Resource Adequacy Enhancements: Portfolio Assessment

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ISO seeks Market Surveillance Committee's input on the following items:

- Modeling inputs and assumptions
- Metrics and measurements for assessing the adequacy

The ISO will conduct a monthly portfolio deficiency test of the shown RA fleet

- A stochastic production simulation tool to assess how likely the shown monthly RA fleet supports grid reliability
  - Stochastic approach offers best opportunity to assess the widest array of load, wind, and solar profiles and historic outage profiles
- Uses only shown RA fleet to determine if the ISO can:
  - Serve forecasted gross and net-load peaks
  - Maintain adequate reserves and load following capability in that relevant RA compliance month
- Done for system level needs on monthly RA showings
  - Only showings where LSEs must meet 100 percent of the RA capacity requirements
  - Local capacity needs will be assessed under existing methods

Stochastic monthly assessments pose unique challenges

- Stochastic production simulation provides a distribution of potential outcomes and probabilities, not yes-no
  - There are clear yes-no answers regarding the adequacy of the portfolio of resources when using an “RA accounting” or deterministic production simulation
- The goal is to establish the data needed to build the framework to determine
  - The adequacy of a given portfolio and
  - How much additional capacity may be needed if the fleet is determined to be inadequate

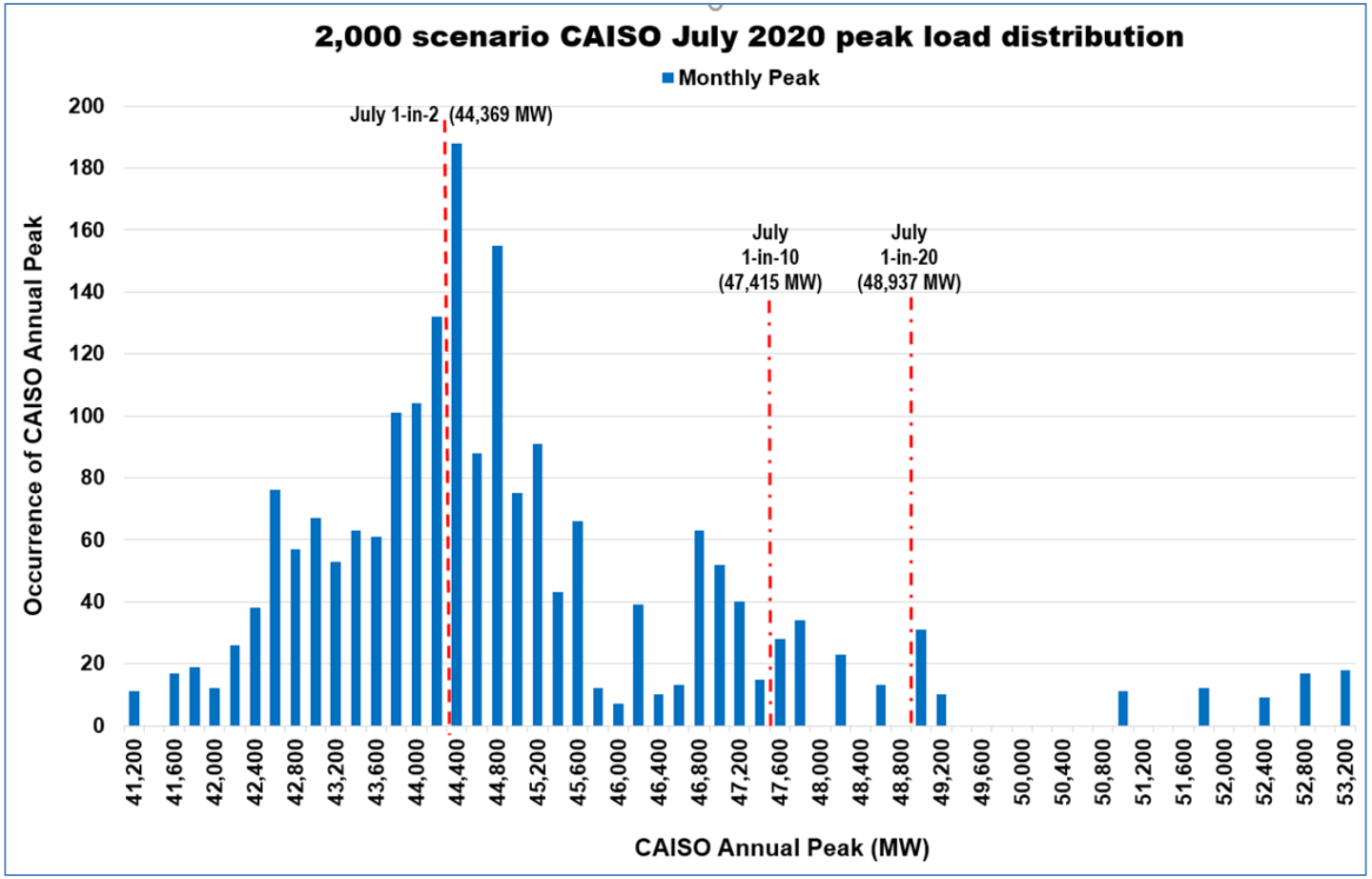
ISO's objective is to provide insight and transparency into the assessment model, methods, and initial findings that inform the portfolio assessment

- The ISO modeled two scenarios: July 2020 RA fleet and a "Thermal Scenario"
  - Allows the ISO to compare the relative needs created by an RA fleet in 2005 and the July 2020 RA showings
- The results presented here are instructive, though not conclusive
- ISO will conduct modeling using other months' RA showings

Overview of the iterations and output

- ISO's model is run using 2,000 month-long iterations
- Each iteration pulls from data sets containing profiles for
  - Load
  - Wind
  - Solar
  - Resource outages
- Once all iterations are complete, the ISO can compute the probability of a portfolio deficiency
- The model output can be expressed in terms of the probabilities of occurrence for the range of deficiency magnitudes observed

Distribution of monthly peak loads



The ISO tried to maintain consistent resource inputs to the greatest extent possible

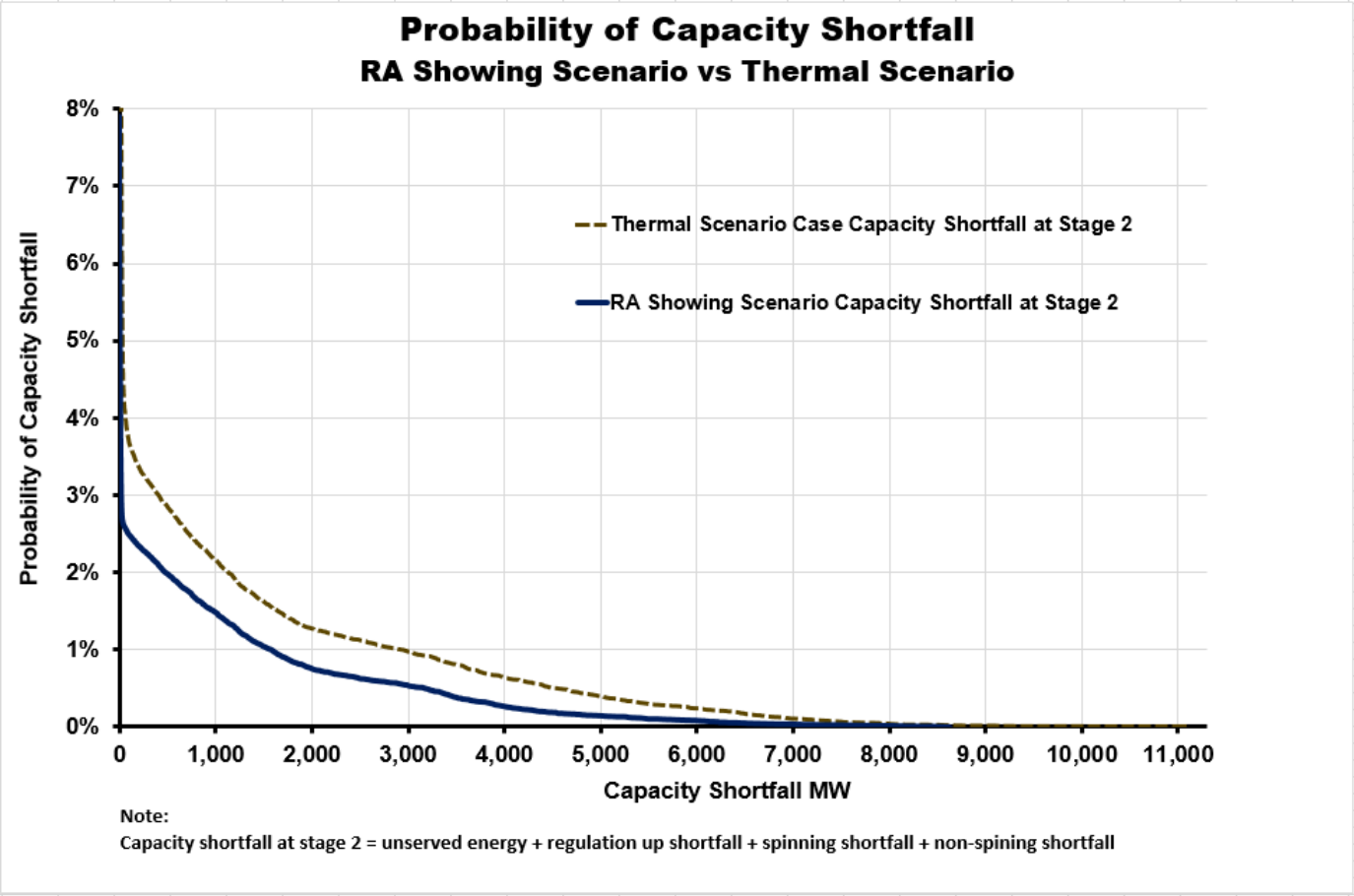
Fuel Type	RA Showing Scenario	Thermal Scenario	Fuel Type	RA Showing Scenario	Thermal Scenario
Battery	106	106	**Solar (RA)**	4,233	--
Biomass	535	535	**Wind (RA)**	1,222	--
Coal	11	11	**HRCV**	29	29
Demand Response*	1289	1289	**Other**	45	45
Distribution	165	165	**Pumping Load**	131	131
Gas*	27,512	27,512	**Generic CCGT**	--	3932
Geothermal	994	994	**Generic SCGT**	--	2621
Hydro	4,316	4,316	**Total RA**	50,466	51,562
Nuclear	2150	2150	**Solar (non-RA)**	333	--
Pump Hydro	1391	1391	**Wind (RA)**	0	--
Interchange*	6335	6335	**Total**	50,799	51,562
*** Includes both RA showings and credits**					

The resource mix used by the ISO in the RA showing scenario includes all generating resources provided on LSE RA showings

What defines a “deficiency?”

- The ISO defines a deficiency as follows:
  - Any hour in which the production simulation shows the ISO would have to call a Stage Two Emergency. This means the model shows the ISO would have inadequate capacity to meet the aggregate of non-spin, spin, regulation, and load
- Though included in the model, shortfalls in load following alone are not flagged as deficiencies

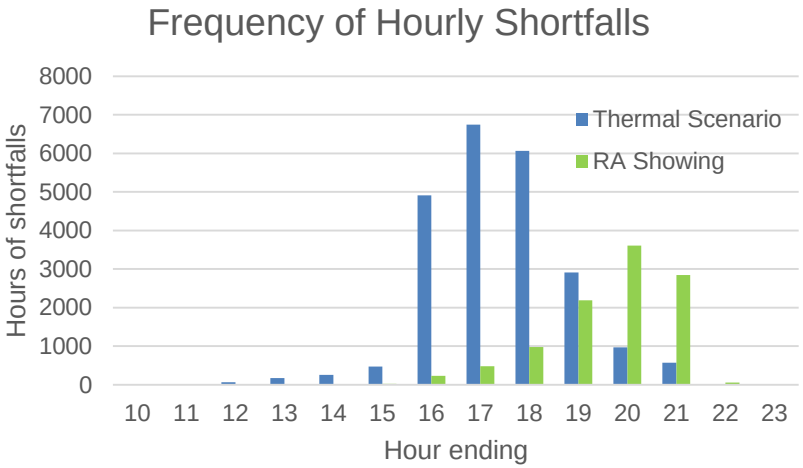
Results: Probability of capacity shortfall

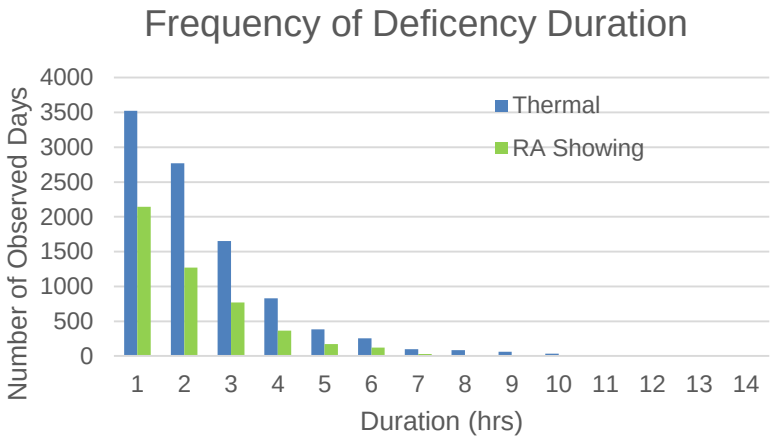


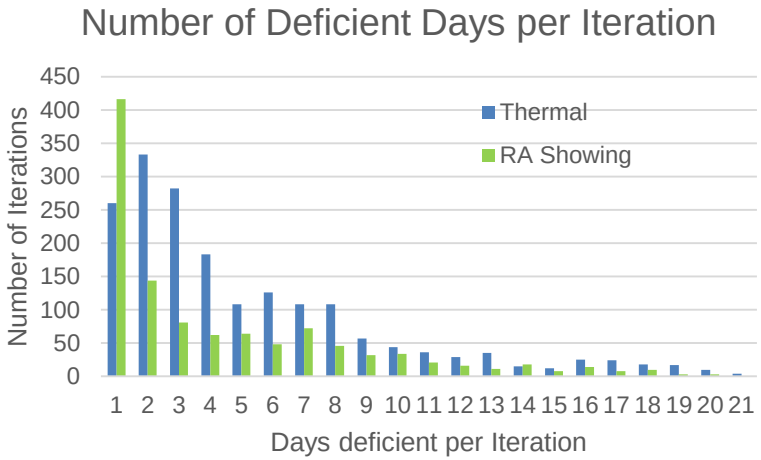
The desired service level reliability standard is defined by determining an acceptable loss of load probability when setting its RA procurement targets

- Based on the ISO's study results, the July 2020 RA showing would provide for approximately a three percent loss-of-load expectation (LOLE)
  - This probability translates to a 0.93 days LOLE in July
  - If July is representative of all 12 months, this would result in an equivalent of 10.95 days LOLE for the year
- That is not to say that the ISO would shed firm load during each instance when it is short of RA
- It does mean the ISO would lean more heavily on backstop procurement

The ISO also reviewed a collection of frequency distributions







These distributions can be informative when trying to

- Assess potential additional risks that may be present
- Provide guidance on the type of resource needed to deal with the deficiencies

How should the reliability provided from RA be measured?

- To establish procurement obligations it is necessary determine if some level of load shedding is acceptable
  - A key consideration for determining the desired service level reliability is the willingness to incur the costs needed to insure a given probability (i.e. the trade-off between cost for more capacity vs. societal cost of lost load)
- Options include:
  - Loss-of-Load Expectation/Loss-of-Load Probability
  - Expected Unserved Energy (EUE)
  - Both
  - Combination

The ISO has provided data to establish a foundational framework to answer the primary questions

- The two core challenges that must be addressed are:
  1. Establishing a defined reliability criteria or loss-of-load expectation that determines procurement targets and backstop procurement trigger
  2. Determining the quantity and attributes of capacity needed to address a portfolio deficiency

To answer the first question, three decisions must be made

1. The correct granularity of the RA program: Annual, Seasonal, or Monthly?
2. The application of an annualized planning standard
3. The desired service level reliability target

These questions may be asked and answered in different orders

Where the probability intersects the vertical axis defines the service level reliability through forward procurement