

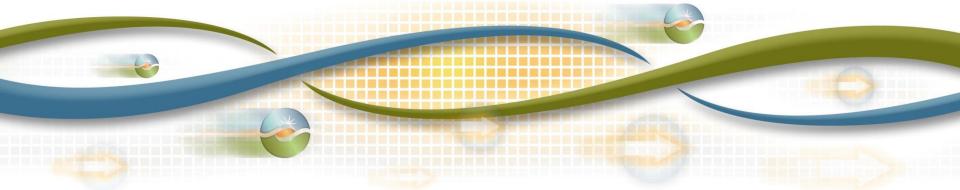
2018 & 2022 Final LCR Study Results San Diego-Imperial Valley

Frank Chen - Regional Transmission Engineer Lead

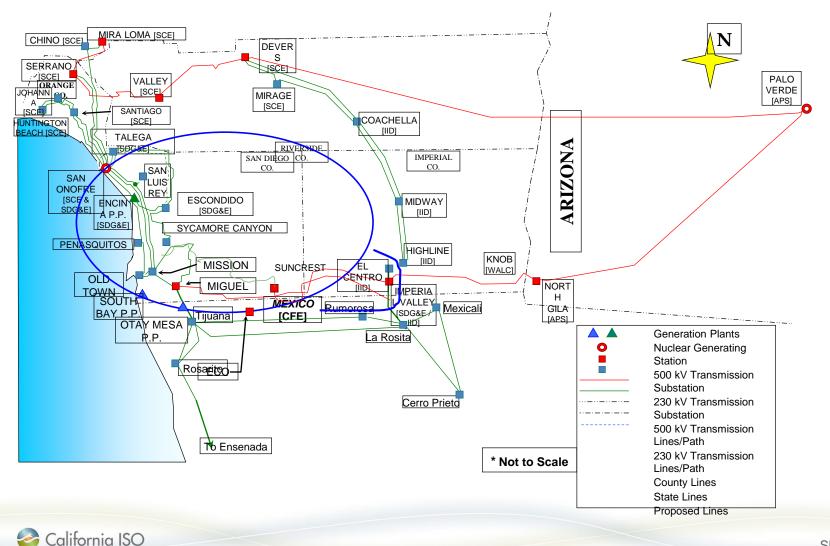
David Le - Senior Advisor Regional Transmission Engineer

Stakeholder Call

April 13, 2017



San Diego-Imperial Valley LCR Area



San Diego-Imperial Valley Area Load and Resources (MW)

Loads

Year	Managed Peak Load (MW)	Peak Shift (MW)	Pump Loads	Transmission Losses (MW)	Total (MW)
2018	4,661	138	0	125	4,924
2022	4,505	415	0	133	5,053

Available Resources

Year	QF/Wind (MW)	Nuclear	Market (MW)	Battery Storage (MW)	20-Minute DR (MW)	Maximum Qualifying Capacity (MW)
2018	202	0	4,694	38	19	4,953
2022	217	0	4,336	38	19	4,610



Major Network Upgrades Modeled by 2018

- 1. 2nd Encina 230/138 bank #61
- 2. Encina power plant unit #1 retirement
- 3. Reconductor of Mission-Mesa Heights 69 kV (ISD: Sept. 2018)
- 4. Reconductor of Kearny-Mission 69 kV line (ISD: Nov. 2018)
- 5. TL600 Loop in to Mesa Height 69 kV substation(ISD: Dec. 2018)
- 5. TL6906 Mesa Rim rearrangement
- 6. Salt Creek 69 kV substation
- 7. Vine 69 kV substation
- 8. Bay Boulevard 230 kV substation
- 9. Sycamore Penasquitos 230kV line (ISD: June 30, 2018)
- 10. Imperial Valley phase shifting transformers
- 11. Miguel synchronous condensers (2x225 Mvar)
- 12. San Luis Rey synchronous condensers (2x225 Mvar)
- 13. San Onofre synchronous condenser (1x225 Mvar)
- 14. New capacitors at Pendlenton and Basilone 69 kV substations
- 15. Storage projects at Escondido(3x10 MW) & El Cajon (7.5 MW)



Additional Network Upgrades by 2022

- 1. Ocean Ranch 69 kV substation
- 2. 2nd Poway to Pomerado line
- 3. TL632 Granite loop-in and TL6914 reconfiguration
- 4. Reconductor of Stuart Tap-Las Pulgas 69 kV line (TL690E)
- 5. Reconductor of Japanes Mesa–Basilone–Talega Tap 69 kV lines
- 6. 2nd San Marcos Escondido 69kV line
- 7. Upgrade Bernardo Rancho Carmel 69kV line
- 8. Second Poway-Pomerado 69 kV line
- 9. Artesian 230 kV expansion with 69kV upgrade
- 10. Second Miguel Bay Boulevard 230 kV line
- 11. South Orange County Reliability Enhancement
- 12. By-passing 500 kV series capacitor banks on SWPL and SPL
- 13. Suncrest SVC project
- 14. Encina repower (500 MW)



Areas and sub-areas studied:

- El Cajon sub-area
- Mission sub-area
- Esco sub-area
- Pala sub-area
- Miramar sub-area
- Border sub-area
- San Diego sub-area
- San Diego-Imperial Valley area



El Cajon Sub-area Critical Contingencies

Category C:

2018:

Contingency: loss of Miguel–Granite–Los Coches three-terminal 69 kV line(TL632) followed by the loss of El Cajon Unit 2 Limiting component: El Cajon-Los Coches 69 kV (TL631) overloaded

LCR need: 75 MW

2022:

Contingency: loss of Granite – Los Coches 69 kV lines #1 and #2 Limiting component: El Cajon-Los Coches 69 kV (TL631) overloaded LCR need: 40 MW

Category B:

2018:

Contingency: loss of El Cajon Unit 2 followed by the loss of Miguel–Granite– Los Coches 69 kV (TL632)

Limiting component: El Cajon -Los Coches 69 kV (TL631) overloaded

LCR need: 75 MW

2022:

LCR need: 0 MW



Mission Sub-area Critical Contingency

Category C:

2018:

Contingency: loss of the Mission-Kearny 69 kV (TL663) followed by the loss of Mission-Mesa Heights 69kV (TL676) or vice versa.

Limiting component: Kearny-Clairmont Tap 69kV line (TL600) overloaded LCR need: 28 MW

2022: LCR need: 0 MW

Category B:

No LCR requirement in 2018 and 2022.



Esco Sub-area Critical Contingency

Category C:

2018:

Contingency: loss of one of the Sycamore-Pomerado 69 kV lines (TL6915 or TL6924), followed by the loss of Esco-Escondido 69kV (TL6908) Limiting component: remaining Sycamore-Pomerado 69 kV line overloaded LCR need: 8 MW

2022:

Contingency: loss of either one of the two Sycamore-Pomerado 69 kV (TL6915 or TL6924) lines followed by the loss of Artesian 230/69kV bank or vice versa

Limiting component: remaining Sycamore-Pomerado 69 kV line overloaded LCR need: 30 MW

Category B:

No requirements in 2018 and 2022.



Pala Sub-area Critical Contingency

Category C:

Contingency: loss of Pendleton-San Luis Rey 69 kV line (TL6912) followed by loss of Lilac-Pala 69kV (TL6908)

Limiting component: Melrose-Morro Hill Tap 69kV (TL694) overloaded

2018 LCR need: 23 MW

2022 LCR need: 28 MW

Category B:

No requirements in 2018 and 2022.



Border Sub-area Critical Contingency

Category C:

Contingency: loss of Bay Boulevard-Otay 69 kV #1 (TL645) followed by loss of Bay Boulevard-Otay 69 kV #2 (TL646)
Limiting component: Imperial Beach-Bay Boulevard 69 kV (TL647) overloaded
2018 LCR: 50 MW
2022 LCR: 62 MW

Category B:

No requirements in 2018 and 2022.



Miramar Sub-area Critical Contingencies

Category C:

No requirement is identified in 2018 and 2022 as the Sycamore Canyon -Penasquitos 230kV Line project would eliminate the Sycamore-Scripps 69 kV (TL6916) overload for the loss of the Miguel-Bay Blvd. 230 kV line followed by outage of Sycamore-Palomar 230 kV line or vice versa.
It is recommended to retain at least 38 MW of Miramar Energy Center operational until the project is in service by June of 2018 or 2022.

Category B:

No requirements in 2018 and 2022



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 ٠ Imperial Valley areas are closely coordinated in the LCR study.
- The San Diego-Imperial Valley area is evaluated first due to its position as ٠ 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 ٠ check for adequacy and to optimize its LCR need if possible.
- This effort goes back and forth several times until further LCR reduction ٠ 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



San Diego Sub-area Critical Contingencies

Category C (2018 & 2022)

The LCR need for the San Diego sub-area, independent of the San Diego-Imperial Valley area is driven by an overlapping contingency of N-1 of ECO-Miguel 500 kV line, system readjustment, followed by an N-1 of the Ocotillo-Suncrest 500kV line

Limiting component: Post-transient voltage instability

- San Diego sub-area 2018 LCR need: 2,157 MW
- San Diego sub-area 2022 LCR need: 2,502 MW

Observations:

- With the increase in managed peak loads with peak shift, the San Diego subarea LCR need also increases.
- However, this LCR need due to voltage instability is still lower than the LCR need that is caused by the "S" line thermal loading constraint for the 2022 time frame.



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)

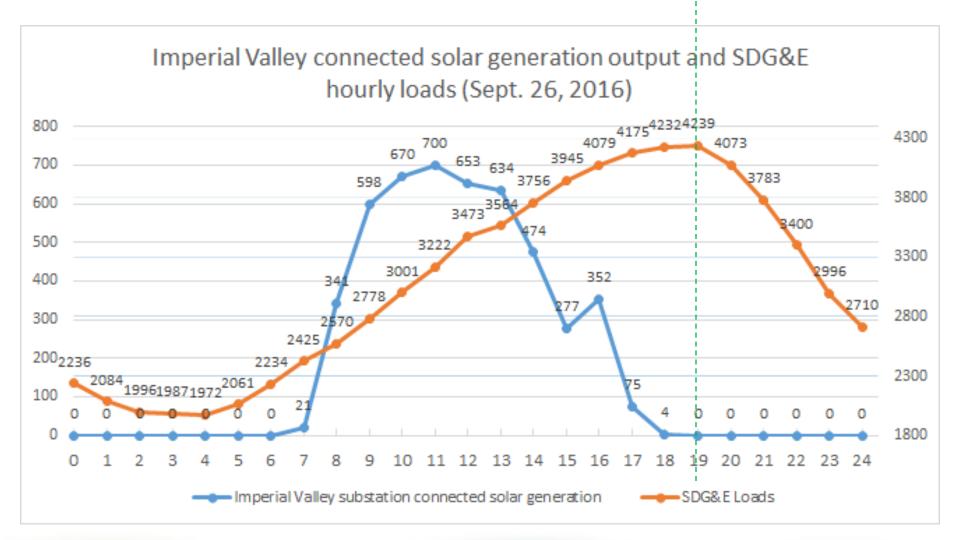
Contingency: Mesa – Redondo 230 kV line, system readjustment, followed by Mesa - Lighthipe 230 kV line out

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

- Overall LA Basin 2022 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 2022 LCR need: 4,643 MW
 - This includes a 33 MW deficiency for the area
 - 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





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.-Otay 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 Otay Mesa and Pio Pico, the load curtailment impact would be reduced to about 145 MW



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/New s_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 San Diego-Imperial Valley area is increased by 84 MW compared to 2017.
- 2) The overall San Diego-Imperial Valley LCR need for 2018 is reduced by 603 MW compared to the corrected value (4635 MW) for 2017, based consistent assumptions regarding Aliso Canyon gas storage constraint scenario. Compared with the actual 2017 LCR Report that used inconsistent assumptions the value in higher by 462 MW.
- 3) The 2022 adjusted managed peak demand, with peak shift, for the San Diego-Imperial Valley area is increased by 139 MW compared to 2021.
- 4) The overall San Diego-Imperial Valley LCR need for 2022 is increased by 286 MW compared to the 2021, mostly due to demand forecast increase.



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.
- 5) Provide sensitivity study regarding unavailability of the Sycamore Penasquitos 230 kV line.

Your comments and questions are welcome

For written comments, please send to: <u>RegionalTransmission@caiso.com</u>

