



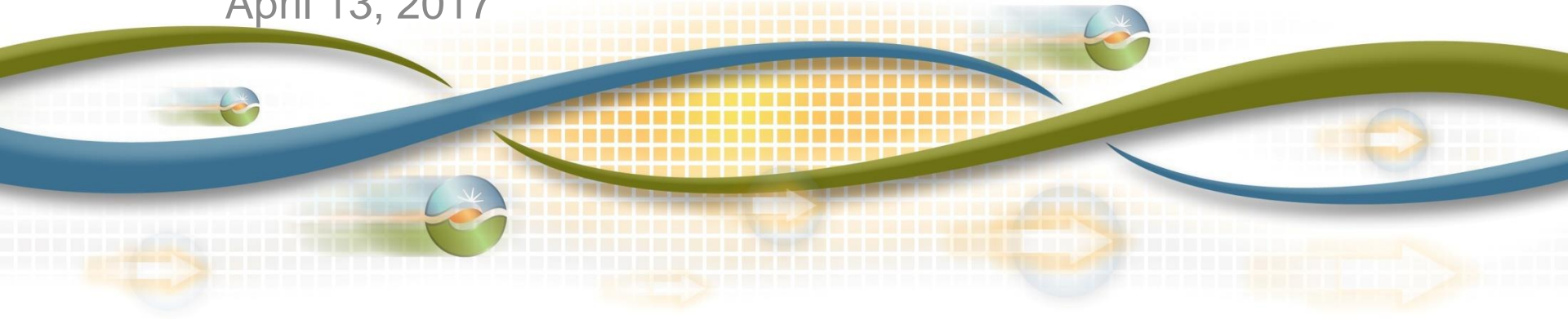
2018 & 2022 Final LCR Study Results LA Basin and San Diego-Imperial Valley Areas

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Stakeholder Conference Call

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LA Basin Area Loads & Resources

Loads

Year	Managed Peak Load (MW)	Peak Shift (MW)	Pump Loads	Transmission Losses (MW)	Total (MW)
2018	18,970	146	22	83	19,221
2022	18,454	458	23	90	19,025

The above total load for the LA Basin represents the geographic area load, which would correspond to the CEC demand forecast peak for the LA Basin, with Saugus load included. The electrical boundary load, without Saugus load, is 18,466 MW and 18,162 MW, respectively for 2018 and 2022. Saugus substation is located in the LA County and is considered part of the LA Basin geographic area.

Available Resources

Year	QF/Wind (MW)	Muni (MW)	Nuclear	Market (MW)	LTPP Preferred Resources (MW)	20-Minute DR (MW)	Mothballed (MW)	Maximum Qualifying Capacity (MW)
2018	380	1,176	0	8,279	144	321	435	10,735
2022	380	1,176	0	5,394	432	321	435	8,138

Major Transmission & Generation Assumptions

- San Luis Rey, San Onofre, Miguel and Santiago synchronous condensers (in-service anticipated prior to summer 2018);
- Huntington Beach Units 3 & 4 synchronous condensers retired at the end of 2017);
- Alamitos, Huntington Beach and Redondo Beach generation is assumed to retire by the end of 2020 timeframe to comply with the State Water Board's OTC Policy;
- Long-term procurement for preferred resources and conventional resources that were approved by the CPUC for the LA Basin fully implemented by the end of 2020 or prior to summer 2021.
- Carlsbad Energy Center (approved by the CPUC) is assumed to be delayed until Q4 2018; Encina Units 2 – 5 are on standby, assumed that OTC schedule is extended until Carlsbad Energy Center achieves commercial operation.
 - Encina Unit 1 retired by the end of Q1 2017 (to allow related generation interconnection for the new Carlsbad Energy Center);
 - Encina Units 2 – 5 are assumed to retire upon completion and energization of Carlsbad Energy Center (Q4 2018).
- Imperial Valley phase shifting transformers (230/230kV 2x400 MVA) in-service by June 2017;
- Sycamore – Penasquitos 230 kV transmission line (projected June 30, 2018);
- Mesa Loop-In project (June 2021);
- 20-minute Demand Response resources

Critical Area Contingencies

El Nido Sub-area – Category C

Contingency: Hinson – La Fresa 230 kV line out followed by double-circuit tower line La Fresa - Redondo #1 and #2 230 kV lines

Limiting component: Voltage Collapse

2018 LCR need: 227 MW

2022 LCR need: 0 MW

- No LCR requirement in 2022 due to lower demand forecast

El Nido Sub-area – Category B

No requirements.

Critical Area Contingencies

Western LA Basin Sub-area – Category C

Contingency (2018): Serrano – Villa Park #2 230 kV line, followed by Serrano – Lewis #1 or #2 230 kV line, or vice versa

Limiting component (2018): Serrano – Villa Park #1 230 kV line

Contingency (2022): Mesa – Redondo #1 230 kV line, followed by Mesa - Lighthipe 230 kV line, or vice versa

Limiting component (2022): Thermal loading on the Mesa-Laguna Bell #1 230 kV line

2018 LCR need: 3621 MW

2022 LCR need: 3803 MW

Western LA Basin Sub-area – Category B

Non binding – multiple combinations possible.

Critical Area Contingencies

Eastern LA Basin Subarea – Category C

Contingency (2018): Palo Verde – Colorado River 500 kV line out, followed by Serrano – Valley 500 kV line or vice versa

Limiting component (2018): Iron Mountain – Eagle Mountain 230 kV line

Contingency (2022): Alberhill – Serrano 500 kV line, followed by an N-2 of Red Bluff – Devers #1 & #2 500 kV lines

Limiting component (2022): post-transient voltage instability

2018 LCR need: 2361 MW

2022 LCR need: 2107 MW

Combined Overall LA Basin and San Diego-Imperial Valley LCR Assessment

The presentation on the combined overall LA Basin and San Diego-Imperial Valley LCR areas is common for both the LA Basin and San Diego-Imperial Valley area presentations

Combined Overall LA Basin and San Diego-Imperial Valley LCR Assessment

- Due to electrical interdependency, the overall LA Basin and San Diego – Imperial Valley areas are closely coordinated in the LCR study.
- The San Diego-Imperial Valley area is evaluated first due to its position as the southernmost area and power flow typically flows in the north to south direction with the outages that isolate SDG&E system from major import tie lines connecting to the WECC system that lie east of San Diego. The San Diego-Imperial Valley LCR need will be determined with the outages that affect this area.
- Once the preliminary LCR need is determined for the San Diego – Imperial Valley area, the LA Basin LCR need will be evaluated next based on the contingencies that would most affect the LA Basin.
- The ISO then checks for the San Diego – Imperial Valley area again to check for adequacy and to optimize its LCR need if possible.
- This effort goes back and forth several times until further LCR reduction can no longer be achieved for these two areas.

Overall San Diego-Imperial Valley Critical Contingencies

Category B & C (2018)

The LCR need for the overall San Diego-Imperial Valley area is driven by the limiting contingency of G-1 of (TDM), system readjustment, followed by an N-1 of the Imperial Valley-North Gila 500kV line

Limiting component: Imperial Valley – El Centro 230 kV line thermal loading

- San Diego-Imperial Valley LCR area LCR need: 4,032 MW
- Overall LA Basin 2018 LCR need: 7,300 MW

Overall San Diego-Imperial Valley Critical Contingencies (cont'd)

Category B & C (2022)

The LCR need for the overall San Diego-Imperial Valley area is driven by the limiting contingency of G-1 of (TDM), system readjustment, followed by an N-1 of the Imperial Valley-North Gila 500kV line

Limiting component: Imperial Valley – El Centro 230 kV line thermal loading

- San Diego-Imperial Valley LCR area LCR need: 4,643 MW
- Overall LA Basin 2018 LCR need: 5,957 MW
 - The LA Basin resources are not as effective as the Imperial Valley and San Diego subarea resources in mitigating the “S” line loading concern
 - The LCR need in the LA Basin is much lower when compared to the 2018 LCR need due to implementation of major transmission projects (i.e., Mesa Loop-In and Delaney – Colorado River 500 kV line) as well as having lower CEC demand forecast

Overall LA Basin Critical Contingency

Category C (2018)

Contingency: Lugo-Victorville 500 kV, system readjustment, followed by Sylmar-Gould 230 kV line out

Limiting component: Sylmar – Eagle Rock 230 kV line

- Overall LA Basin 2018 LCR need: 7,525 MW
- San Diego-Imperial Valley LCR area 2018 LCR need: 4,032 MW

Overall LA Basin Critical Contingency

Category C (2022)

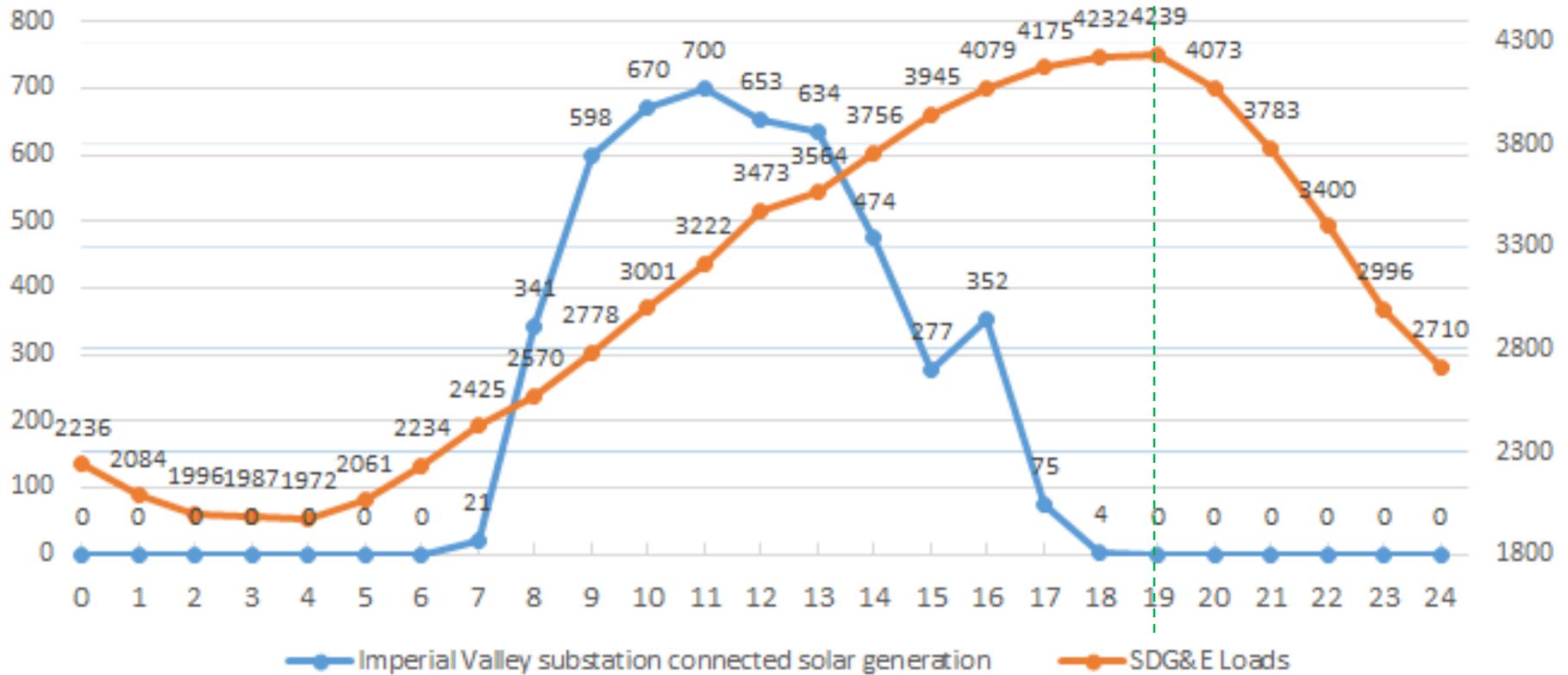
Contingency: Mesa – Redondo 230 kV line, system readjustment, followed by Mesa - Lighthipe 230 kV line out

Limiting component: Mesa – Laguna Bell #1 230 kV line

- Overall LA Basin 2018 LCR need: 6,022 MW
 - Lower LCR need in the LA Basin is attributed to implementation of transmission projects (i.e., Mesa Loop-In and Delaney – Colorado River 500 kV line projects) as well as lower CEC demand forecast (with peak shift)
- San Diego-Imperial Valley LCR area 2018 LCR need: 4,643 MW
 - Higher LCR need for the San Diego-Imperial Valley area is attributed to the constraint on the “S” line between IID and SDG&E and higher peak demand forecast (with peak shift)

Peak shift has already occurred

Imperial Valley connected solar generation output and SDG&E hourly loads (Sept. 26, 2016)



Overall LA Basin and San Diego-Imperial Valley Critical Contingencies – Sensitivity Study (2018)

Sensitivity study with Imperial Valley connected solar generation unavailable at 6 p.m. (based on EMS data for Sept. 26, 2016 high load day in Southern California)

Contingency: G-1/N-1 of TDM/Imperial Valley – North Gila 500kV line or N-1/G-1 vice versa

Limiting component: Imperial Valley – El Centro 230 kV line

- LA Basin 2018 LCR need: 7604 MW
 - The LCR need for this area is increased by about 79 MW
- San Diego subarea LCR need: 3145 MW
 - *The LCR need for this area increases by 750 MW as there are no further resources in the Imperial Valley area that can be dispatched*
- San Diego-Imperial Valley area LCR need: 4142 MW
 - The LCR need is increased by about 110 MW as less effective resources are dispatched

Overall LA Basin and San Diego-Imperial Valley Critical Contingencies – Sensitivity Study (2022)

*Sensitivity study with Imperial Valley connected solar generation
unavailable at 6 p.m.*

Contingency: G-1/N-1 of TDM/Imperial Valley – North Gila 500kV line or N-1/G-1
vice versa

Limiting component: Imperial Valley – El Centro 230 kV line

- LA Basin 2022 LCR need: 7404 MW
 - The LCR need for this area is increased by about 1382 MW (compared to 2022 LCR without the sensitivity) to support the San Diego-Imperial Valley LCR need
- San Diego subarea LCR need: 2800 MW
 - Maximum available resources for this subarea in the 2022 timeframe
- San Diego-Imperial Valley area LCR need: 4739 MW
 - There is a deficiency of about 900 MW if replacement resources are to be located in effective area (i.e., Imperial Valley substation or vicinity)

Overall San Diego-Imperial Valley Sensitivity Study without Sycamore-Penasquitos 230 kV Line (2018)

Sensitivity study without the Sycamore-Penasquitos 230 kV line. This project is expected to miss the June 1, 2018 in-service date.

- Contingency: N-1 of Miguel-Miguel Tap-Bay Blvd.-Otoy Mesa 230 kV line, system readjustment, followed by an N-1 of Mission-Old Town Tap-Silvergate-Old Town 230 kV line
- Limiting component: Mission-Old Town 230 kV line
- Loading concerns under various generation dispatch scenarios

	Encina Generation (MW)	Percent loadings on the Mission-Old Town 230 kV Line	Firm Load Curtailment (MW)
1	0	137%	0
2	859	117%	0
3	859	<100%	199*

Notes: *With generation curtailment of about 643 MW from Otoy Mesa and Pio Pico, the load curtailment impact would be reduced to about 145 MW

- The total overall San Diego-Imperial Valley LCR need for this scenario would be 4,308 MW (with 145 MW of deficiency)

Updated considerations related to the Aliso Canyon gas storage constraint scenarios

The ISO also evaluated whether the Aliso Canyon gas storage constraint would affect the LCR need in the LA Basin and San Diego areas

- Based on the recent CPUC Public Utilities Code Section 715 report, dated January 17, 2017 (http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/News_Room/News_and_Updates/AlisoGas1-9-715.pdf), the CPUC has recognized the effectiveness of tighter non-core balancing rules.
 - On page 15 of the report, the CPUC indicated that the 150 mmcf potential imbalance has been offset by the enhanced balancing rules and thus directly reduces the amount of the original curtailment identified in the four Summer Technical scenarios.
 - Due to this balancing rules benefit, the LCR study evaluated here does not include resource balancing as previously considered under the Aliso Canyon gas storage constraint study scenario.
- However, as Southern California Gas Company has informed the CPUC in its February 17, 2017 Storage Safety Enhancement Plan, *it is important to note that there are potential deliverability impacts due to tubing flow only operation* of the remaining gas storage fields at Goleta, Playa Del Rey and Honor Rancho. More study is necessary to understand the meaning and the extent of the tubing only production limitation.

Changes

Since last year:

- 1) The 2018 adjusted managed peak demand, with peak shift, for the LA Basin area is reduced by 671 MW compared to 2017 study.
- 2) The overall LA Basin LCR need for 2018 has increased by 157 MW compared to 2017 mainly due to change in assumptions regarding the Aliso Canyon gas storage constraint (used in 2017 and not in 2018).
- 3) The 2022 adjusted managed peak demand, with peak shift, for the LA Basin area is reduced by 478 MW compared to 2021 study.
- 4) The overall LA Basin LCR need for 2022 has decreased by 876 MW compared to 2021 primarily due to lower demand forecast as well as dispatch of more effective available resources in the LA Basin and San Diego-Imperial Valley areas to mitigate their respective concerns.

Changes

Since last stakeholder meeting:

- 1) Updated NQC.
- 2) Updated 2018 LCR study results for all sub-areas and area needs.
- 3) Provide complete 2022 LCR study results.
- 4) Provide sensitivity study results for Imperial Valley solar generation unavailable at 6:00 pm.

Your comments and questions are welcome

For written comments, please send to: RegionalTransmission@caiso.com