2020 & 2024 Draft LCR Study Results for LA Basin and San Diego-Imperial Valley Areas

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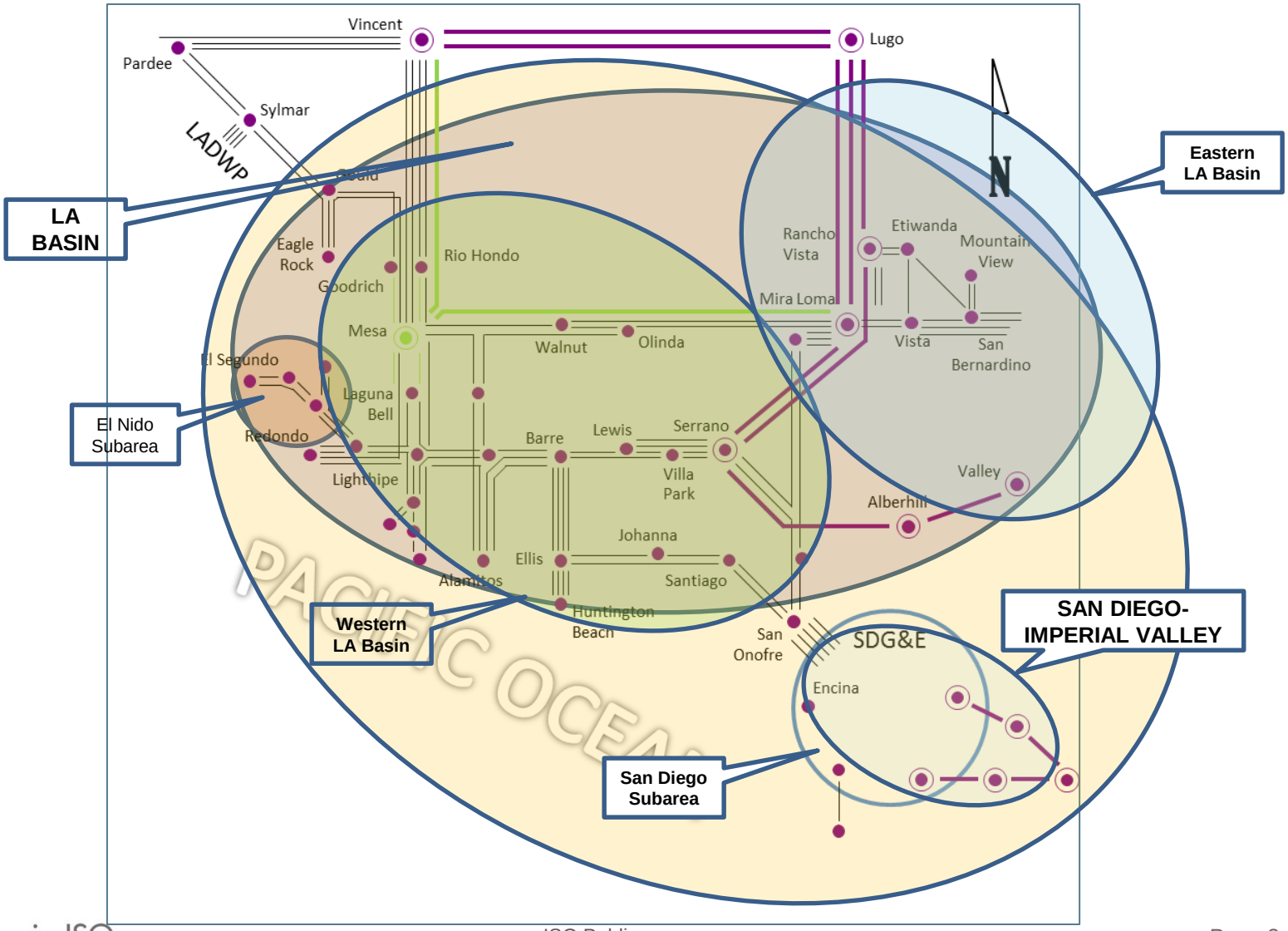
LA Basin and San Diego-Imperial Valley Areas



Major Transmission Upgrade Assumptions

2020 LCR study case

- Talega synchronous condensers (2x225 MVAR)
- San Luis Rey synchronous condensers (2x225 MVAR)
- Miguel synchronous condensers (2x225 MVAR)
- San Onofre synchronous condenser (225 MVAR)
- Santiago synchronous condensers (3x81 MVAR)
- Imperial Valley phase shifting transformers (230/230kV 2x400 MVA)
- Sycamore – Penasquitos 230 kV transmission line
- Bypassing series capacitors on the Imperial Valley-North Gila 500kV line, as well as the Sunrise and Southwest Powerlink lines

2024 LCR study case

- Mesa 500/230kV Loop-In project (March 2022 in-service date at this time)
- Imperial Valley – El Centro 230 kV (“S” line) upgrades

Major Resource Assumptions

2020 LCR study case

- Solar generation production is modeled at the respective output based on peak loads
  - Modeled at NQC values (33.4% of installed capacity) for SCE peak load study case (the CEC forecast peak load at 5 p.m. PDT)
  - Modeled at 0 MW values for SDG&E peak load study case (the CEC forecast peak load at 8 p.m. PDT)
- Encina generation retirement (946 MW)
- Carlsbad Energy Center (500 MW) in-service (*CPUC LTPP resource*)
- The existing 20-minute demand response in the LA Basin and San Diego is utilized for overlapping contingency
- Implementation of long-term procurement plan (LTPP) for preferred resources that were approved by the CPUC for local capacity need in the western LA Basin (248 MW)
- Battery energy storage projects in San Diego area (78 MW)

2024 LCR study case

- Alamitos, Huntington Beach and Redondo Beach generation retirement (for a total of 3,818 MW) based on the State Water Resources Control Board OTC Policy's implementation schedule
- Full implementation of long-term procurement plan (LTPP) for preferred resources that were approved by the CPUC for local capacity need in the western LA Basin (432 MW)
- 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*)

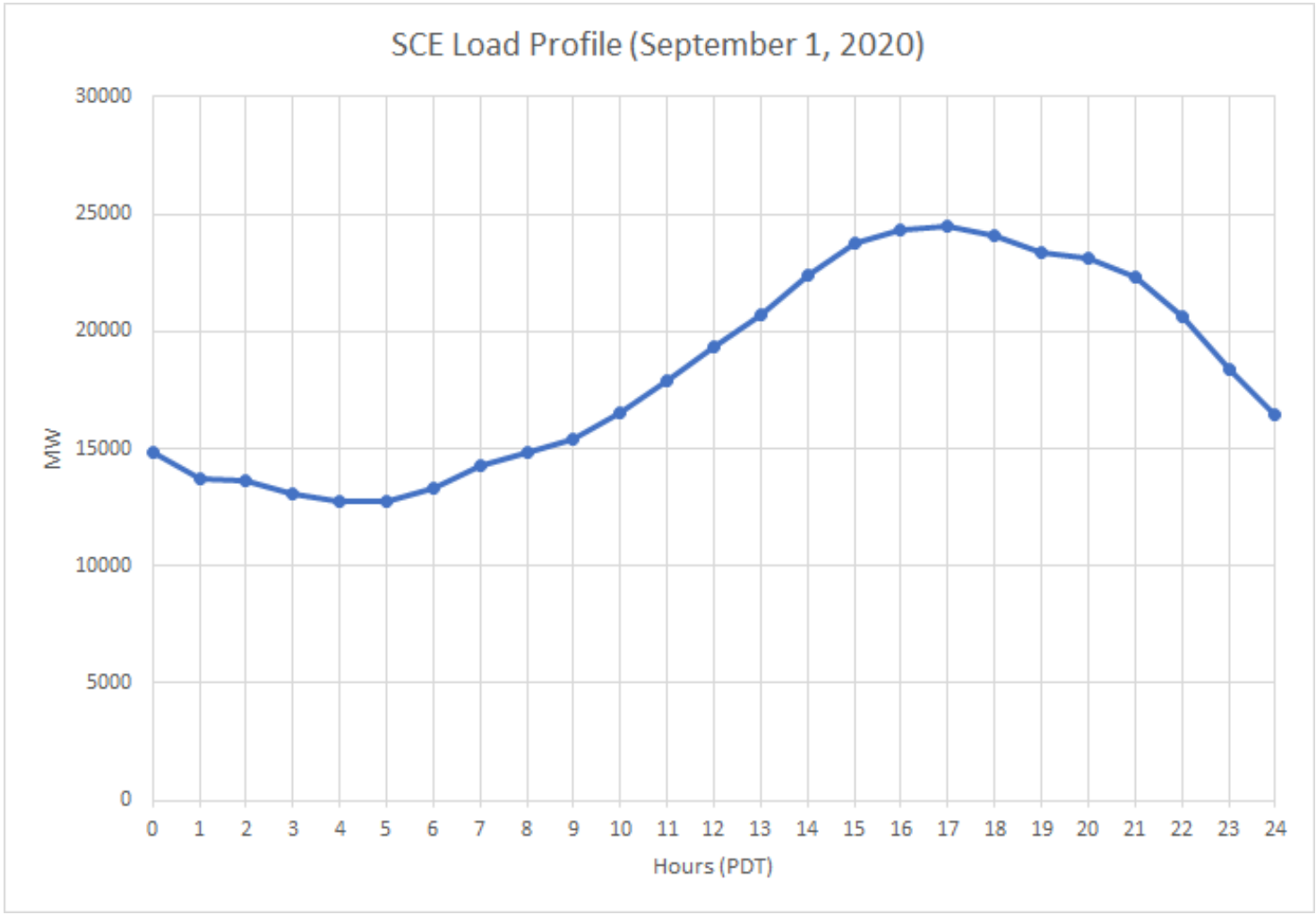
LA Basin Area: Loads and Resources

Loads (MW)	2020	2024	Resources NQC (MW)	2020	2024
Gross Load	20,684	22,143	Market/Net Seller	8,192	5,756
AAEE + AAPV	-277	-995	Wind	159	159
Behind the meter DG (production)	-1,450	-2,159	Solar	17	17
Net Load	**18,957**	**18,989**	Battery	42	42
Transmission Losses	284	285	Muni	1,110	1,110
Pumps	20	21	QF	193	193
Loads + Losses + Pumps	**19,261**	**19,295**	LTPP Preferred Resources (BESS, EE, DR, PV)	348	432
			Existing 20-minute Demand Response	294	294
			Mothballed	335	335
			Total Qualifying Capacity	**10,690**	**8,338**

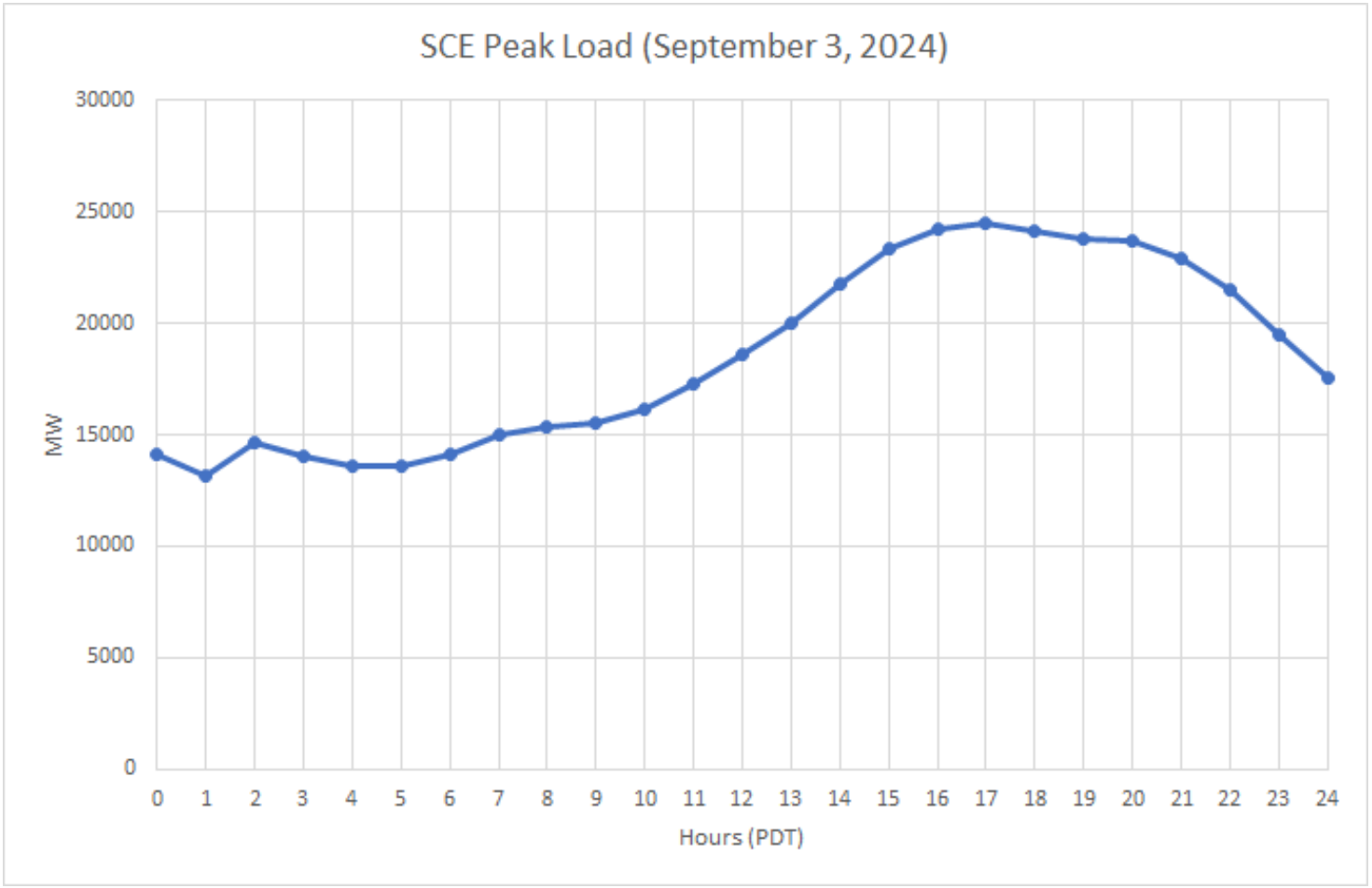
San Diego-Imperial Valley Area: Loads and Resources

Loads (MW)	2020	2024	Resources NQC (MW)	2020	2024
Gross Load	5,090	5,598	Market/ Net Seller	3,577	3,577
AAEE + AAPV	-54	-293	Wind	185	356
Peak load impact (due to peak shift)	-547	-600	Solar	439	552
Net Load	**4,489**	**4,705**	Muni	0	0
Transmission Losses	124	129	QF	4	4
Loads + Losses	**4,613**	**4,834**	Existing 20-Minute Demand Response	16	16
			Battery	255	358
			Total Qualifying Capacity	**4,476**	**4,863**

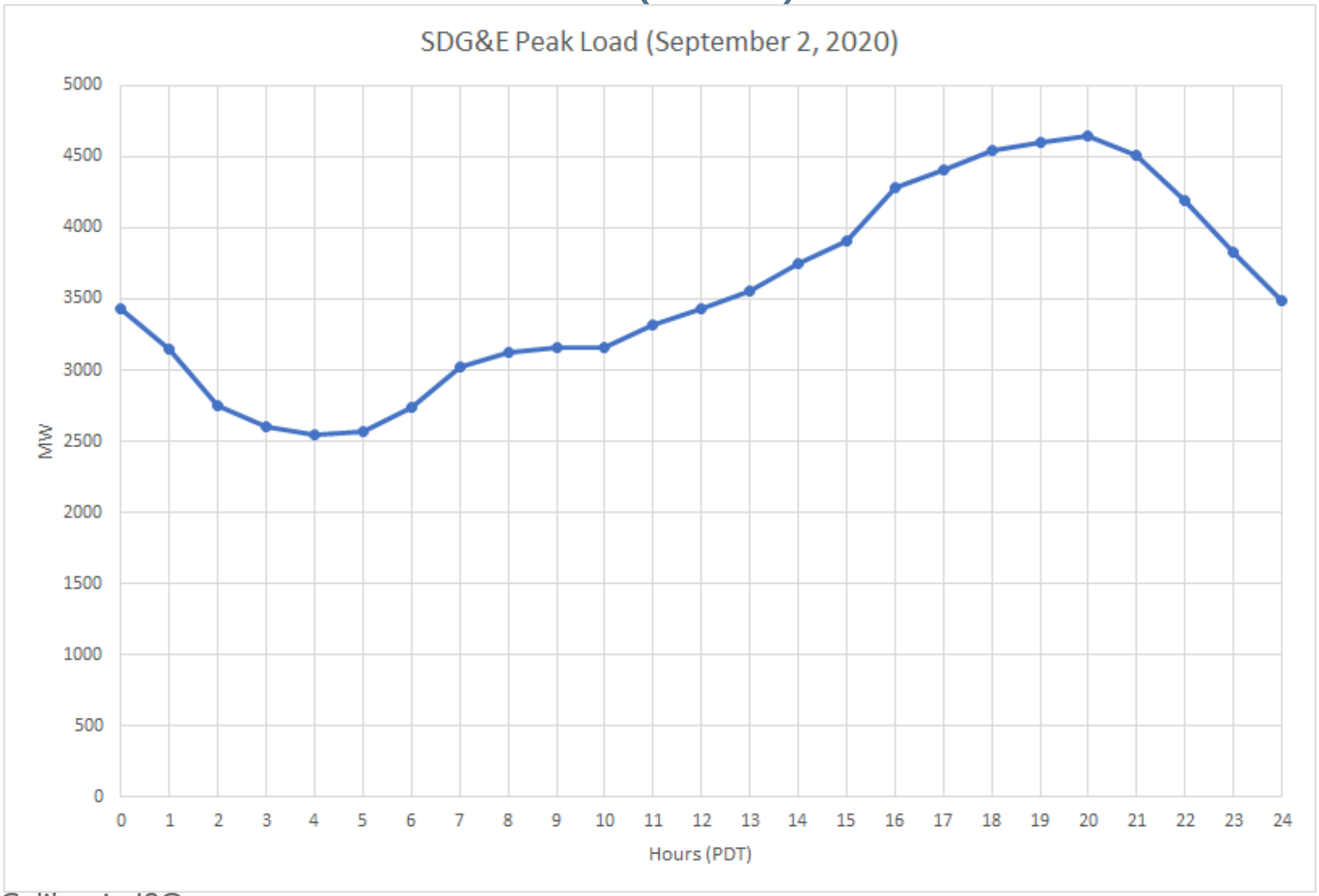
Hourly demand forecast profile for SCE service area (2020)



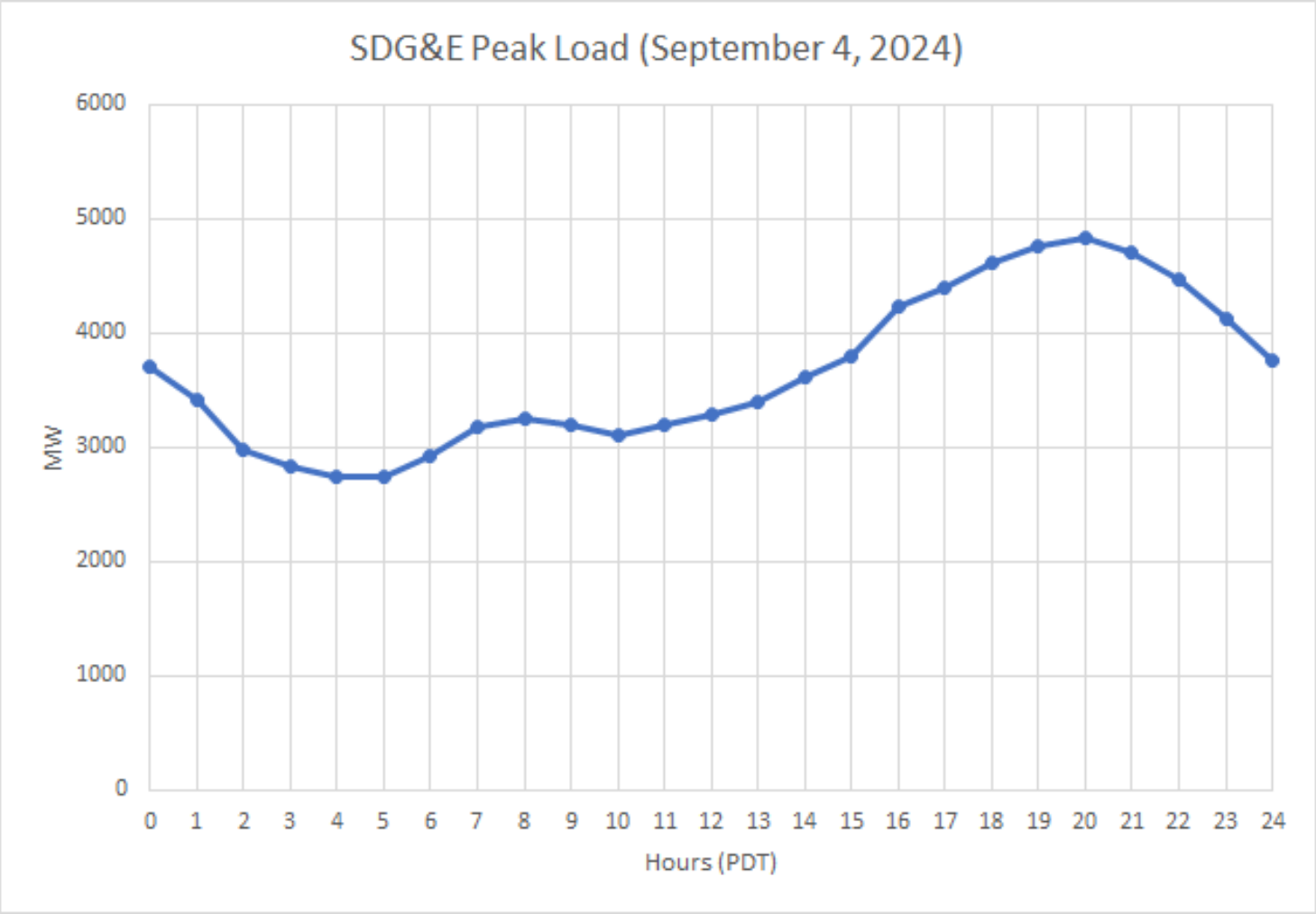
Hourly demand forecast profile for SCE service area (2024)



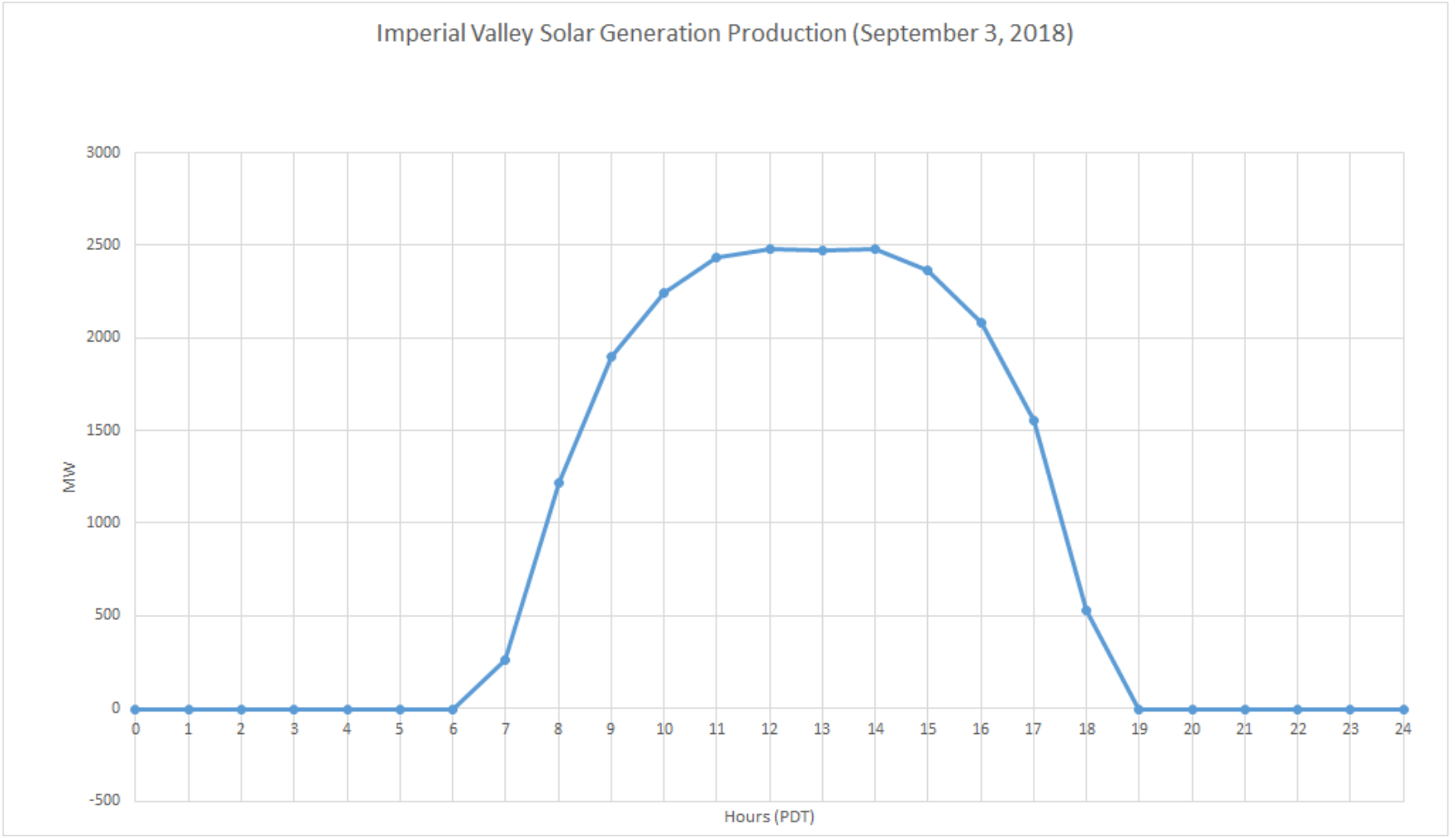
Hourly demand forecast profile for SDG&E service area (2020)



Hourly demand forecast profile for SDG&E service area (2024)



Total Imperial Valley Area Solar Generation Production (EMS Data)



Estimated factors to calculate simultaneous loads between SCE and SDG&E

	2020	2024
SDG&E at SCE Peak Load (at 5 p.m. PDT)	94.91% * SDG&E peak load	91.01% * SDG&E peak load
SCE at SDG&E Peak Load (at 8 p.m. PDT)	94.29% * SCE peak load	96.68% * SCE peak load

Notes:

* All hour expressed in PDT hour ending (HE)

**Based on the CEC posted Hourly 2018 CED Updated Forecast for Mid Demand Level (1-in-2) with Low AAEE and AAPV

El Nido Subarea LCR (LA Basin)

Year	Category	Limiting Facility	Contingency	LCR (MW)
2020	C	Thermal loading on La Fresa-La Cienega 230kV line	La Fresa – El Nido #3 & 4 230kV lines	355 MW*^
2020	B	None	Various contingencies	No requirements
2024	C	Thermal loading on La Fresa-La Cienega 230kV line	La Fresa – El Nido #3 & 4 230kV lines	393 MW**^
2024	B	None	Various contingencies	No requirements

Notes:

* This includes 10.4 MW of the existing 20-minute demand response.

^ All procured resources in the El Nido subarea are also used toward meeting the western LA Basin LCR need.

** This includes 10.4 MW of existing demand response and 30.8 MW of long-term procurement plan preferred resources for the western LA Basin.

Western LA Basin Subarea LCR

Year	Category	Limiting Facility	Contingency	LCR (MW)
2020	C	Thermal loading on the Barre-Lewis 230kV line	Barre-Villa Park 230kV line, followed by G-1 of Alamitos new combined cycle plant (N-1/G-1)	3,571*
2020	B	Thermal loading on the Barre-Lewis 230kV line	G-1 of Alamitos new combined cycle plant, followed by Barre-Villa Park 230kV line (G-1/N-1)	3,571*
2024	C	Thermal loading on the Mesa-Laguna Bell 230kV line	Mesa-Redondo 230kV, followed by Mesa-Lighthipe 230kV line, or vice versa	3,783**
2024	B	None-binding	Multiple combinations possible	N/A

Notes:

*This includes 153 MW of existing 20-minute demand response.

**This includes 153 MW of existing 20-minute demand response, 432 MW of long-term procurement plan for preferred resources (a 100 MW battery energy storage, connected to transmission grid, is included in the total amount for LTPP preferred resources).

Eastern LA Basin Subarea LCR

Year	Category	Limiting Facility	Contingency	LCR (MW)
2020	C	Post-transient voltage stability	Serrano-Valley 500kV line, followed by Devers – Red Bluff 500kV #1 and 2 lines	2,416*
2020	B	None-binding	Multiple combinations possible	N/A
2024	C	Post-transient voltage stability	Serrano-Valley 500kV line, followed by Devers – Red Bluff 500kV #1 and 2 lines	2,477*
2024	B	None-binding	Multiple combinations possible	N/A

Notes:

*This includes 141 MW of existing 20-minute demand response.

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

Overall LA Basin LCR (independent from the San Diego-Imperial Valley LCR need)*

Year	Category	Limiting Facility	Contingency	LCR (MW)
2020	C	Sum of Western and Eastern LA Basin LCR needs	See Western and Eastern LA Basin LCR results	5,987^
2020	B	N/A	Non-binding, multiple combinations possible	N/A
2024	C	Sum of Western and Eastern LA Basin LCR needs	See Western and Eastern LA Basin LCR results	6,260^
2024	B	N/A	Non-binding, multiple combinations possible	N/A

Notes:

* For LA Basin LCR need related to the overall San Diego-Imperial Valley LCR need, please see study results under the San Diego-Imperial Valley LCR slides).

^This includes 294 MW of 20-minute (“fast”) demand response in the LA Basin.

San Diego Bulk Subarea LCR

Year	Category	Limiting Facility	Contingency	LCR (MW)
2020	C	Thermal loading concern on the remaining Sycamore-Suncrest 230 kV line	N-1/N-1 ECO-Miguel 500 kV line, system readjustment, followed by one of the Sycamore-Suncrest 230 kV lines	2,783*
2020	B	None-binding	Multiple combinations possible	N/A
2024	C	Thermal loading concern on the remaining Sycamore-Suncrest 230 kV line	N-1/N-1 ECO-Miguel 500 kV line, system readjustment, followed by one of the Sycamore-Suncrest 230 kV lines	2,930^
2024	B	None-binding	Multiple combinations possible	N/A

Notes:

* This includes 77.5 MW battery storage, 40 MW pumped storage, and 16 MW of existing 20-minute demand response in San Diego area. The existing RAS for contingency generation curtailment in the Imperial Valley and the Imperial Valley phase shifters are also utilized.

^ Includes the same preferred resources as in * above, but with higher penetration of battery energy storage (231 MW dispatched to meet local capacity need).

Overall San Diego – Imperial Valley Area LCR (2020)

- There are two major factors that affect the change in LCR need for the San Diego-Imperial Valley area:
  - Modeling of expected solar generation output (i.e., 0 MW) at the time of forecast peak load (for San Diego area, the peak load is forecast to be at 8 p.m. PDT). This represents approximately 440 MW of unavailable local capacity at effective locations for the most constraint reliability concern for the area.
  - Modeling San Diego peak load based on the CEC-adopted 2018 – 2030 California Energy Demand Update forecast, reflecting 211 MW higher than the previous year's 2018-2030 CED forecast (2017 IEPR).

Overall San Diego – Imperial Valley Area LCR (2020)

- Anticipating potential reliability concerns due to the two major factors mentioned for the San Diego-Imperial Valley local capacity area, the ISO performed the analyses to determine local capacity need for the following scenarios:
  - Scenario 1: Assess LCR need for the San Diego – Imperial Valley area without increasing LA Basin local capacity. Identified the amount of deficient local capacity by assuming the additional capacity is located in the most effective location.
  - Scenario 2: Assess LCR need for the San Diego – Imperial Valley area based on available resources in San Diego. Increase local capacity in the LA Basin to help offset local capacity deficiency in the San Diego – Imperial Valley area.
  - Scenario 3: same as Scenario 2 but implementing actions to curtail imports to SDG&E via southern 500kV and 230kV lines

Overall San Diego – Imperial Valley Area LCR and Associated LA Basin LCR Need (2020)

Year	Scenario	Category	Limiting Facility	Contingency	SD-IV LCR (MW)	Deficiency in SD-IV area (MW)	Total LA Basin LCR (MW)
2020	1	B/C	Imperial Valley – El Centro 230kV Line (S-Line)	G-1 of TDM generation, system readjustment, followed by Imperial Valley-North Gila 500kV line (N-1), or vice versa	4,579*	537*	5,839
2020	2	B/C	Imperial Valley – El Centro 230kV Line (S-Line)	G-1 of TDM generation, system readjustment, followed by Imperial Valley-North Gila 500kV line (N-1), or vice versa	4,042**	0	9,579***
2020	3	B/C	Imperial Valley – El Centro 230kV Line (S-Line)	G-1 of TDM generation, system readjustment, followed by Imperial Valley-North Gila 500kV line (N-1), or vice versa	**4,042**** (Recommended LCR)	0	**7,712^** (Recommended LCR)

Notes:

*Total LCR need to mitigate identified reliability concern. Deficiency represents the assumption of additional local capacity requirements, if located in the most effective location (i.e., connecting to Imperial Valley substation), would mitigate identified transmission constraint. The total LCR includes 16 MW of 20-minute demand response and 222.5 MW of battery storage in the San Diego area.

** Total available local capacity resources within the San Diego-Imperial Valley LCR area.

***The LA Basin local capacity includes 100 MW of in-front-the meter battery storage, 294 MW of "fast" demand response, 248 MW of long-term procurement plan preferred resources, 368 MW of demand response with 30-minute or more response time (i.e., "slow" demand response) and thermal resources.

^ This 100 MW of in-front-of meter battery storage, 294 MW of "fast" demand response, and 248 MW of LTPP preferred resources in the LA Basin.

Overall San Diego – Imperial Valley Area LCR (2024)

- Similar to the 2020 LCR study, the following are two major factors that affect the change in the LCR need for the San Diego-Imperial Valley area:
  - Modeling of expected solar generation output (i.e., 0 MW) at the time of forecast peak load (for San Diego area, the peak load is forecast to be at 8 p.m. PDT). This represents approximately 562 MW of unavailable local capacity at effective locations for the most constraint reliability concern for the area.
  - Modeling San Diego peak load based on the CEC-adopted 2018 – 2030 California Energy Demand Update forecast, reflecting 245 MW higher than the previous year's 2018-2030 CED forecast (2017 IEPR).

Overall San Diego – Imperial Valley Area LCR and Associated LA Basin LCR Need (2024)

Year	Category	Limiting Facility	Contingency	SD-IV LCR (MW)	Deficiency in SD-IV area (MW)	Total LA Basin LCR (MW)
2024	B/C	El Centro 230/92kV Transformer	G-1 of TDM generation, system readjustment, followed by Imperial Valley-North Gila 500kV line (N-1), or vice versa	**4,295***	0	**6,260^**

Notes:

*This includes 358 MW of battery energy storage and 16 MW of 20-minute demand response in San Diego-Imperial Valley LCR area.

^This includes 294 MW 20-minute demand response, 294 LTPP preferred resources and 100 MW in-front-of-meter battery energy storage.

Summary of Overall San Diego – Imperial Valley Total LCR Need

2020 LCR Need	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total LCR (MW)
Category B (Single)	4,042	0	4,042
Category C (Multiple)	4,042	0	4,042
2024 LCR Need			
Category B (Single)	4,295	0	4,295
Category C (Multiple)	4,295	0	4,295

Notes:

- 2020 load forecast (2018 CEDU) is higher by 229 MW compared to 2019 load forecast (2018 CED).
- 2024 load forecast (2018 CEDU) is higher by 281 MW compared to 2023 load forecast (2018 CED).
- Solar generation production is at 0 MW for both cases (440 MW and 562 MW lower as these represent NQC values).
- Operating procedure and LA Basin generation are utilized to mitigate potential deficiency for the San Diego-Imperial Valley LCR area.

Summary of Overall LA Basin LCR Need

2020 LCR Need	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total LCR (MW)
Category B (Single)	7,712	0	7,712
Category C (Multiple)	7,712	0	7,712
2024 LCR Need			
Category B (Single)	6,260	0	6,260
Category C (Multiple)	6,260	0	6,260

Notes:

- 2020 load forecast (2018 CEDU) is lower by 812 MW compared to 2019 load forecast (2018 CED).
- 2024 load forecast (2018 CEDU) is lower by 777 MW compared to 2023 load forecast (2018 CED).
- Operating procedure and LA Basin generation are utilized to mitigate potential deficiency for the San Diego-Imperial Valley LCR area.

Changes Compared to Previous LCR Requirements

Subarea/Area	2019		2020		2023		2024		Comments
	Loads + Losses (MW)	LCR* (MW)	Loads + Losses (MW)	LCR* (MW)	Loads + Losses (MW)	LCR* (MW)	Loads + Losses (MW)	LCR* (MW)	
El Nido Subarea	1,611	421	1,519	355	1,614	439	1,442	393	Lower load forecast; Petrol load reconnected to a new 230kV substation; Mesa loop-in project (2023 & 2024)
Western LA Basin Subarea	11,635	3,993	11,291	3,571	11,681	3,970	10,988	3,783	Lower load forecast; Mesa loop-in project
Eastern LA Basin Subarea	7,390	2,956	6,634	2,416	7,428	2,702	7,210	2,477	Lower load forecast; Mesa loop-in project helps relieve Eastern LA Basin
Overall LA Basin	20,078	7,525	19,266	7,712	20,076	6,793	19,299	6,260	Lower load forecast; resources are utilized to help mitigate SD-IV area LCR need
San Diego Subarea	4,415	2,717	4,644	2,783	4,554	2,731	4,835	2,930	Higher load forecast for the San Diego area
Overall San Diego-Imperial Valley Area	4,415	4,032	4,644	4,042	4,554	4,132	4,835	4,295	Higher load forecast; unavailability of solar generation at peak load (8 p.m.)