Energy Division Revised Proposal Monthly LOLE and Monthly ELCC

Donald Brooks

Supervisor, Energy Resource Modeling

Energy Division

California Public Utilities Commission

Tuesday, February 14, 2017

Evacuation Procedure

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

•In the event of an emergency evacuation, please cross McAllister Street, and gather in the Opera House courtyard down Van Ness, across from City Hall.

Remote Access

- Please place yourself on mute, and remain on mute unless you are asking a question
- All phones will be listen only – please use WebEx to raise your hand if you have a question
- **To mute / unmute press *6**
- ***PLEASE DO NOT PUT YOUR LINE ON HOLD!***

November 8, 2016 **10:00 am – 4:00 pm**	**<u>To join by phone</u>:** **Teleconference number: 866 811 4174** **Passcode: 4390072#** **<u>WebEx Information</u>** Meeting Number: 749 010 451 Meeting Password: !Energy1 To start or join the online meeting: Go to: https://van.webex.com/van/j.php?MTID=m007fbe340a658754424b783c8e5910bd

Workshop Purpose and Goals

- Provide parties with greater clarity and understanding of Phase 3 Proposals
- Provide parties an opportunity to:
  - Informally address concerns raised in comments
  - Provide additional analysis that may help others better understand proposals
- Encourage discussion and collaboration leading to more refined Phase 3 proposals which are due February 24th

February 14th Workshop Agenda

10:00 - 10:15 am	**Introduction & Ground Rules, Review Agenda and Goals**	*Jaime Rose Gannon* *Donald Brooks*
10:15 - 10:25 am	**Commissioner Randolph Introduction and Opening Remarks**	*Commissioner Randolph*
10:25 - 12:30 am	**Effective Load Carrying Capacity (ELCC) Proposals**	
	Energy Division Staff Proposal	*Donald Brooks*
	Calpine Proposal	*Calpine*
	Round Table Discussion	
12:30 - 1:45 am	**Lunch**	
1:45 - 2:00 pm	**ELCC, continued**	
	Discussion of a 2018 Phase-in Proposal	*Donald Brooks*
2:00 - 4:00 pm	**Load Forecast Proposals**	
	Coincident Adjustment Based on Current Customer Load	*CLECA*
	BTM Resources Reporting in the Load Forecast Process	*Jaime Rose Gannon*
	Preliminary Allocation Timeline	*PG&E*
	Mandatory YA Load Migration Reporting	*PG&E*
3:50 - 4:00pm	**Wrap up, Review Next Steps**	*Jaime Rose Gannon*

Commissioner Randolph Opening Remarks

Background and Definitions

- Loss of Load Expectation (LOLE) is equal to the expected number of events (of any duration) over a period of time
- Effective Load Carrying Capability (ELCC) equals the comparative value of a generator in terms of reducing LOLE compared to a Perfect Generator
  - ELCC equals ratio of (MW of Perfect Generator)/(MW of generator being studied) – percentage between 0 and 1
  - Perfect Generator would have ELCC equal to 1
  - A generator with ELCC of 0.5 is half as good at reducing LOLE as a Perfect Generator

Energy Division Revised Proposal

- ED staff (on 12-16) proposed monthly ELCC values for solar generators, including BTM solar.
- Calpine also proposed monthly ELCC values for wind and solar, based on a study of the Portfolio ELCC of the whole RPS fleet, then distributed diversity benefit to solar/wind prorated from total Portfolio RPS fleet ELCC.

ED incorporated parts of Calpine's proposed method

- Correction to load shapes for daylight savings time
- Portfolio ELCC – Diversity Adjustment
- Portfolio ELCC studied removing BOTH solar and wind, then standalone ELCC values were studied removing EITHER wind or solar
- Calpine may have done this differently – opposite diversity adjustment

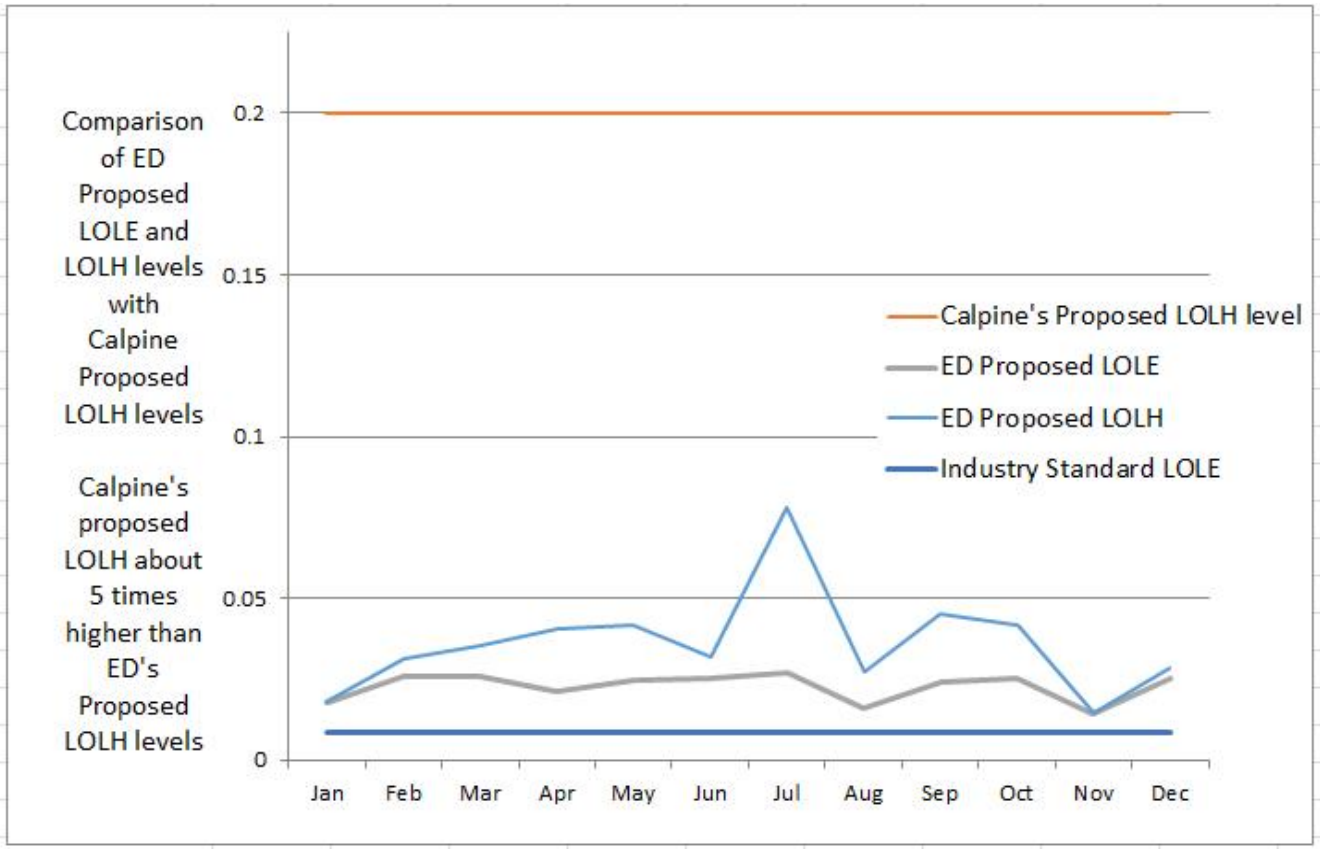
Load Shapes – Daylight Savings Adjustment

- Calpine staff pointed out that ED's posted load profiles appeared to be offset from corresponding wind/solar production by one hour during daylight savings time
- ED corrected the load shapes and reran the studies
- ED staff intends to repost corrected load shapes to CPUC website

LOLE – LOLH translation

- Loss of Load Expectation (LOLE) reflects the expected **number** of Loss of Load Events – frequency but not duration or magnitude
- Loss of Load Hours (LOLH) represents the expected total duration of Loss of Load Events, not frequency or magnitude
- LOLH/LOLE equals the average **duration** of each outage event in hours
- Standard industry metric LOLE – 0.1 total Loss of Load Events per year or 0.1/12 per month

LOLE and LOLH – ED base case vs. Calpine's proposed LOLH level



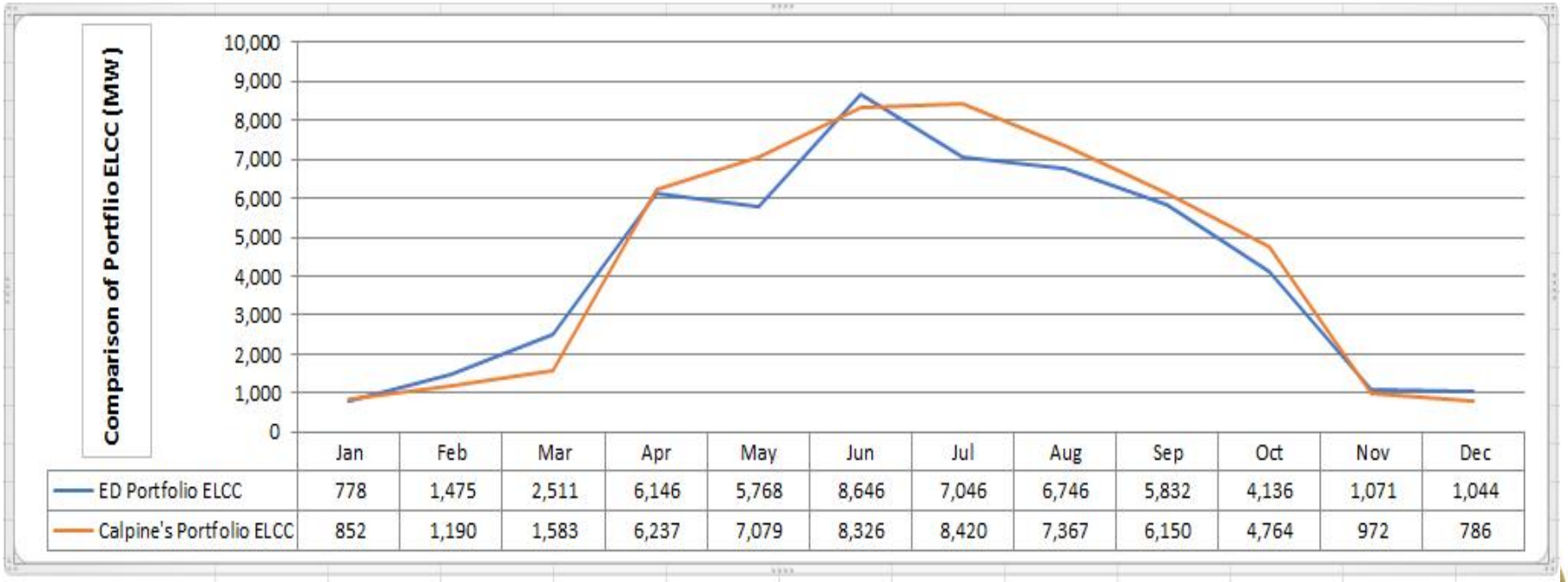
- Calpine's proposal starts from a LOLH level corresponding to a far higher LOLE level than ED's proposal (2.4 LOLH total for a year)
- ED proposal much closer to industry standard of 0.1/12 LOLE total for a year

Revised ED proposal closer to Calpine

- ED studied monthly portfolio ELCC – removed all wind and solar generators in CAISO areas and replaced with Perfect Capacity until returned to 0.02 LOLE each month
- Standalone solar ELCC calculated by adding back wind, removing solar, then replacing with Perfect Capacity. Standalone wind ELCC calculated the same way – with solar included and wind removed
- Difference between Portfolio ELCC and sum of wind and solar standalone ELCCs is allocated as a diversity adjustment – can be positive or negative
- Solar standalone ELCC values are draft – will be final by Feb 24th

Comparison of Portfolio ELCC

- ED Portfolio ELCC results are similar to Calpine Portfolio ELCC results



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ED Portfolio ELCC	778	1,475	2,511	6,146	5,768	8,646	7,046	6,746	5,832	4,136	1,071	1,044
Calpine's Portfolio ELCC	852	1,190	1,583	6,237	7,079	8,326	8,420	7,367	6,150	4,764	972	786

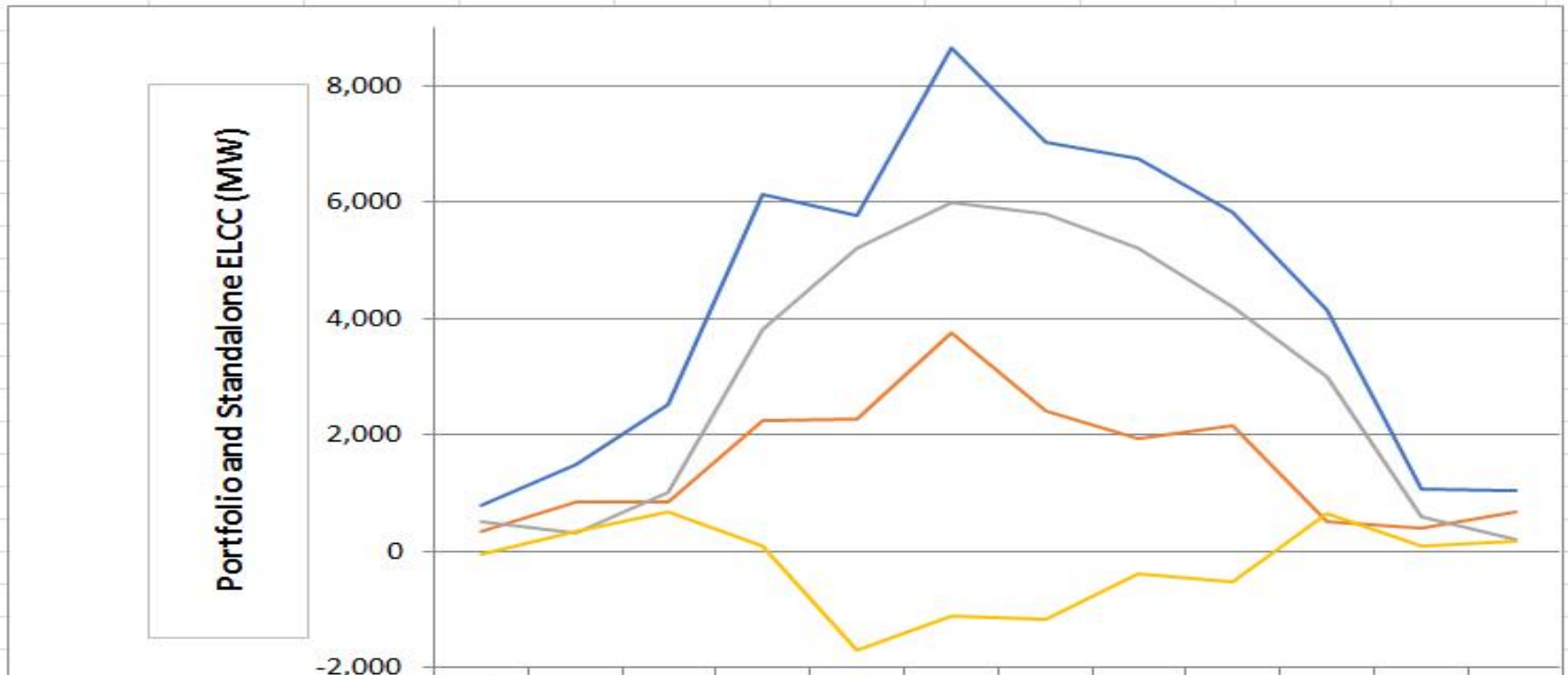
Proposed ED ELCC Results

- ED staff completed a study of Portfolio ELCC
  - Portfolio ELCC equals the effective load carrying equivalent (in MW of Perfect Capacity) to provide the same reliability benefit as all the wind and solar generators studied.
- Standalone solar and wind ELCC values are totaled and compared to Portfolio ELCC each month – standalone values are adjusted up or down to equal Portfolio ELCC by a Diversity Adjustment

Diversity Adjustment allocation:(Solar Standalone ELCC/Total Standalone Wind and Solar ELCC)*Diversity Adjustment

Example – Jan Solar Diversity Adjustment=
500/(500+339)-61 = -36*
Final January Solar ELCC = 500-36=464 MW
Final Wind ELCC is calculated the same way

ELCC Results and Diversity Adder



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Portfolio ELCC	778	1,475	2,511	6,146	5,768	8,646	7,046	6,746	5,832	4,136	1,071	1,044
Wind Standalone ELCC	339	841	838	2,246	2,282	3,764	2,425	1,928	2,147	500	385	663
Draft Solar Standalone ELCC	500	300	1,000	3,800	5,200	6,000	5,800	5,200	4,200	3,000	600	200
Diversity Adjustment	-61	334	673	100	-1,715	-1,118	-1,179	-382	-515	636	86	181

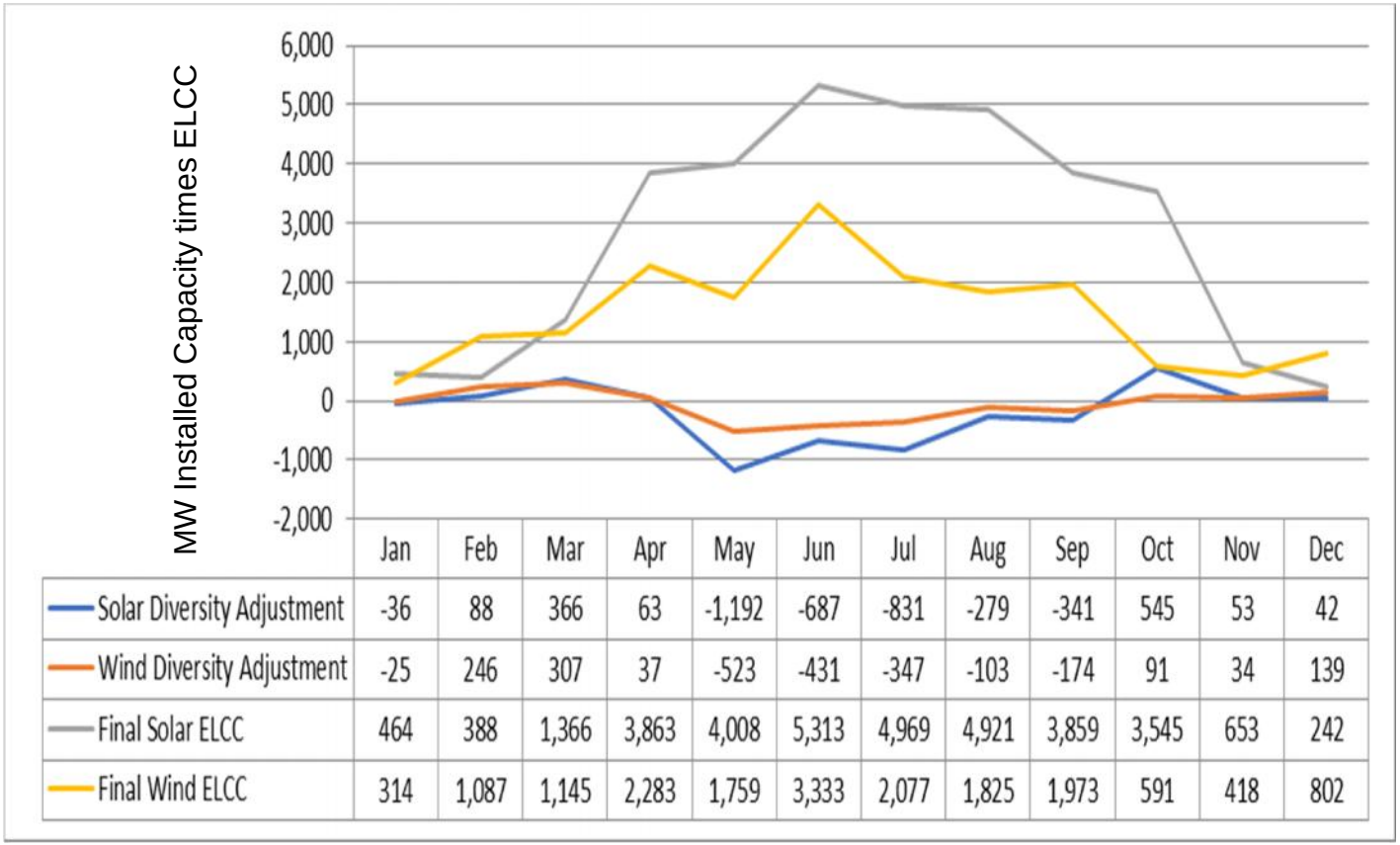
Diversity Adjustment allocation:
(Solar Standalone ELCC/Total Standalone Wind and Solar ELCC)*Diversity Adjustment *Example – Jan Solar Diversity Adjustment = 500/(500+339)*-61 = -36*
Final January Solar ELCC = 500-36=464 MW

Calculation of Standalone ELCC

- Standalone wind or solar ELCC calculated by taking either wind or solar out and adding in Perfect Capacity.
- When wind is removed, solar remains in the portfolio. When solar is removed, wind remains in the portfolio
- Diversity adjustment may be negative – adjusting downwards to **remove** the benefit of resource diversity embedded in standalone ELCC
- If wind was studied without solar in the portfolio and vice versa, diversity adjustment would likely be positive

Diversity Adjustment - Final ELCC Percentage

Diversity adjustment highest in shoulder months and negative in peak (June and July). Each month's MW equivalent ELCC is divided by total nameplate to calculate monthly ELCC percentages



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Solar Diversity Adjustment	-36	88	366	63	-1,192	-687	-831	-279	-341	545	53	42
Wind Diversity Adjustment	-25	246	307	37	-523	-431	-347	-103	-174	91	34	139
Final Solar ELCC	464	388	1,366	3,863	4,008	5,313	4,969	4,921	3,859	3,545	653	242
Final Wind ELCC	314	1,087	1,145	2,283	1,759	3,333	2,077	1,825	1,973	591	418	802

	Solar	Wind
Install	16,033	6,891
Jan	2.9%	4.6%
Feb	2.4%	15.8%
Mar	8.5%	16.6%
Apr	24.1%	33.1%
May	25.0%	25.5%
Jun	33.1%	48.4%
Jul	31.0%	30.1%
Aug	30.7%	26.5%
Sep	24.1%	28.6%
Oct	22.1%	8.6%
Nov	4.1%	6.1%
Dec	1.5%	11.6%

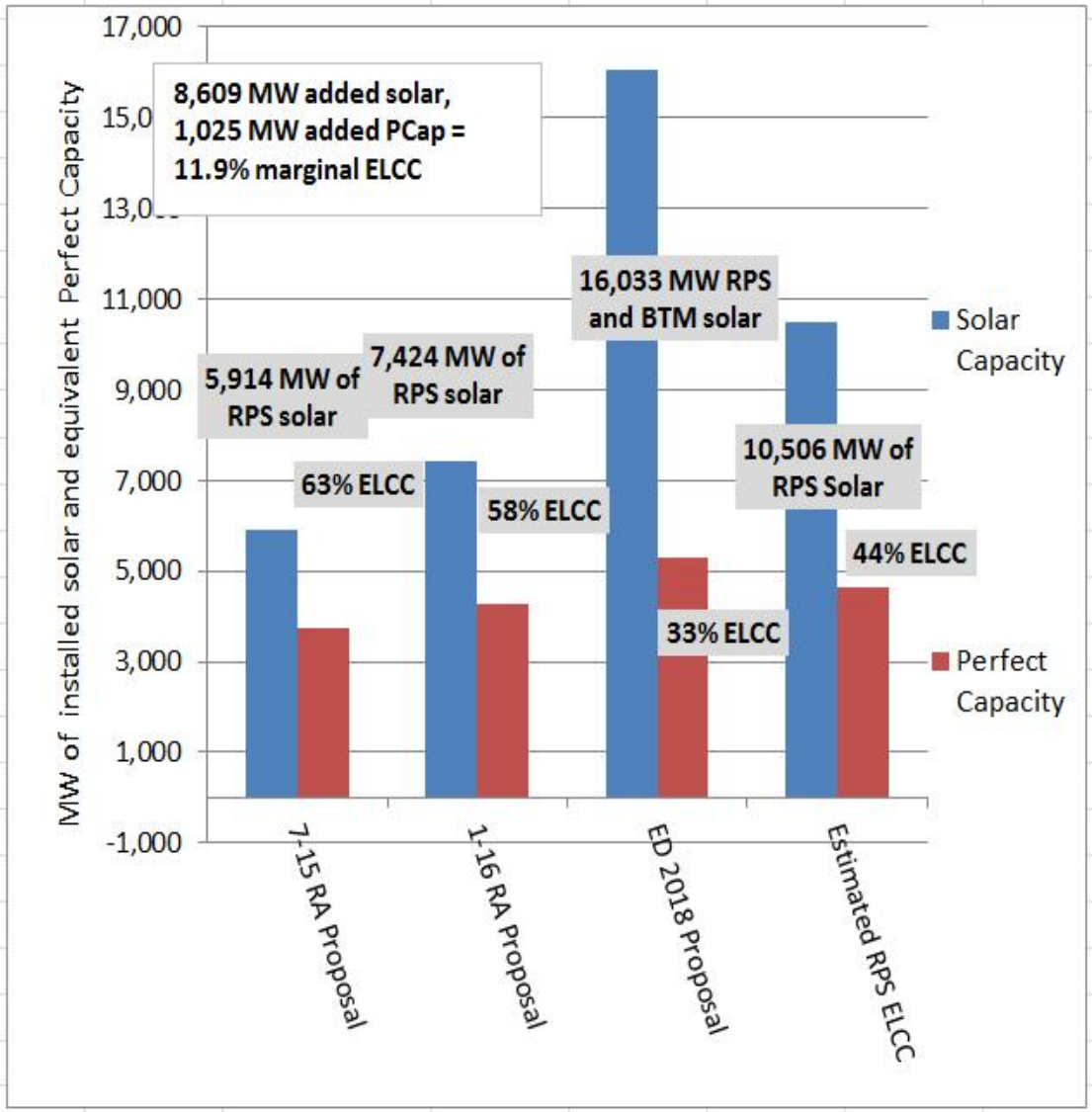
Estimated RPS only ELCC

- Both proposals (Calpine and ED) assess the ELCC of BTM PV and RPS solar together
- RA obligations and NQC calculations do not account for or value BTM PV
- Potential compromise – estimate effect of BTM PV on solar ELCC
- ED March 2016 ELCC Proposal
  - Annual ELCC for solar generators (excluding BTM PV) equaled 58% for 7,424 MW of solar equivalent to 4,288 MW of Perfect Capacity.
- ED December 2016 Updated ELCC Proposal
  - Annual ELCC for solar generators(including BTM PV) equaled 33% for 16,033 MW of solar equivalent to 5,313 MW of Perfect Capacity

Estimation of effect BTM PV has on overall solar ELCC

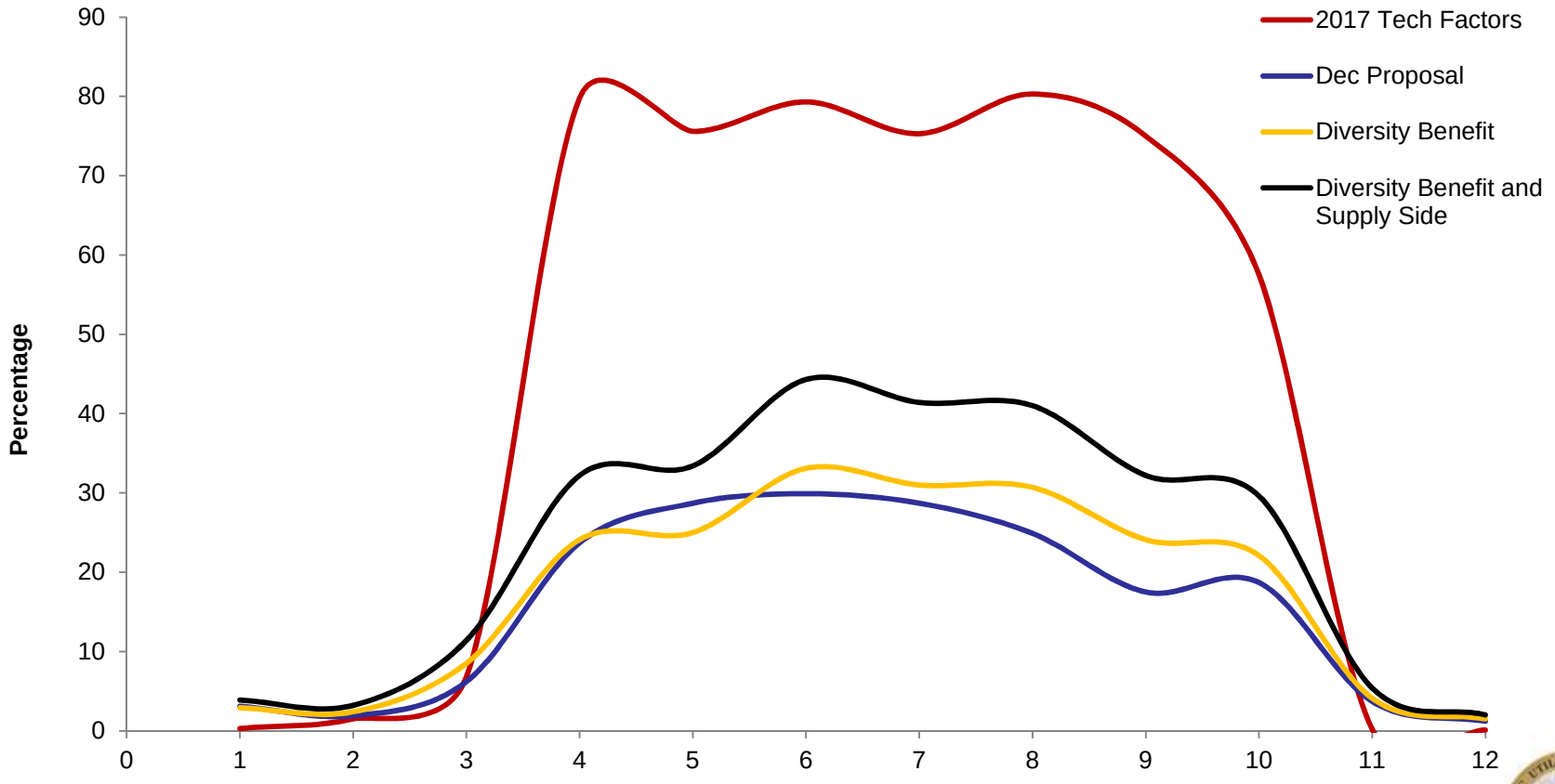
- Incremental RPS solar since Jan 2016 equals 3,082 MW out of 8,609 MW of total solar added (35.8% RPS, 64.2% BTM PV)
- Adjust proposed monthly solar ELCC by ratio of difference between proposed solar ELCC and estimated RPS non-BTM PV only ELCC
- 1,025 MW of Perfect Capacity added for 8,609 MW of additional solar. Prorated amount equals 367 MW Perfect Capacity for 3,082 MW of RPS non-BTM PV
- Estimated RPS-only solar ELCC (44.3%) compared to proposed solar ELCC (33%) results in ratio of 1.34
- Proposal to multiply each month's final solar ELCC by 1.34

Estimate of Supply Side ELCC



	Total RPS and BTM Solar	Estimated RPS only ELCC
MW Install	16,033	10,506
Jan	2.9%	3.9%
Feb	2.4%	3.2%
Mar	8.5%	11.4%
Apr	24.1%	32.2%
May	25.0%	33.4%
Jun	33.1%	44.3%
Jul	31.0%	41.4%
Aug	30.7%	41.0%
Sep	24.1%	32.2%
Oct	22.1%	29.6%
Nov	4.1%	5.4%
Dec	1.5%	2.0%

Comparison of Solar ELCC values



Round Table on ELCC – 30 min

Panelists include:

- Donald Brooks (ED)
- Matt Barmack (Calpine)
- Others as announced

Questions to consider

- Do we have sufficient material to adopt ELCC for 2018?
- What information would aid either ED or Calpine ELCC proposal?
- Do we have sufficient material to craft a compromise solution?
- What are the key differences and similarities between Calpine and ED proposals?

Next Steps/Calendar

February 7th and February 14th	Workshop on Phase 3 Proposals
Thursday, February 16, 2017	**Comments/Proposals on Multi-Year**
Friday, February 24, 2017	**Final Phase 3 Proposals, All Topics**
Friday, March 10, 2017	Comments on Final Phase 3 Proposals
Friday, March 24, 2017	Reply Comments on Final Phase 3 Proposals
Friday, April 14, 2017	Final LCR and FCR Studies
Friday, April 28, 2017	Comments on LCR and FCR Studies
Friday, May 05, 2017	Reply Comments on LCR and FCR Studies

R.14-10-010 Proceeding Schedule

Date	Event
Friday, September 23, 2016	Study Plans for FCR Topics (Comments)
October, 2016	Staff Report on Multiyear RA
October, 2016	Workshop on FCR and ELCC Topics
Thursday, December 1, 2016	Analysis of FCR and ELCC Topics (Comments)
Friday, December 16, 2016	Preliminary Phase 3 Proposals, All Topics
Friday, January 13, 2017	Comments on Preliminary Phase 3 Proposals
January or February, 2017 February 7th and February 14th	Workshop on Phase 3 Proposals
February 16, 2017	**Comments/Proposals on Multi-Year**
Friday, February 24, 2017	**Final Phase 3 Proposals, All Topics**
Friday, March 10, 2017	Comments on Final Phase 3 Proposals
Friday, March 24, 2017	Reply Comments on Final Phase 3 Proposals
Friday, April 14, 2017	Final LCR and FCR Studies
Friday, April 28, 2017	Comments on LCR and FCR Studies
Friday, May 05, 2017	Reply Comments on LCR and FCR Studies

Thank you!
For Additional Information:

www.cpuc.ca.gov