2019 & 2023 Draft LCR Study Results LA Basin and San Diego-Imperial Valley Areas

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Stakeholder Meeting

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Major Transmission & Generation Assumptions

- San Onofre synchronous condenser
- Encina generation retirement
- Carlsbad Energy Center in-service by Q4 2018 (*CPUC LTPP resource*)
- Alamitos, Huntington Beach and Redondo Beach generation retirement (for a total of 3,818 MW) by the end of 2020 timeframe to comply with the State Water Board's OTC Policy
- Alamitos and Huntington Beach repowering (1284 MW) (*CPUC LTPP resource*)
- Stanton Energy Center (98 MW) with 10 MW battery energy storage system (*CPUC LTPP resource*)
- Long-term procurement for preferred resources (i.e., energy efficiency, battery energy storage, behind-the-meter solar PV, demand response) that were approved by the CPUC for the LA Basin as well as San Diego area are fully implemented by the end of 2020 or prior to summer 2021
- Imperial Valley phase shifting transformers (230/230kV 2x400 MVA)
- Sycamore – Penasquitos 230 kV transmission line
- Mesa Loop-In project (anticipated March 2022 in-service date at this time)
- Existing 20-minute demand response resources in the LA Basin
- Battery energy storage projects in San Diego area
- Bypassing series capacitors on the Imperial Valley-North Gila 500kV line, as well as the Sunrise and Southwest Powerlinks

LA Basin Area Loads & Resources

Loads

Year	A-bank Loads (MW)	Pump Loads	Transmission Losses (MW)	Total (MW)
2019	19,757	22	296	20,075
2023	19,754	22	296	20,072

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 substation load included.

Available Resources

Year	QF/Wind (MW)	Muni (MW)	Market (MW)	LTPP Preferred Resources (MW)	20-Minute DR (MW)	Mothballed (MW)	Maximum Qualifying Capacity (MW)
2019	403	1,164	8,295	248	321	435	10,866
2023	403	1,164	6,196	432	321	435	8,951

Available generation values for 2019 and 2023 includes Etiwanda, which may be retired by June 1, 2018 per letter from NRG.

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

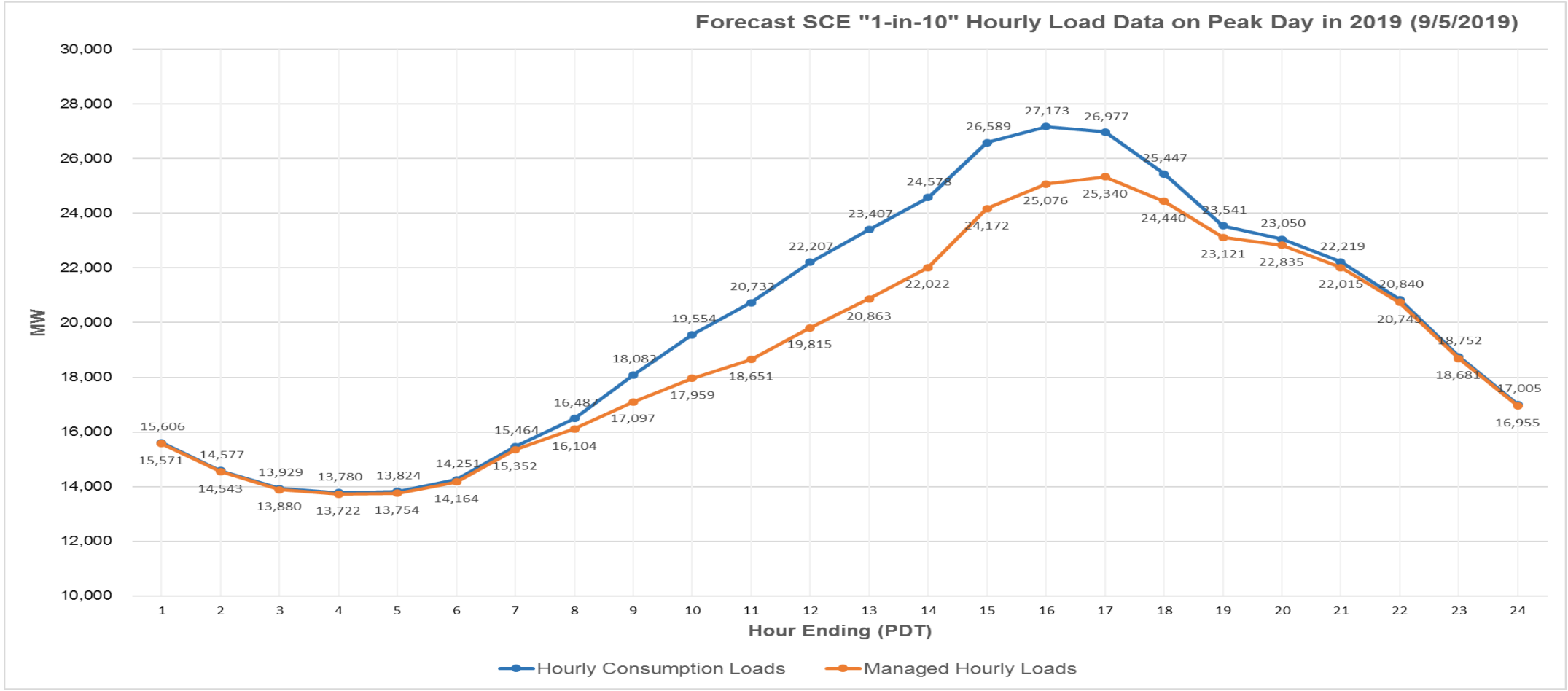
Loads

Year	Managed Peak Load (MW)	Pump Loads	Transmission Losses (MW)	Total (MW)
2019	4,295	0	117	4,412
2023	4,420	0	115	4,535

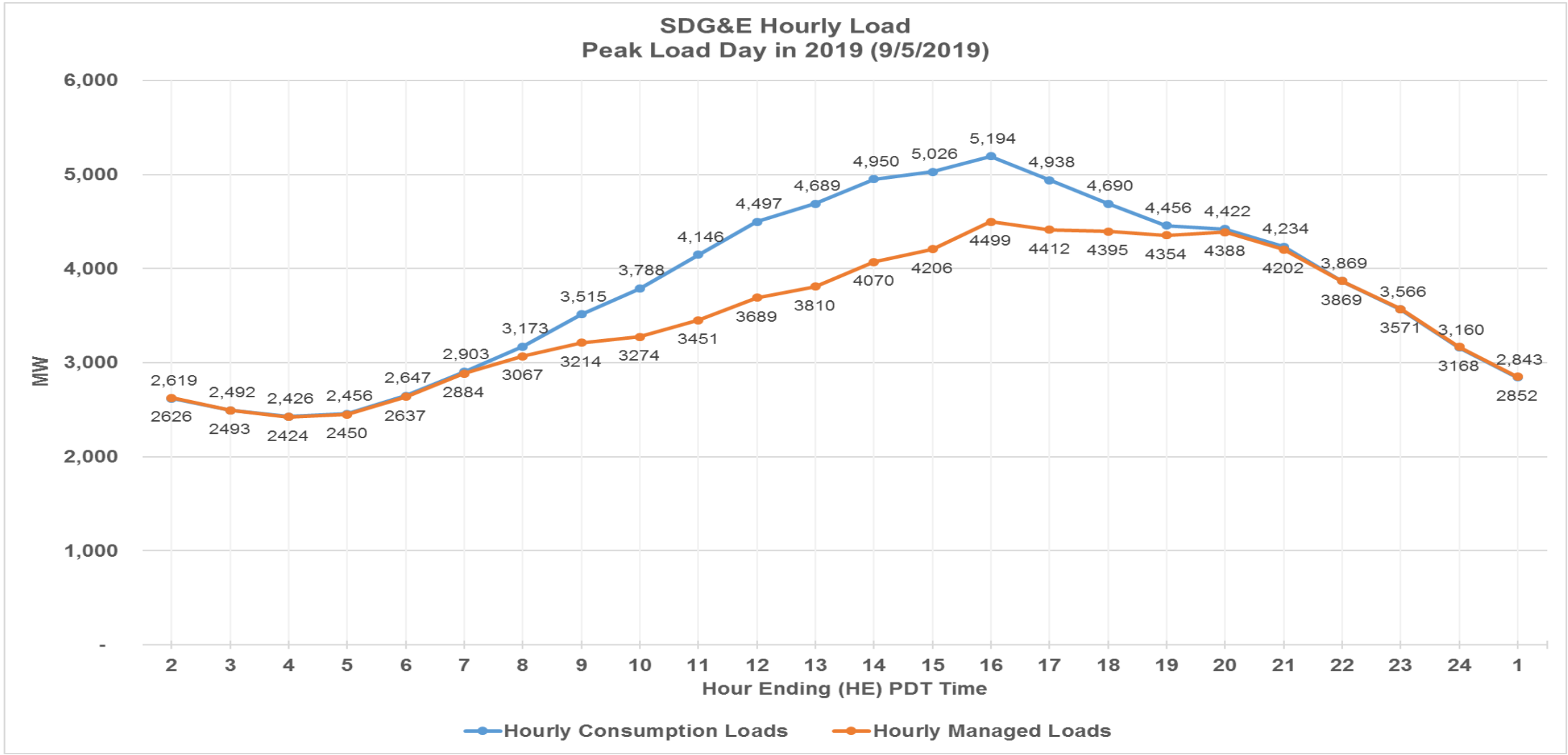
Available Resources

Year	QF/Self-gen (MW)	Wind (MW)	Market (MW)	Battery Storage (MW)	20-Minute DR (MW)	Maximum Qualifying Capacity (MW)
2019	106	175	3,989	77	19	4,366
2023	106	190	3,989	77	19	4,381

Hourly demand forecast for SCE service area on the peak day in 2019 (projected 1-in-10 load based on 1-in-2 load forecast profile)



Hourly demand forecast for SDG&E service area on the peak day in 2019 (projected 1-in-10 load based on 1-in-2 load forecast profile)



Estimated derated factors to calculate simultaneous loads between SCE and SDG&E at each other's respective peak load hours

Year	SCE peak demand			SDG&E @ SCE peak demand			SDG&E peak demand			SCE @ SDG&E peak demand		
	Date/time (PDT)*	Hourly Managed Peak Demand (MW) from hourly plot	LSE/BA Table peak demand forecast (MW)**	Date/time (PDT)*	Hourly Managed Demand (MW) from hourly plot	% of own peak demand (from hourly managed demand plot)	Date/time (PDT)*	Hourly Managed Peak Demand (MW) from hourly plot (MW)	LSE/BA Table peak demand forecast (MW)**	Date/time (PDT)*	Hourly Managed Demand from hourly plot (MW)	% of own peak demand (from hourly managed demand plot)
2019	9/5/2019 17:00 hr.	25340	25410	9/2/2019 17:00 hr.	4412	98.07%	9/5/2019 16:00 hr.	4499	4415	9/5/2019 16:00 hr.	25076	98.96%
2023	8/31/2023 17:00 hr.	25359	25368	8/31/2023 17:00 hr.	4400	96.30%	8/31/2023 20:00 hr.	4569	4554	8/31/2023 20:00 hr.	23548	92.86%
2028	8/31/2028 17:00 hr.	24813	24716	8/31/2023 17:00 hr.	4278	91.51%	8/31/2023 20:00 hr.	4675	4681	8/31/2028 20:00 hr.	24127	97.24%

Notes:
*** All hour expressed in PDT hour ending (HE)**
****Peak demand from the CEC posted 2017 CED Revised Forecast for LSE/BA Table for Mid Demand Level (1-in-10) with Low AAEE and AAPV**

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

- 2019 LCR need: 231 MW (195 MW gas-fired gen, 12.5 MW existing 20-minute DR, 23.7 MW LTPP P.R.)
- 2023 LCR need: 53 MW (all LTPP preferred resources, i.e., BTM energy storage, energy efficiency, existing and new demand response)
  - ❖ Lower LCR requirements in 2023 due to implementation of the Mesa Loop-in Project

El Nido Sub-area – Category B

No requirements

Critical Area Contingencies

Western LA Basin Sub-area – Category C

Contingency (2019): Serrano – Villa Park #2 230 kV line, followed by Serrano – Lewis #1 or #2 230 kV line, or vice versa

- Limiting component (2019): Serrano – Villa Park #1 230 kV line
- 2019 LCR need: 3993 MW (this includes 162 MW of existing DR and 248 MW of LTPP preferred resources)

Contingency (2023): Mesa – Redondo #1 230 kV line, followed by Mesa - Lighthipe 230 kV line, or vice versa

- Limiting component (2023): thermal loading on the Mesa-Laguna Bell #1 230kV line
- 2023 LCR need: 3970 MW (this includes 162 MW of existing DR and 432 MW of LTPP preferred resources)

Western LA Basin Sub-area – Category B

Non binding – multiple combinations possible.

Critical Area Contingencies

Eastern LA Basin Subarea – Category C

Contingency (2019): Serrano-Valley 500kV line, followed by Devers – Red Bluff 500kV #1 and 2 lines

- Limiting component (2019): post-transient voltage stability
- 2019 LCR need: 2956 MW (this includes 159 MW of existing 20-minute DR)

Contingency (2023): Alberhill – Serrano 500 kV line, followed by an N-2 of Red Bluff – Devers #1 & #2 500 kV lines

- Limiting component (2023): post-transient voltage instability
- 2023 LCR need: 2702 MW (this includes 159 MW of existing 20-minute DR)

Observations:

- The Mesa Loop-in Project, implemented by March 2022, helps reduce the LCR need in the eastern LA Basin in 2023 as it balances the flow into the LA Basin from both direction: east and north.
- The LCR for the eastern LA Basin are higher than the previous 2018 and 2022 assessments due to higher CEC demand forecast for SCE service area

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

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

- Due to electrical interdependency, the overall LA Basin and San Diego – Imperial Valley area studies 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 based on 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.

Illustration of the interdependency of the LA Basin and San Diego-Imperial Valley LCR needs

Overall San Diego-Imperial Valley Critical Contingencies

Category B & C

Contingency: G-1/L-1 TDM, system readjustment, followed by Imperial Valley-North Gila 500kV line.

2019 LCR:

- Limiting component: Imperial Valley – El Centro 230 kV line thermal loading
- LCR need: 4,122 MW (includes 77 MW of battery energy storage);
  - 20-minute DR and LTPP preferred resources in the LA Basin was utilized to help manage the San Diego-IV LCR need lower as this Category B contingency is common for both the LA Basin and San Diego-IV areas

2023 LCR:

- Limiting component: El Centro 230/92 kV transformer thermal loading
- LCR need (for the SD-IV overall area with LA Basin peak loads modeled): 4132 MW
  - SDG&E resources are more effective in mitigating the identified constraint
  - Use of LA Basin DR and LTPP preferred resources to help lower SD-IV overall LCR need
- LCR need (for the SD-IV area with SDG&E peak loads modeled): 4,072 MW (similar notes regarding preferred resources in the above)

Observations:

- Lower Solar NQC (based on ELCC) causes the need to use more MWs from less effective resources.
- The S-line upgrades provide an estimated 260 MW of LCR reduction benefits. The 20-minute DR and LTPP preferred resources in the LA Basin help lower the LCR need in the San Diego-I.V. area by up to an additional 200 MW.

San Diego Sub-area Critical Contingencies

Category C (2019 & 2023)

Contingency: N-1/N-1 ECO-Miguel 500 kV line, system readjustment, followed by one of the Sycamore-Suncrest 230 kV lines

Limiting component: Thermal loading concern on the remaining Sycamore-Suncrest 230 kV line

- 2019 LCR need: 2,417 MW
- 2023 LCR need: 3,002 MW

Observations:

- With the increase in managed peak loads with peak shift, the San Diego sub-area LCR need also increases between 2019 and 2023 timeframe.
- Thermal loading constraint on the Sycamore-Suncrest 230kV line is mitigated using a combination of RAS for generation tripping and utilization of the Imperial Valley phase shifters.

Overall LA Basin Critical Contingency (Category C for 2019)

Category C (2019)

Contingency: N-1/N-1 Lugo-Victorville 500 kV, system readjustment, followed by Sylmar-Gould 230 kV line out

Limiting component: Eagle Rock – Gould 230 kV line

- 2019 LCR need: 8,091 MW (this includes 321 MW of existing DR and 248 MW of LTPP preferred resources)

Observations:

- Higher LCR needs for the area are related to higher demand forecast from the CEC.
- About half of SCE's LTPP LCR preferred resources are assumed to be implemented by June 1, 2019 based on inputs from SCE.
- This is the binding constraint for the overall LA Basin for 2019 as the LCR needs are larger than the Category B LCR needs (next slide)

Overall LA Basin Critical Contingency (Category B for 2019)

Category B (2019)

Contingency: G-1/N-1 of TDM power plant, system readjustment, followed by an outage of the Imperial Valley – North Gila 500kV line

Limiting component: Imperial Valley – El Centro 230kV line (the S-line) thermal loading

- 2019 LCR need: 7,968 MW (321 MW of 20-minute DR and 248 MW of LTPP preferred resources were included in this total)

Observations:

- The Category B LCR needs identified above are for informational purpose and are non-binding constraint for the overall LA Basin as the needs are lower than the Category C LCR needs.

Overall LA Basin Critical Contingency (Category B and C for 2023)

Category B and C (2023)

Contingency: G-1/N-1 of TDM power plant, system adjustment, followed by an outage of the Imperial Valley – North Gila 500kV line

Limiting component: Imperial Valley – El Centro 230kV line (the S-line) thermal loading

- 2023 LCR need: 6,793 MW (includes 321 MW of DR and 432 MW of LTPP preferred resources)

Observations:

- The LCR need for Category B (G-1)(N-1) is the same as Category C (N-1)(G-1).
- This LCR need is associated with the peak loads for LA Basin and corresponding simultaneous loads for SDG&E (see slide 8 for further load information).

Overall LA Basin Critical Contingency (Secondary Category C for 2023)

Secondary Category C (2023)

Contingency: N-1/N-1 Mesa – Redondo 230 kV line, system readjustment, followed by Mesa - Lighthipe 230 kV line out

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

- 2023 LCR need: 6,634 MW (includes 321 MW of DR and 432 MW of LTPP preferred resources)

Observations:

- The Mesa Loop-in Project, with projected in-service date of March 2022, helps reduce the overall LCR need for the LA Basin.
- Full implementation of LTPP preferred resources was assumed for the study.
- This is not the binding constraint for the overall LA Basin see previous slide.

Changes

Since last year:

1. The CEC's 2017 IEPR Revised Forecast's 2019 managed peak demand, which includes peak shift, for the LA Basin area is increased by 812 MW compared to the 2018 demand forecast used for the 2018 LCR study.
   - The overall LA Basin LCR need for 2019 has increased by 566 MW compared to the 2018 LCR need primarily due to higher demand forecast.
2. The 2023 adjusted managed peak demand, with peak shift, for the LA Basin area is increased by 952 MW compared to the previous year's demand forecast for the 2022 LCR study.
   - The overall LA Basin LCR need for 2023 has increased by 771 MW compared to the 2022 LCR need primarily due to higher demand forecast.

Changes (cont'd)

Since last year:

1) The CEC's 2017 IEPR Revised Forecast's 2019 managed peak demand, which includes peak shift, for the San Diego area is decreased by 509 MW compared to the 2018 demand forecast used for the 2018 LCR study.
   - The overall San Diego-Imperial Valley LCR need for 2019 has increased by 90 MW compared to the 2018 LCR need.
   - The increase in the LCR need is attributed to the following factors:
     - Primarily due to lower net qualifying capacity (NQC) at peak loads for solar generating units that are located in the most effective locations for mitigating the overall area constraint;
     - As well as generation retirement in the Big Creek/Ventura area.
2) The 2023 adjusted managed peak demand, with peak shift, for the San Diego area is decreased by 565 MW compared to the previous year's demand forecast for the 2022 LCR study.
   - The overall San Diego-Imperial Valley LCR need for 2023 has decreased by 511 MW compared to the 2022 LCR need due to a combination of implementation of the IID's S-line upgrades as well as lower demand forecast for the San Diego area.

THANK YOU

Your comments and questions are welcome.

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