



R.14-10-010 Track III

Monthly LOLE and ELCC Modeling

California Public Utilities Commission

Donald Brooks

Energy Resources Modeling Section

Energy Division

November 8, 2016





Evacuation Procedure

In the event of an emergency evacuation, please calmly proceed out the nearest exit.

★ Our assembly point is the park in front of the War Memorial Theater





Remote Access

- Please place yourself on mute, and remain on mute unless you are asking a question
- **To mute / unmute press *6**
- **PLEASE DO NOT PUT YOUR LINE ON HOLD!**

November 8, 2016
10:00 am – 4:00 pm

To join by phone:

Teleconference number: 866 811 4174

Passcode: 4390072#

Participant code:

WebEx information:

Meeting Number: 742 711 180

Meeting Password: !Energy1

To start or join the online meeting:

Go to:

<https://van.webex.com/van/j.php?MTID=m014987859c2459474f7f3b8e6a84789f>





Agenda for Today

- CPUC presentation
 - Context and Introduction – big takeaways
 - Big data updates/modeling changes since Mar 2016
 - Proposal to base monthly ELCC on monthly LOLE – 2 ways to calculate monthly LOLE
 - Monthly LOLE results and monthly ELCC
- Calpine ELCC presentation results
- SCE revised ELCC proposal
- Simplified Energy Division monthly ELCC proposal
- Next steps/Questions
- Lunch between noon and 1 pm, and a break around 2:30





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Context and Intro – big takeaways

- PU Code section 399.26(d) requires the CPUC to determine the effective load carrying capacity (ELCC) of wind and solar resources for purposes of the state's resource adequacy program.
- Energy Division has been using the SERVIM model maintained by Astrape Consulting
- Energy Division issued a proposal in March 2016 to generate LOLE and ELCC for an annual basis and to calculate locational factors for wind and solar generators
- The Commission chose not to adopt Energy Division's proposal, encouraging Energy Division to develop a plan to allocate ELCC values to individual months reflective of reliability conditions and reliability need.
- Energy Division has a plan, and presents the first part of the calculations – monthly LOLE results





Context and Intro – big takeaways

- Energy Division staff presents three plans to calculate LOLE values. Annual and two Monthly LOLE metrics
 - Equalized LOLE in each month – LOLE in each month in the range of 0.0175 - 0.025; totals around 0.26, more than 0.1
 - Minimized LOLE - Maintain about same LOLE in five summer months, but lower margin of effective capacity until minimum non-zero LOLE results in offpeak months
- Staff is presenting ideas to start conversation – which way is best? Alternative ideas?
- Monthly LOLE is the foundation for monthly ELCC. Staff will calculate monthly ELCC once monthly LOLE is calculated





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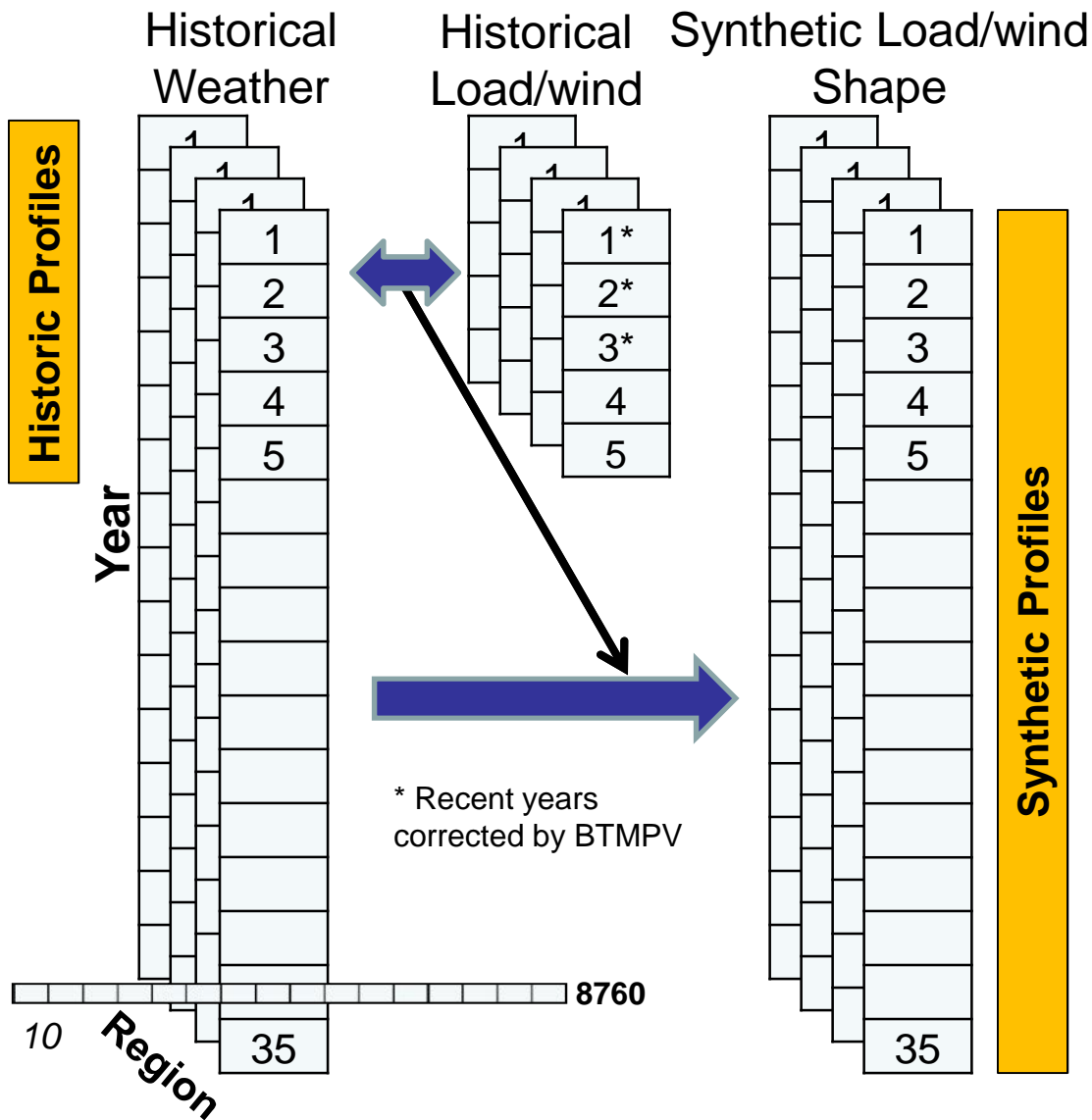
Updates/Modeling Changes since March

- Staff has updated several critical datasets
 - 17 external areas – BA areas instead of state borders. Same 8 areas for California
 - Remodeled load, wind, solar fixed and solar tracking shapes to match new regions and added 2013 and 2014 weather data. Shapes trained to 2010-2014 weather, update from 2008-2012 weather
 - Updated to 2026 Common Case v1.5 for outside of CA
 - Updated to IEPR 2015, reconstituted CONSUMPTION forecasts by adding back BTMPV generation and AAEE
 - Added RPS portfolios from the RPS Calculator and BTMPV from CEC adopted 2015 IEPR
 - Updated hydro shapes by adding production from 2013 and 2014 (drought affects) and by reclassifying hydro generators to correct regions





Update: Load (consumption) profiles



- 35 (1980-2014) Weather Years
- 25 Transmission Regions for WECC
 - 8 for CA, 17 outside of CA
- Profiles created for load and wind. Solar is created differently.
- Synthetic 8760 load profiles based on historical weather, scaled to target year peak and average annual consumption
- **Installed capacities are basis of renewable generation in target year**





Update to Regions Modeled in SERVM

California Regions	Regions external to California	
IID (Imperial Irrigation District) Balancing Authority Area (BAA)	AZPS including HGMA, GRMA, and DEAA	Portland General Electric WALC
LADWP BAA	BCHA and AESO	TEPC
PG&E Bay Area (Greater Bay Area LCR Area)	PSCO	WACM
PG&E Valley (Non-Bay PG&E Service Territory)	CFE	PACE
SCE Service Area	NWMT with GWA and WAUW	BPA including several smaller utilities
SDG&E Service Territory	NEVP	IPCO
Balancing Authority of Northern California (aka SMUD)	PNM and EPE	SPPC
TID (Turlock Irrigation District) BAA	PACW	SRP





Update: RPS portfolios added

- Staff added in several new RPS resources/portfolios to match RPS calculator linked here:
http://www.cpuc.ca.gov/RPS_Calculator/
 - 15 resources (1,246 MW) to achieve 40% RPS compliance, 223 (4,261 MW) resources for 45% RPS compliance, and 90 resources (5,196 MW) to achieve 50% RPS. Not all active by 2018
 - Added BTMPV annual growth to match CEC IEPR – 5,526 MW in 2018, growing to 12,165 MW by 2026
 - BTMPV resources are connected to the Solar PV production curves used for larger fixed solar generating plants





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Step zero - Annual LOLE Base Case

- Annual LOLE base Case
 - Effective Capacity is removed until LOLE equals 0.1 total in peak months.
 - Capacity surplus in PGE territory obscures LOLE – must remove significant MW amount to equalize LOLE across study areas
 - Capacity surplus causes significant excess generation, caused by locational constraints – can't move energy to help other areas
 - Effort made to levelize LOLE across areas – take out less in SCE and SDGE and more in PGE_Valley and PGE_Bay
 - Probability weighted average LOLE of 0.1 total across CAISO, and about equal in each of the four study areas in CAISO.

Area/Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CAISO	-	-	-	-	-	-	0.0283	0.0275	0.0479	0.0029	-	-
PGE_Bay	-	-	-	-	-	-	0.0282	0.0272	0.0478	0.0028	-	-
PGE_Valley	-	-	-	-	-	-	0.0277	0.0272	0.0473	0.0026	-	-
SCE	-	-	-	-	-	-	0.0282	0.0272	0.0479	0.0029	-	-
SDGE	-	-	-	-	-	-	0.0282	0.0275	0.0479	0.0029	-	-





Calibrating LOLE Across CAISO

- Effective capacity was removed in specific study areas to equalize LOLE in each of the four CAISO study areas
 - Effort made to equalize LOLE across study areas, unlike previous studies in March which allowed LOLE to be concentrated in SCE and SDG&E
 - Significant capacity surplus in PGE_Valley area without sufficient transmission capacity to move it all across CAISO
 - Removed Diablo Canyon and the old Moss Landing units 6 and 7 to raise LOLE
 - Other large generators (about 2,750 MW) announced retirement by 2018 also since March proposal Most in PGE areas
 - None removed in SCE and SDG&E areas regardless of age or OTC status, although one large and two small units announced retirement by 2018





Development of Monthly LOLE

- Once LOLE is calibrated in peak months, how to calibrate (add or remove units) to have monthly LOLE results? two alternatives
 - Equalize LOLE across all months (total 0.24 LOLE)
 - Maintain LOLE concentrated in peak months but barely surface LOLE in offpeak months





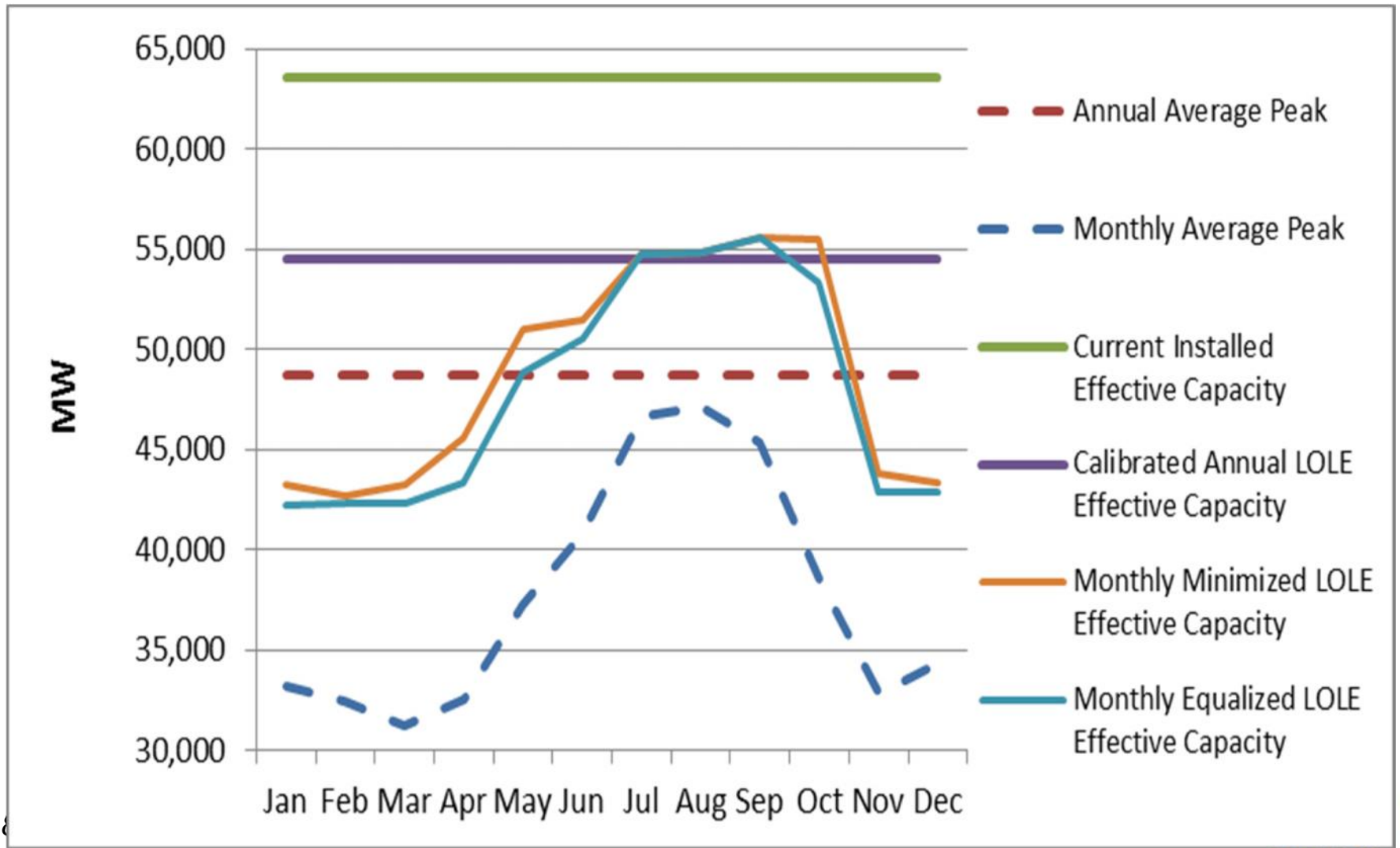
Further Effective Capacity is Removed

- In all cases, further effective capacity was removed relative to the Annual LOLE study in order to increase the LOLE levels in offpeak months
- Staff reviewed the RA filings for 2016 and identified units that were committed as RA in peak months but not committed as RA in offpeak months
- Staff attempted to follow the procurement patterns of LSEs



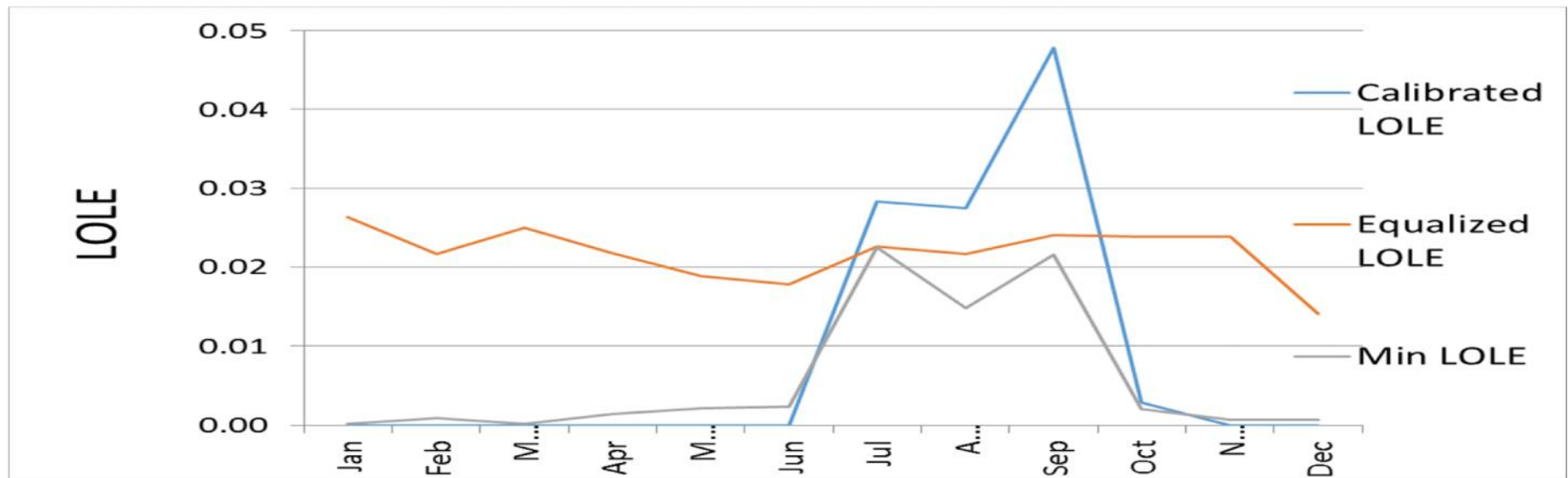


Load versus Capacity – LOLE studies





LOLE Results – Monthly Proposals

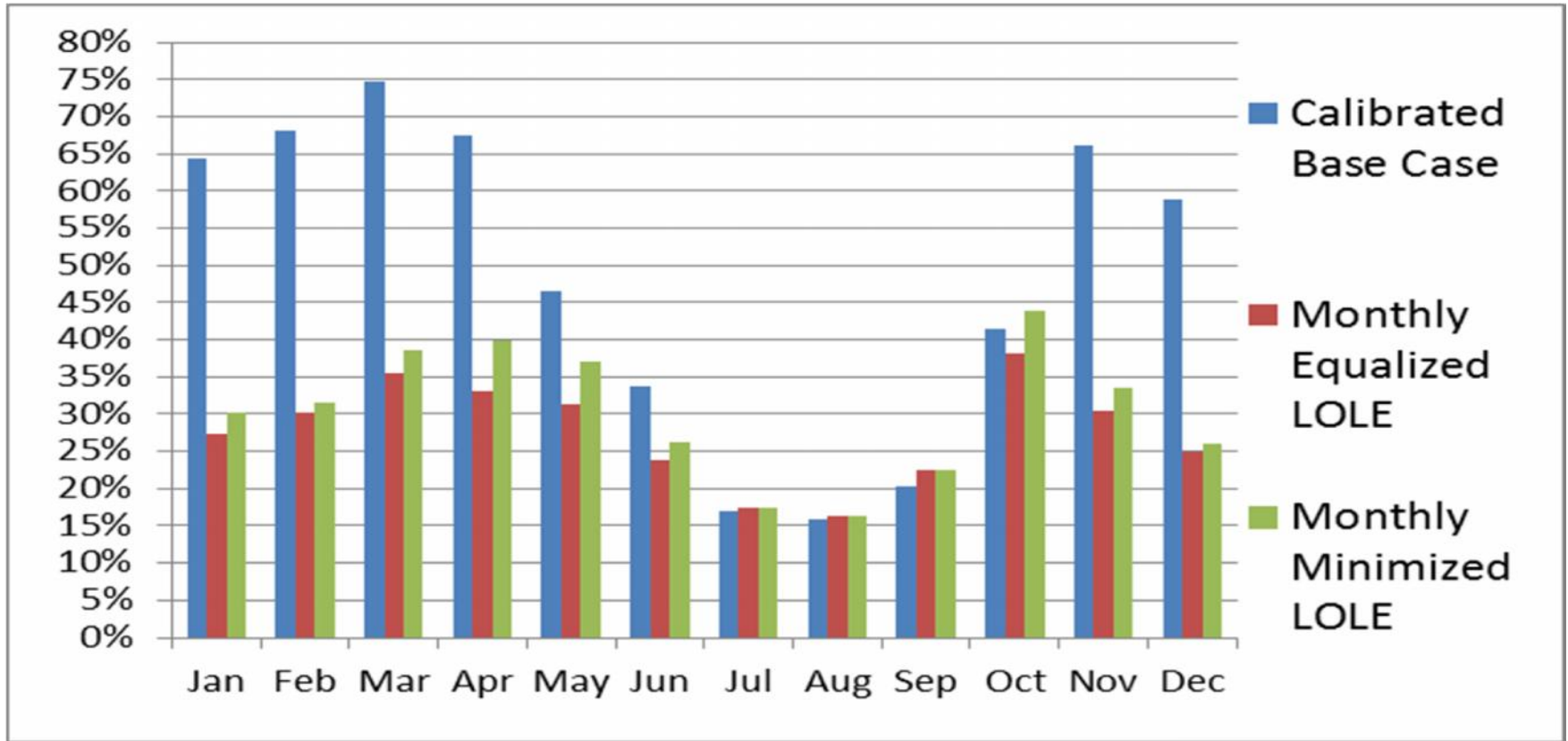


Key decision to make – what does monthly LOLE mean? What is the desired level?





Reserve Margins – Monthly Proposals



Key insight – choice of LOLE carries consequences in terms of reserve margin





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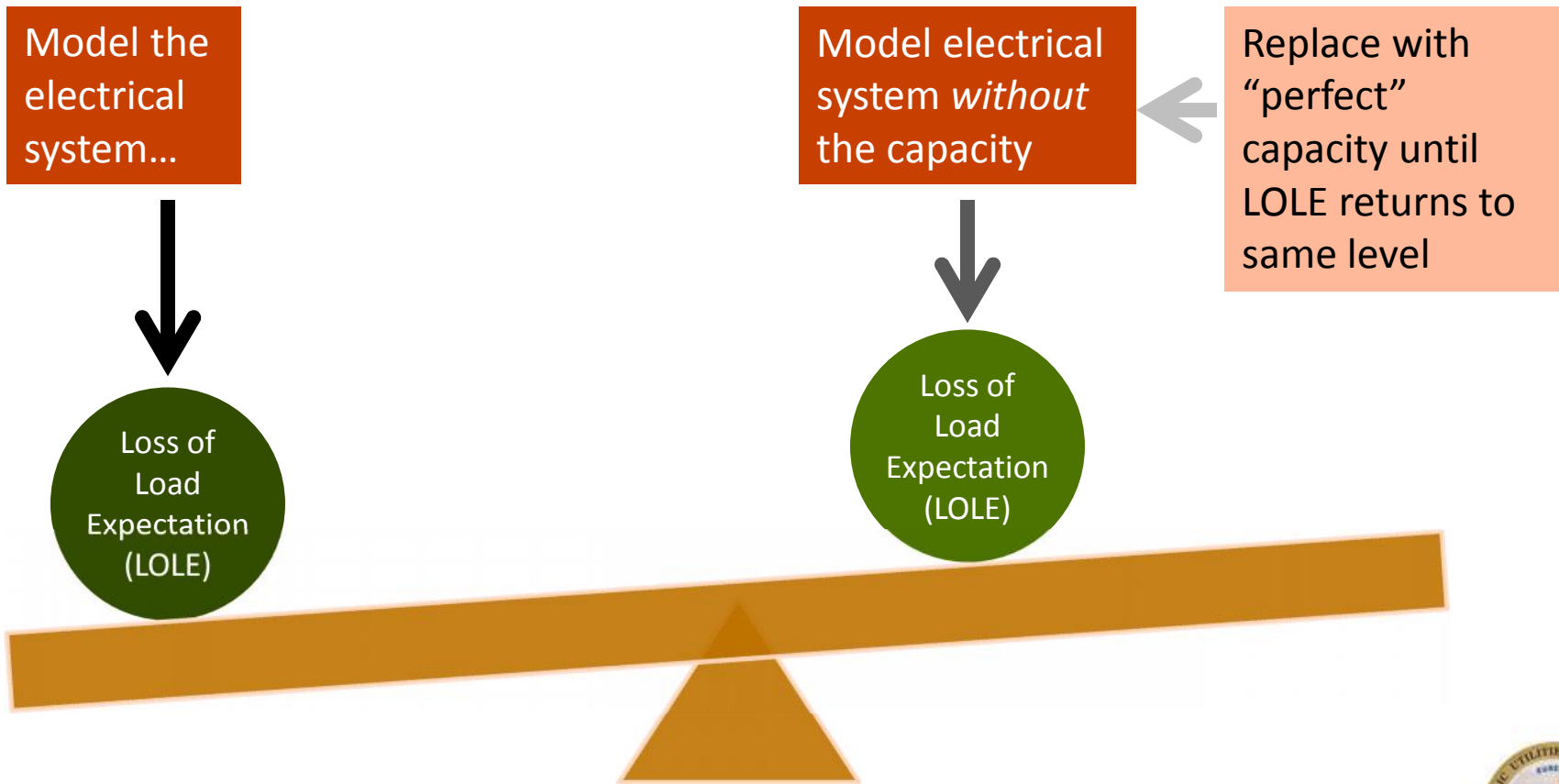
Monthly LOLE and monthly ELCC

- ELCC represents the equivalent capacity value of a particular generator to meet load relative to a “perfect” generator
- Meeting load is observed as ability to mitigate LOLE
- Review of ELCC study process



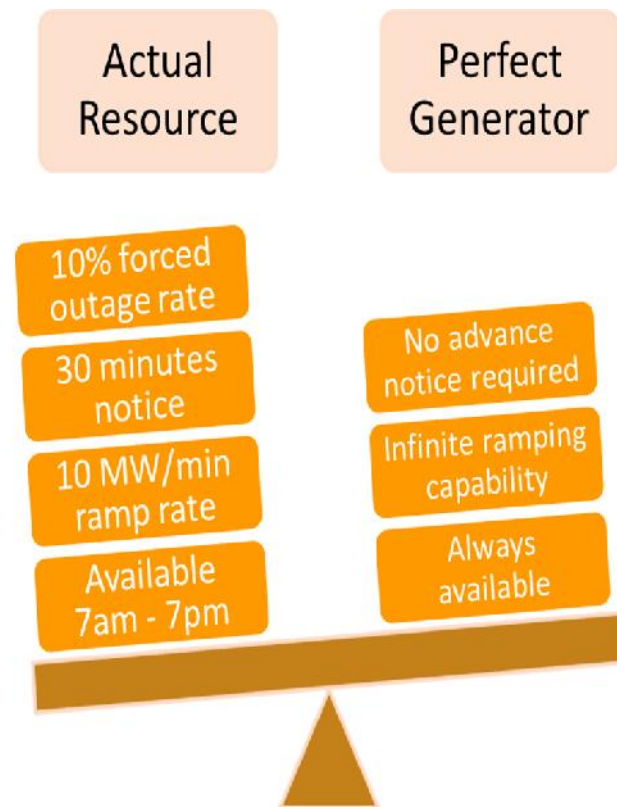


$$\text{ELCC} = \text{Perfect MW} / \text{Resource MW}$$





ELCC Studies are Iterative



Calibrate LOLE then study ELCC

1. All solar/ wind is removed
2. Perfect Generator is added and system is remodeled
3. Repeated until system is returned to desired LOLE
4. Monthly ELCC study looks at each month individually
5. Perfect capacity comparison allows comparison of all generators against same standard





Next Steps/Q+A

- Staff will submit a complete monthly LOLE and ELCC proposal on December 16
- Once monthly LOLE is settled on, staff will perform monthly ELCC studies and present results
- Propose same locational factors calculated for March proposal – will include that material again in proposal
- Questions/Answers
- Lunch Break

