stakeholders were generally supportive of the CAISO's proposed stochastic model, including using the Summer Assessment as the basis
- Stakeholders continue to request additional details about the model and its potential uses
- Some stakeholders have requested additional details about the model's ability to model storage resources
 - CAISO has not had the opportunity to explore this in greater detail

CAISO will leverage an existing stochastic production simulation model to develop the portfolio analysis

- A stochastic approach allows the CAISO to assess the widest array of load, wind, and solar profiles as well as various outage profiles for other resource types
- Utilizing an existing model provides at least two benefits
 - Helps the CAISO expedite testing and implementation
 - CAISO can utilize an accepted and vetted model that has been relied on for other CAISO published studies

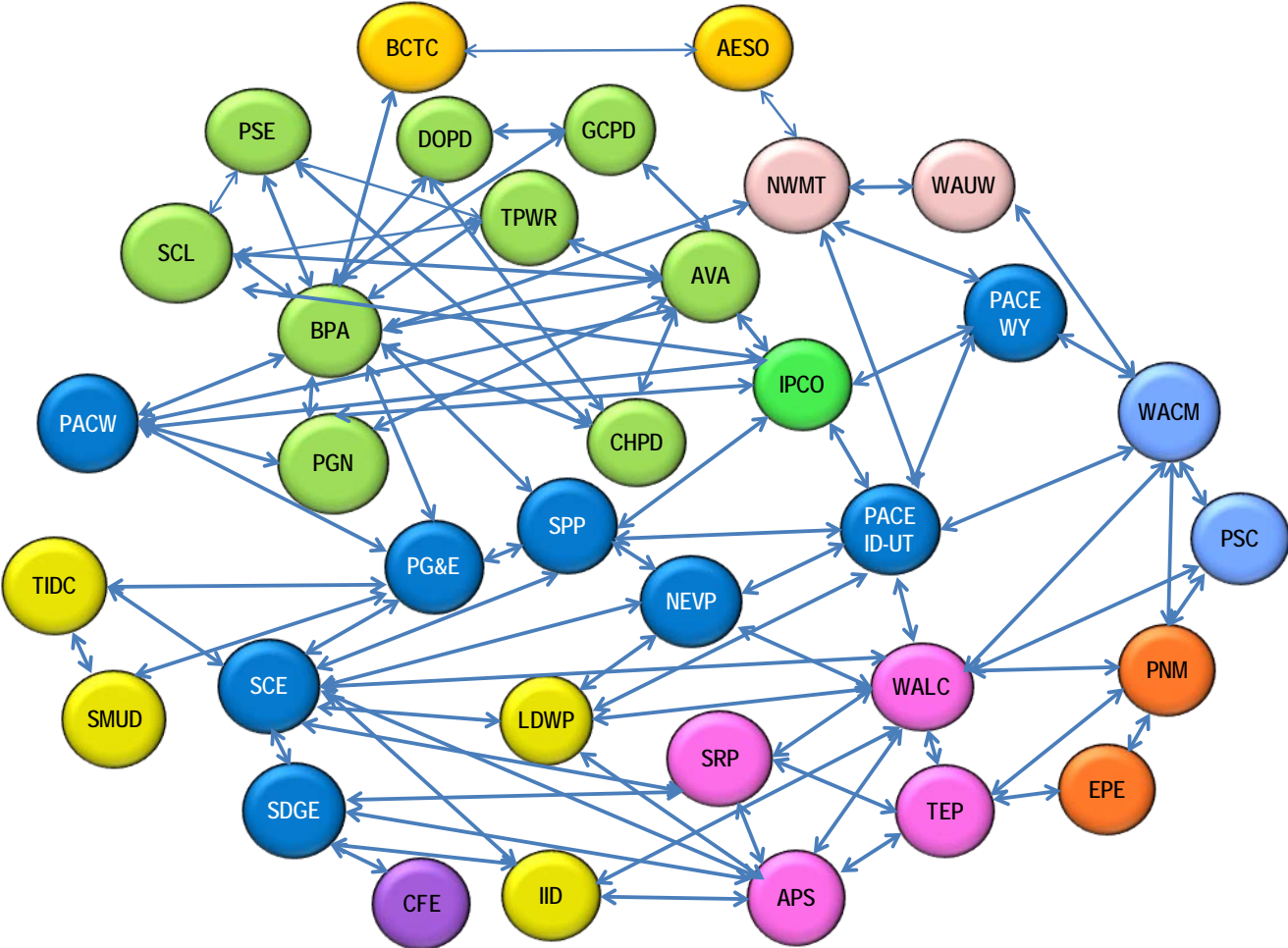
CAISO is currently assessing the capabilities of the Summer Loads and Resources Assessment (Summer Assessment) model

- Ability to determine UCAP needs
- Conduct Portfolio analysis

Summer Assessment's core modelling functions are identical to the needs for the portfolio analysis

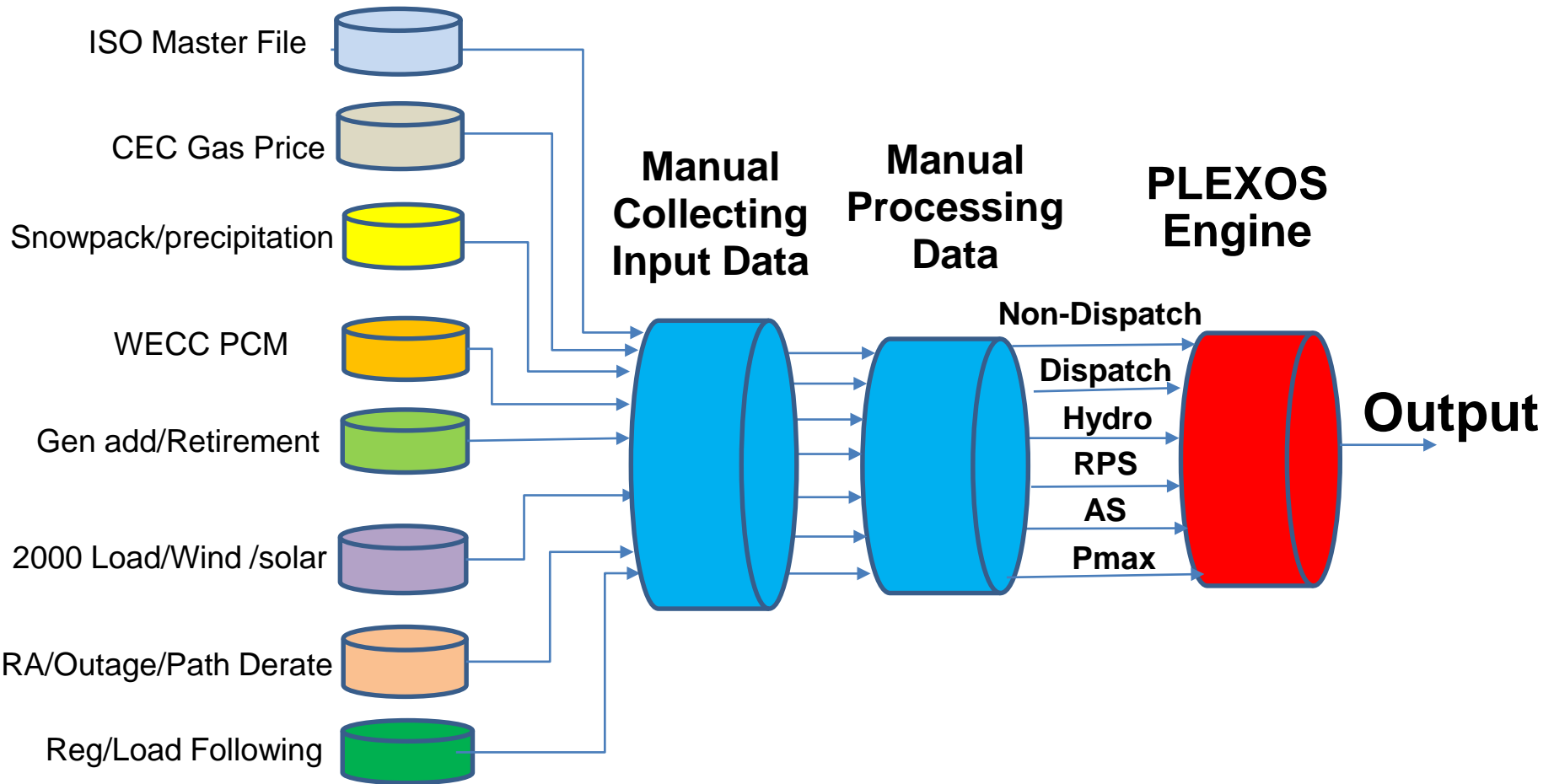
- The model is a detailed representation of loads and resources characteristics across the CAISO
- It can model resources across the WECC, allowing imports into the CAISO
- Commits resources based on load, unit specific forced outage rates, ramp rates, start times, and minimum down times
- Model looks to meet CAISO needs, including
 - Operating reserves
 - Regulation
 - Load following (analysis is run on hourly blocks)
- The model can run both stochastically and deterministically
 - Allows CAISO to develop robust statistical results while still testing various sensitivities

PLEXOS model simulates WECC 35 zones and 91 paths



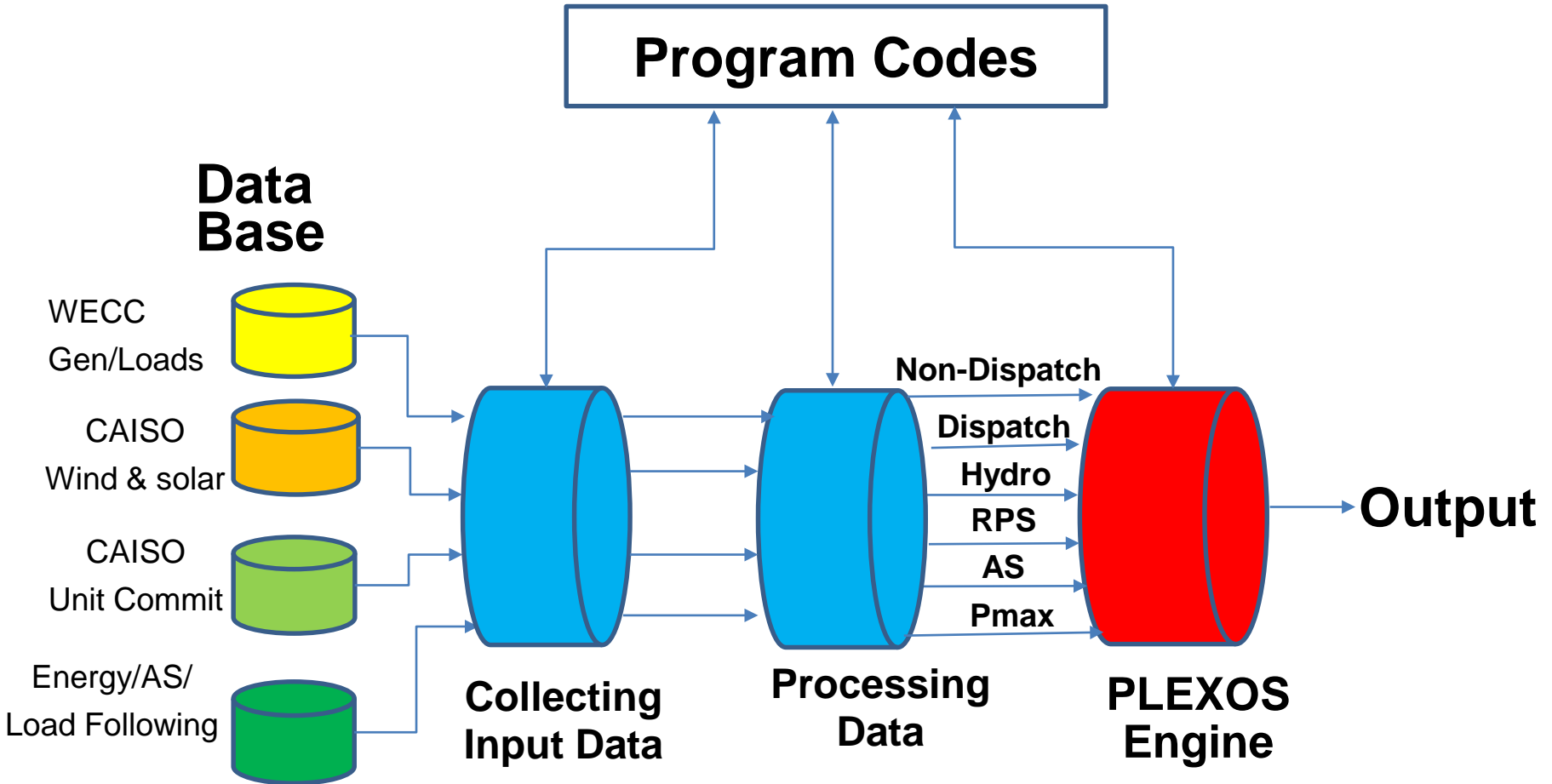
PLEXOS Stochastic Model

Input



PLEXOS Deterministic Model

The automation process takes 3 minute run time

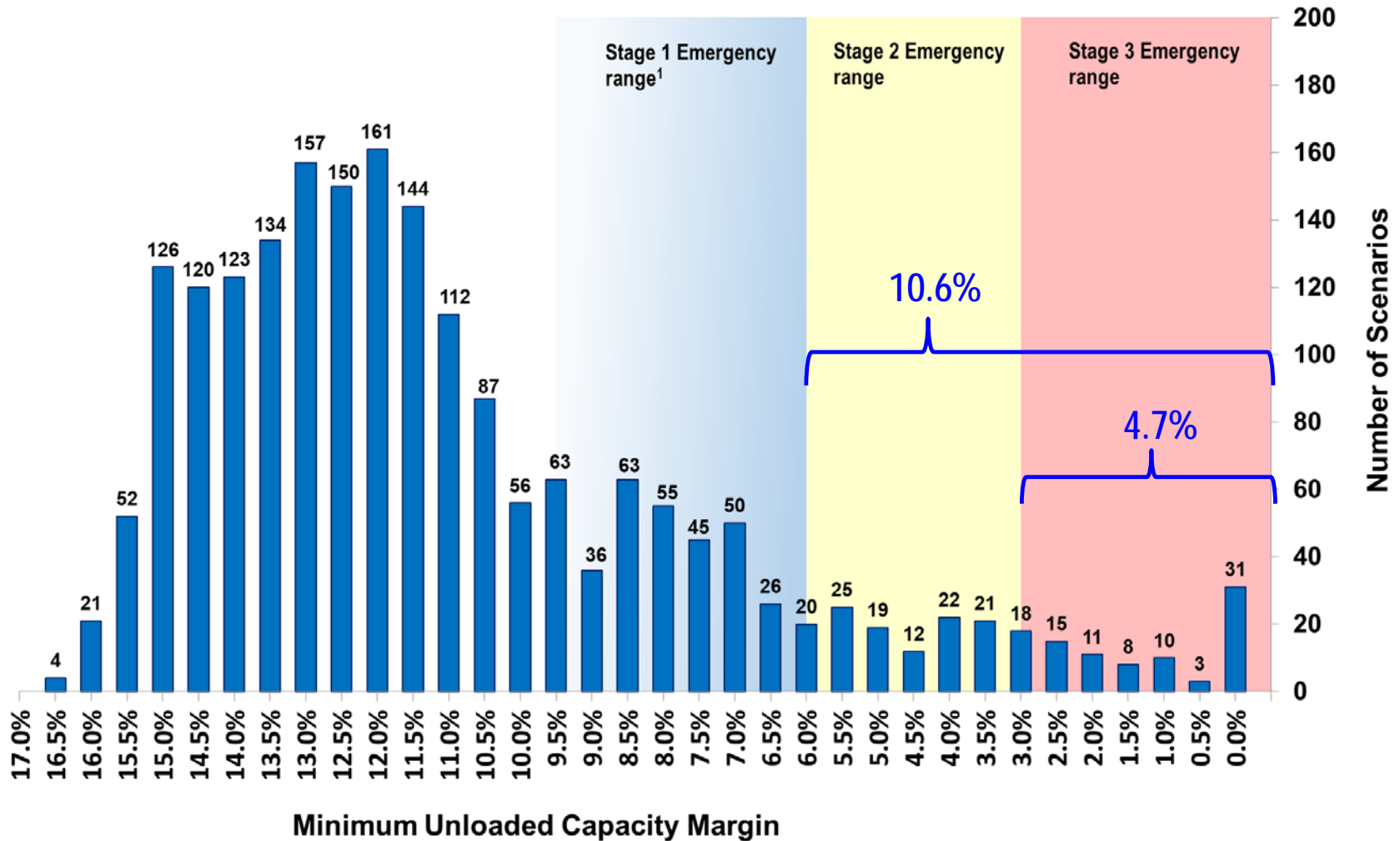


Example results from 2020 Summer Assessment sensitivity case

Probability of CAISO system capacity shortfall

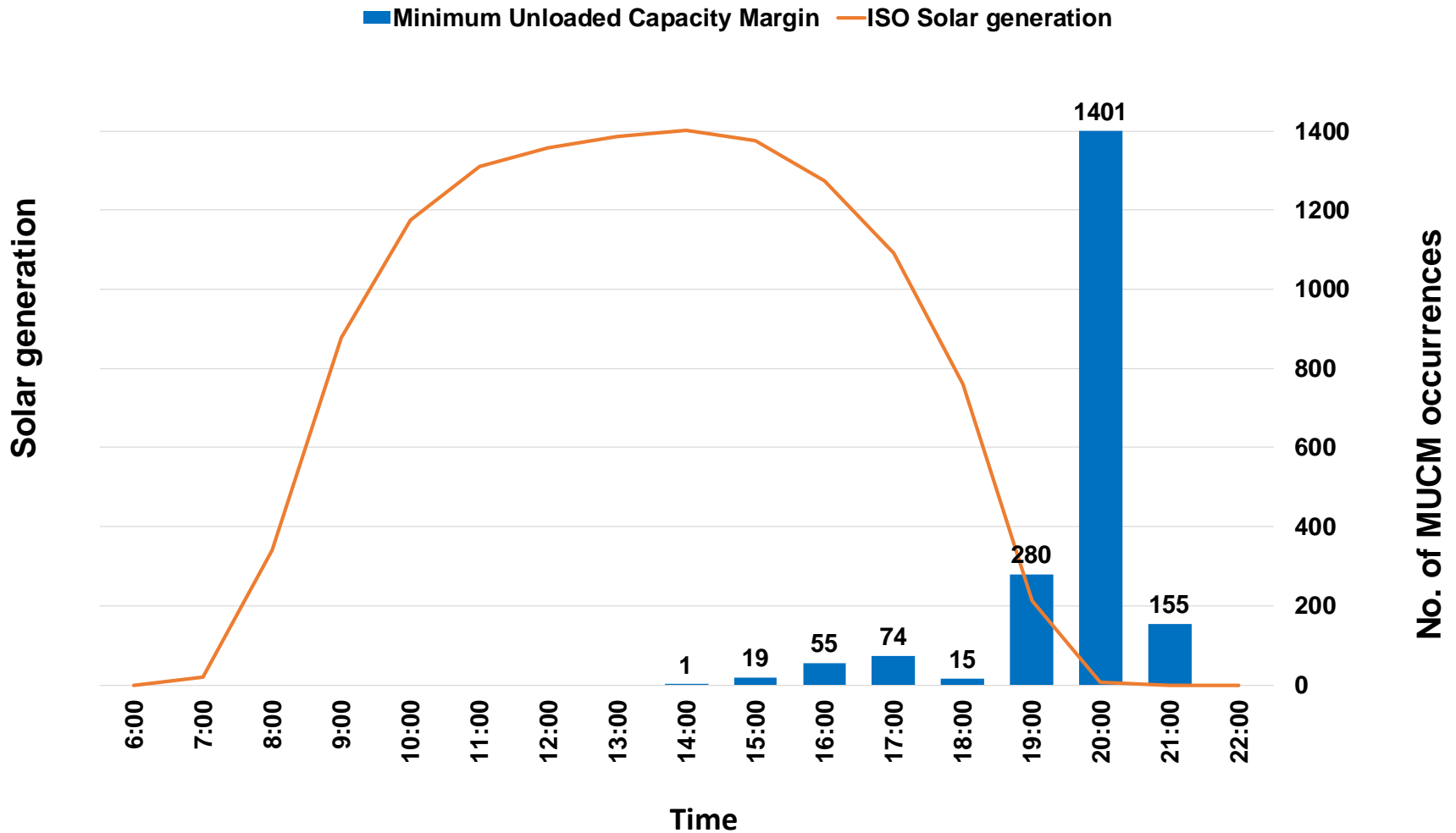
Result	2020 Summer Assessment Sensitivity Case
Stage 2	10.6%
Stage 3	4.7%
Unserved energy	1.6%

Conservative import sensitivity: minimum unloaded capacity margins



¹ Stage 1 range is approximate

Conservative scenario – hours of minimum unloaded capacity margins (showing solar profile)



Current status of the CAISO's study efforts

- Testing actual RA showings with the following inputs
 - Use similar year to reflect expected hydro output
 - Using established wind and solar profiles
 - Modelling on shown RA imports
 - Using CAISO forecast (within 1% of CEC forecast)
- Will test sensitivities around the RA showings to help inform UCAP requirements (i.e. higher or lower imports, sensitivity to load forecast)
 - This relates to setting UCAP requirements and potential CPM triggers, not how it applies to UCAP
- Based on output of initial tests, CAISO will identify criteria for CPM designations

TRANSITIONING TO UCAP PARADIGM

The CAISO is exploring two primary options for integrating unforced capacity outages into the RA program

- Option 1: A two step de-rate process to resource QCs that includes resource availability
 - Step 1: Conduct resource deliverability assessment and adjust QC for deliverability, creating Deliverable QC (DQC) for the resource (i.e. today's NQC will become DQC)
 - Step 2: Apply non-availability factor to DQC, resulting in NQC for the resource
- Pros:
 - Capacity value will still be expressed in terms of NQC, addressing stakeholder concerns about existing contracts
- Cons:
 - May create more confusion than it solves by using the same term to mean two different things over time
 - Requires significant revisions to numerous sections of the CAISO to clarify bidding requirements

The CAISO is exploring two primary options for integrating unforced capacity outages into the RA program

- Option 2: De-rate NQC for forced outages to calculate UCAP
 - Apply non-availability factor to current NQC definition, resulting in UCAP value
- Pros:
 - Removes ambiguity from dual meaning of the term NQC over time
 - Clarifications of to exists RA contracts would be jointly needed, not favoring one side over the other
- Cons:
 - May require reworking existing contracts

The CAISO proposes a clean transition to UCAP accounting and requirements by the 2023 RA year

- Transitional accounting protocols will only add complexity and costs while potentially degrading reliability
- The CAISO proposes
 - 2022 RA year – Binding RA requirements established in terms of today's NQC values, but shadow test both UCAP RA requirements and showings
 - 2023 RA year – UCAP requirements and showings become binding for the 2023 RA year

UNFORCED CAPACITY EVALUATIONS

CAISO proposes to evaluate the reliability and availability of resources by accounting for forced outages

- Current CAISO and CPUC RA framework does not account for system resources on forced outage beyond margins included in established planning reserve margin requirement
 - Instead, CAISO relies on substitution rules and Resource Adequacy Availability Incentive Mechanism (RAAIM)
- CAISO has proposed new rules to account for probability of forced outages and derates that will eliminate need for complicated replacement capacity rules
- Applying unforced capacity evaluations to RA values is intended to provide certainty CAISO will receive adequate reliability from resources to be available in advance

Several advantages for integrating forced outages and derates into RA capacity values

- Recognizing individual resource's potential contribution to reliability enables each resource to be compared and contrasted to the reliability of other resources
- Promotes procurement of better performing resources with improved operational reliability and availability
- Information on availability and reliability of resources can help buyers avoid risks and make better informed decisions when procuring RA capacity

Resource specific NQC and UCAP determinations

- CAISO proposes to calculate and publish monthly NQC and UCAP values for all resources annually
 - Once per year, a unit will have a distinct NQC and UCAP value determined for each month of the upcoming year
- NQC process will remain similar to current approach with no major proposed changes, depending on transition approach
- CAISO proposes that the calculation of each resource's UCAP will be limited at a resource's NQC value and will consider the resource's forced outages and derates
- UCAP values will not be affected by CAISO approved planned outages or opportunity outages

CAISO proposes to align CAISO BA outages with existing RC outage definitions

- RC procedure RC0630 defines the following outage types:
 - **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
 - **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

Outages applied towards UCAP will be based on outage types defined in the RC procedure

- CAISO proposes to use the outage type as defined in the RC outage procedure to categorize outages for UCAP purposes
 - Forced and Urgent outages will count towards a resource's UCAP
 - Planned and Opportunity outages will not count towards a resource's UCAP
- Simplifies classification of outages that affect a resource's UCAP and aligns with outages definitions established in the RC outage coordination process

Forced and urgent outages will count against a resource's UCAP value

- CAISO proposes not to provide exemptions based on existing nature of work categories
- Instead, the CAISO will develop a process to exclude certain outages caused by events outside of management control and outside of normal utility operations that directly affect generators
 - For example – terrorism, government orders, fire, earthquake, etc.
 - CAISO will develop process to identify events that qualify a resource for forced outage exemptions and allow SCs to submit justification and supporting documentation for these outages
 - CAISO will develop annual internal review and approval process to exclude these outages from UCAP calculation

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

- CAISO proposes to calculate seasonal availability factors for UCAP determination purposes
- CAISO proposes to utilize two seasons for UCAP evaluations
 - On-peak: May-September (summer)
 - Off-peak: October-April (winter)
- Considers different impacts of availability during seasons across the year to better reflect unit reliability

Supply cushion is a measure of real-time system resource adequacy risk

- 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

New proposal assess forced outages during 20% of tightest supply cushion hours

- Today we assess 5 RAIM hours per day, which is roughly 20% of all hours
- Using RAIM 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 RAIM, 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

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

Data: Supply Cushion Analysis

- CIRA provided Daily RA Showings, Planned Outage Impacts and Forced Outage Impacts data
- Net Load data came from the 2018, 2019, 2020 Production and Curtailment public dataset
- Contingency Reserves were estimated as 6% of Gross Load, or 2500 MWs, whichever is largest
- Peak Months= May-September
- Off-Peak Months = October-April

- To implemented, the CAISO will need to modify OMS to collect and store necessary hourly outage and derates data to be used in future UCAP valuations for resources

Distribution of Supply Cushion Hours (in MWs)

Percentile	2018 Peak Months	2018-2019 Off-Peak Months	2019 Peak Months	2019-2020 Off Peak Months
1.0	-3062	-2266	-1584	-2619
5.0	380	-217	3494	-449
10.0	2619	1191	5859	977
20.0	5890	3152	8842	3243
25.0	7012	3989	9936	3960
50.0	10627	7069	14572	7526
75.0	14139	10592	18237	11840
90.0	17030	13881	21500	15688
95.0	18790	15220	23468	18076
99.0	21213	17737	26867	21467
Hours	3672	5088	3672	5111

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

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	4	0.54	6	0.59	18	2.45	13	1.27
2	0	0.00	2	0.20	8	1.09	2	0.20
3	0	0.00	1	0.10	4	0.54	2	0.20
4	0	0.00	1	0.10	4	0.54	1	0.10
5	0	0.00	3	0.29	7	0.95	4	0.39
6	2	0.27	12	1.18	16	2.18	20	1.96
7	4	0.54	66	6.48	19	2.59	65	6.36
8	1	0.14	51	5.01	8	1.09	46	4.50
9	0	0.00	10	0.98	5	0.68	14	1.37
10	0	0.00	5	0.49	4	0.54	7	0.68
11	0	0.00	1	0.10	3	0.41	4	0.39
12	1	0.14	0	0.00	4	0.54	1	0.10
13	6	0.82	0	0.00	7	0.95	1	0.10
14	14	1.90	3	0.29	9	1.09	2	0.20
15	23	3.13	5	0.49	13	1.77	6	0.59
16	30	4.08	11	1.08	22	2.99	15	1.47
17	38	5.17	42	4.13	27	3.67	60	5.87
18	60	8.16	102	10.02	44	5.99	116	11.35
19	93	12.65	150	14.73	82	11.16	141	13.80
20	124	16.87	169	16.60	115	15.65	146	14.29
21	126	17.14	161	15.82	117	15.92	140	13.70
22	109	14.83	126	12.38	103	14.01	121	11.84
23	72	9.80	74	7.27	66	8.98	69	6.65
24	28	3.81	17	1.67	31	4.22	27	2.64
Total	735	100.0	1018	100.0	735	100.0	1022	100.0

Distribution of the Top 20% of Supply Cushion Hours by Operating Hour

- 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. 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.
- Caputres a similar picture that a weighted 8760 analysis would
- This approach will include a majority of the possible days (averages 79.3%)

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

$$\text{Hourly Unavailability Factor} = \frac{\text{Derates} + \text{Forced Outage Impacts}}{\text{NQC}}$$

- 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

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

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)
- SAAs will be based on each Hourly Unavailability Factor (HUF) derived by assessing forced outages and derates compared to the annual NQC 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)

**Weighted Seasonal Average Availability Factor =
Annual Weighting * 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

On Peak UCAP

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

Off Peak UCAP

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

Summary of UCAP process steps

1. Determine UCAP Assessment Hours by identify which hours fall into the top 20% of tightest supply condition 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

Appendix files demonstrate UCAP methodology for three sample resources

- Actual Outage and derate data was collected for May 2018-April 2020 for three example thermal resources
- Outage and derates were matched to the top 20% of tightest supply cushion hours from peak and off peak season
- Year 3 was estimated as the average of Year 1 and 2
- Examples show that what impacts a resource's UCAP value is systemic outages, rather than the occasional forced outage.
 - i.e. UCAP values represent a resource's reliable capacity, rather than random variation in performance

UCAP determination example: Thermal Resource A

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

Year	Peak Months SAAF	Annual Weight	Weighted SAAF (Summer / On-Peak)
3	0.911	20%	0.182
2	0.835	35%	0.292
1	0.931	45%	0.419
Total = 100%			0.893
Year	Off Peak SAAF	Annual Weight	Weighted SAAF (Winter / Off-Peak)
3	0.986	20%	0.197
2	0.986	35%	0.345
1	0.987	45%	0.444
Total = 100%			0.986

Sum of Weighted SAAFs (Summer)	Sum of Weighted SAAFs (Winter)	NQC	On-Peak UCAP	Off-Peak UCAP
0.893	0.986	250 MW	223.25 MW	246.5 MW

Note: SAAF based on actual outage data, (see excel files for HUF values) but NQC value modified to anonymize the resource

UCAP determination example: Thermal Resource B

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

Year	Peak Months SAAF	Annual Weight	Weighted SAAF (Summer / On-Peak)
3	0.941	20%	0.188
2	0.990	35%	0.347
1	0.891	45%	0.401
Total = 100%			0.936
Year	Off Peak SAAF	Annual Weight	Weighted SAAF (Winter / Off-Peak)
3	0.972	20%	0.194
2	0.982	35%	0.344
1	0.962	45%	0.433
Total = 100%			0.971

Sum of Weighted SAAFs (Summer)	Sum of Weighted SAAFs (Winter)	NQC	On-Peak UCAP	Off-Peak UCAP
0.936	0.971	100 MW	93.6 MW	97.1 MW

Note: SAAF based on actual outage data, (see excel files for HUF values) but NQC value modified to anonymize the resource

UCAP determination example: Thermal Resource C

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

Year	Peak Months SAAF	Annual Weight	Weighted SAAF (Summer / On-Peak)
3	0.947	20%	0.189
2	0.929	35%	0.325
1	0.964	45%	0.434
Total = 100%			0.948

Year	Off Peak SAAF	Annual Weight	Weighted SAAF (Winter / Off-Peak)
3	0.818	20%	0.164
2	0.958	35%	0.335
1	0.678	45%	0.305
Total = 100%			0.804

Sum of Weighted SAAFs (Summer)	Sum of Weighted SAAFs (Winter)	NQC	On-Peak UCAP	Off-Peak UCAP
0.948	0.804	50 MW	47.42 MW	40.20 MW

Note: SAAF based on actual outage data, (see excel files for HUF values) but NQC value modified to anonymize the resource

CAISO is considering two approaches to calculating UCAP for new resources*

- Option 1: Start with class average, maintain constant weights over time:
 - Year 0: 45% class avg., 35% class avg., 20% class avg.
 - Year 1: 45% year 0 performance, 35% class avg., 20% class avg.
 - Year 2: 45% year 1, 35% year 0, 20% class avg.
 - Year 3: 45% year 2, 35% year 1, 20% year 0
- Class-average data based on
 - Operating data for similarly designed resources of the same technology type
 - Availability factors observed during the 20% tightest supply cushion hours each season

Starts with lower capacity value, but lower weights allows for time to “work the bugs out” with lower capacity value impact

* May not apply to all new resources (see DR resources as an example)

CAISO is considering two approaches to calculating UCAP for new resources*

- Option 2: Start with NQC value, place heavy emphasis on actual performance in initial years:
 - Year 0: (i.e. before actual operational data): NQC
 - Year 1: 70% year 0 performance, 30% NQC
 - Year 2: 55% year 1, 35% year 0, 10% NQC
 - Year 3: 45% year 2, 35% year 1, 20 year 0

Starts with higher capacity value, but actual performance can have significant impact early on

* May not apply to all new resources (see DR resources as an example)

UCAP METHODOLOGIES FOR NON-CONVENTIONAL GENERATORS

State of charge for storage resources must be considered, in addition to forced outage rates, to fully measure availability

- Optional parameters available to storage may restrict availability below full RA amount in real-time
 - **End of Hour State of Charge (EOH SOC):** an optional real-time market biddable parameter to achieve desired state of charge by the end of an hour
- UCAP calculation should consider SOC constraints in storage resources' UCAP calculation, in addition to forced outage rates
 - Need to ensure there is no double counting if there is overlap between unavailability caused by both forced outage and SOC constraint
 - Should consider how SOC constraint affects resources' ability to be available for their full RA value for minimum duration
 - Should consider outages on both the charge and discharge portion of the resource

Examples

If the resource is a +/- 25 MW storage resource with 100 MWh of energy storage capability:

- **Hour 1:** The resource is not on outage (+/- 25 MW) in the real-time market, and there is no constraint on the state of charge for this hour
 - Total 4-hour deliverable energy in hour 1 (credit contribution for this hour): 25 MW
 - No impact to UCAP in this hour
- **Hour 2:** The resource is on outage for 5 MW (+/- 20 MW) in the real-time market, and there is no constraint on the state of charge for this hour
 - Total 4-hour deliverable energy in hour 2 (credit contribution for this hour): 20 MW
 - 5MW outage considered in UCAP calculation

Examples (cont.)

If the resource is a +/- 25 MW storage resource with 100 MWh of energy storage capability:

- **Hour 3:** The resource is not on outage (+/- 25 MW) in the real-time market, and they are imposing a minimum end of hour SOC of 25 MWh
 - Total 4-hour deliverable energy in hour 3 (credit contribution for this hour): $18.75 \text{ MW} = (100 \text{ MWh} - 25 \text{ MWh}) / 4 \text{ hours}$
 - $6.25 \text{ MW} = (25 - 18.75)$ unavailability considered in UCAP calculation
- **Hour 4:** The resource is on outage for 10 MW (+/- 15 MW) in the real-time market, and is imposing a minimum end of hour SOC of 25 MWh and a maximum state of charge of 75 MWh
 - Total 4-hour deliverable energy in hour 1 (credit contribution for this hour): $12.5 \text{ MW} = (75 \text{ MWh} - 25 \text{ MWh}) / 4 \text{ hours}$; note that this value is selected because it is less than the 15 MW that is bid into the market
 - $12.5 \text{ MW} = (25 - 12.5)$ unavailability considered in UCAP calculation

UCAP calculations should consider outages on the charge portion, in addition to the discharge portion, to ensure the resource can be charged

- CAISO proposes to use the lower absolute value between the upper and lower range of the resource to reflect resource availability
 - Bid range: from -20 MW to 25 MW -> May only qualify for 20 MW of capacity for this hour
 - Bid range: from -25 MW to 18 MW -> May only qualify for 18 MW of capacity for this hour
 - Bid Range: from -50 MW to 25 MW -> May qualify for full 25 MW of capacity
 - Bids Range: from -50 MW to 50 MW -> May still only qualify for 25 MW of capacity because that is the most that could be delivered persistently for 4 hours, given 100 MWh of energy storage capacity

CAISO is considering how to align hydro UCAP counting with recent CPUC proposed decision on hydro counting

- Currently, hydro QC is based on maximum capability (Pmax)
- Proposed decision provides optional methodology to reflect resource capability considering historic water availability year after year
 - Does not include mechanical outages, which would be subject to RAAIM under existing paradigm
 - UCAP should incorporate forced outages without double counting with optional methodology that considers water availability

For resources with QC values calculated using an ELCC methodology, CAISO will use ELCC value as the UCAP value

- CAISO will rely on an ELCC methodology when applicable
- ELCC will establish UCAP values for wind and solar resources
- Currently, the CPUC only applies this methodology to wind and solar resources, but could expand it to cover other variable energy resources such as weather sensitive or variable output DR

CAISO will use ELCC value as the UCAP value for two main reasons

1. Other ISOs equate wind and solar UCAP values with a statistical assessment of resources' output
2. ELCC already takes into account the probability of forced outages for wind and solar resources
 - By using ELCC, these technologies have already had QCs reductions for expected forced outages and derates
 - CAISO understands there are some shortcomings of this approach but believes this is the most appropriate option for the application of UCAP for these resource types

Resources that do not have ELCC based QC methodology but have a need for alternative UCAP determination approach

- For DR and QF resources their availability is often variable or limited to certain periods dictated by program hours or end-use customer needs
 - CAISO believes these resources should be assessed in a different manner to establish their UCAP values
- If LRAs do not adopt an ELCC based QC methodology for these variable and availability-limited resources, CAISO will apply an alternative UCAP determination

DR and QF resource: alternative performance based UCAP determination

- For DR and QF resources CAISO will evaluate resource performance relative to their dispatch instructions for periods when they received market awards
- CAISO will track each resource's historical performance over the prior 3 years and compare their market dispatches to their actual performance during those periods to establish the availability that will be applied to their UCAP value

For DR providers, the CAISO is also contemplating the need to apply this approach at an SC-level

- For DR providers, CAISO may need to apply this approach at an SC-level, rather than an individual resource level to mitigate the potential for gaming or manipulation by simply creating new DR resource IDs
- This SC-level approach is intended to avoid the potential that poorly performing DR providers receive class-average UCAP values simply by changing or creating a new resource IDs that have no historical data

Removing forced outage replacement and RAIM application to forced outage periods

- RAIM is not providing adequate incentive to provide substitute capacity for forced outages
- Potential causes include:
 - Costs already incorporated into capacity pricing
 - Penalty not high enough
 - Spreading benefits too thin to motivate substitution
 - Costs and benefits mitigated across SC portfolio effects (*i.e.*, an SC receives similar RAIM charges and incentives)
 - Too many RAIM exclusions/exemptions
 - The dead band applying for the first outages

Very little substitute capacity is being provided to the CAISO in response to forced outages

- CAISO believes a superior approach is to establish incentives to conduct resource maintenance to avoid outages and to procure capacity that is more reliable in the first instance
 - It is reasonable to eliminate RAIM once an alternative solution is in place
- UCAP provides the proper incentives, while still allowing LSEs to procure the most cost effective capacity needed to meet their procurement obligations
- CAISO will eliminate RAIM once UCAP is implemented
 - UCAP relies on the upfront and transparent accounting of resource availability and reliability

Next Steps

- Comments due to initiativecomments@caiso.com by June 24.