

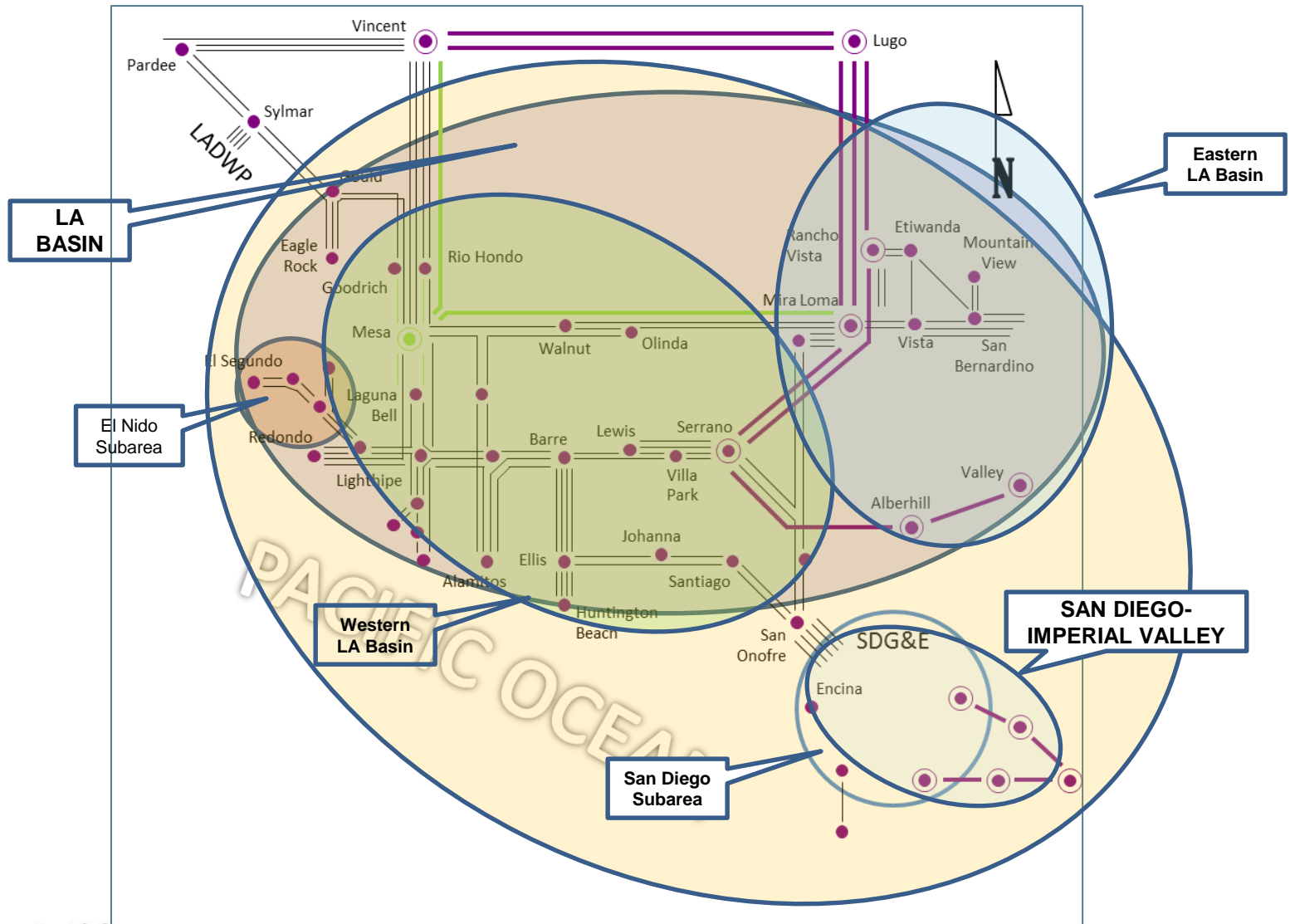


2020 & 2024 Final LCR Study Results for LA Basin and San Diego-Imperial Valley Areas

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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 (230/230 kV 2x400 MVA)
- Sycamore – Penasquitos 230 kV transmission line
- Bypassing series capacitors on the Imperial Valley-North Gila 500 kV 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 as in the following based on the time of peak loads
 - Modeled at NQC values (33.4% of installed capacity) for SCE peak load study case (the CEC forecast peak load for SCE at 5 p.m. PDT)
 - Modeled at 0 MW values for SDG&E peak load study case (the CEC forecast peak load for SDG&E at 8 p.m. PDT)
- Encina generation retirement (946 MW)
- Carlsbad Energy Center (500 MW) in-service (*CPUC LTPP resource*)
- Generation retirement (1525 MW) from various once-through cooled generating units at Alamitos, Huntington Beach and Redondo Beach power plants to move emission credits to the new non-OTC units at Alamitos and Huntington Beach
- New non-OTC generating units at Alamitos (640 MW) and Huntington Beach (644 MW)
- Stanton Energy Center (2x49 MW peakers)
- The existing “fast” 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 (113 MW) – these are based on expected full capacity 4-hour resources

Major Resource Assumptions

2024 LCR study case

- Generation retirement (2165 MW) from the remaining Alamitos, Huntington Beach and Redondo Beach once-through cooled generation
- 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 (for a total of 432 MW). This includes 100 MW for in-front-of-meter battery energy storage system.
- Battery energy storage projects in San Diego area (total 213 MW) – these are based on expected full capacity 4-hour resources

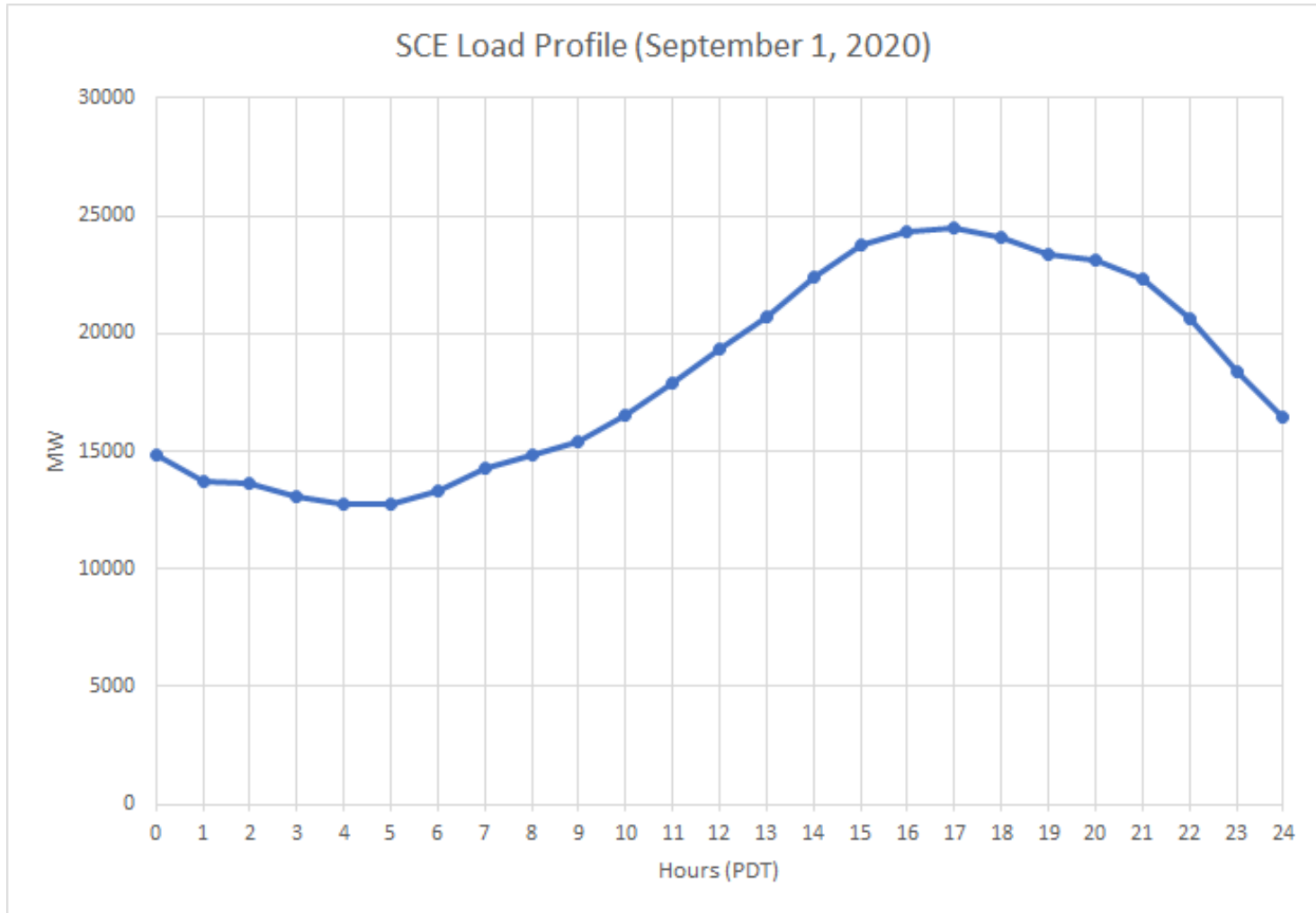
LA Basin Area: Loads and Resources

Loads (MW)	2020	2024	Resources NQC (MW)	2020	2024
Gross Load	20684	21518	Market, Net Seller, Wind, Battery, Solar	8216	5975
AAEE + AAPV	-277	-370	Muni	1110	1110
Behind the meter DG (production)	-1450	-2159	QF	234	234
Net Load	18957	18989	LTPP Preferred Resources (BESS, EE, DR, PV)	248	432
Transmission Losses	284	285	Existing 20-minute Demand Response	295	313
Pumps	20	21	Mothballed	335	335
Loads + Losses + Pumps	19261	19295	Total Qualifying Capacity	10439	8399

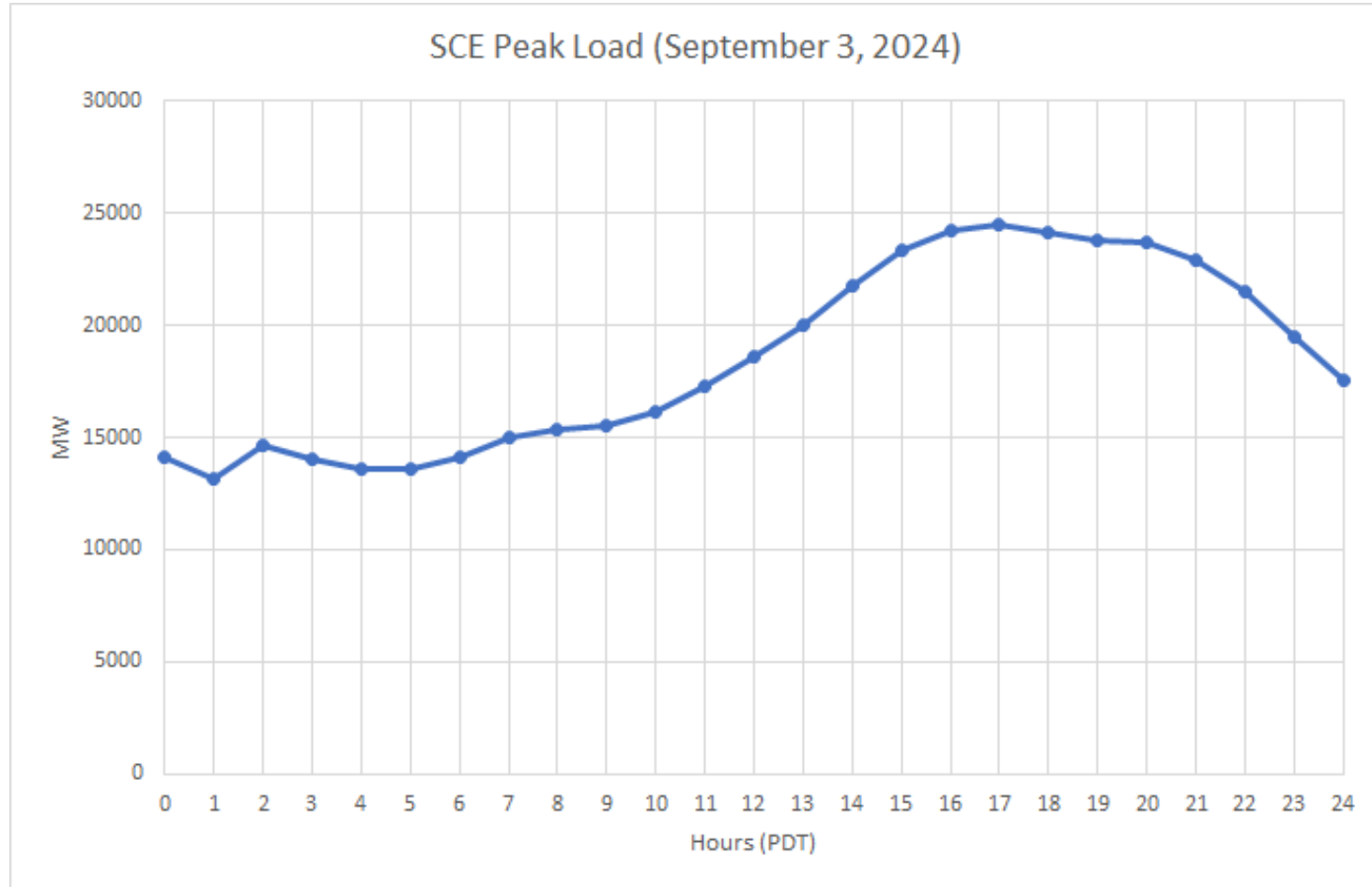
San Diego-Imperial Valley Area: Loads and Resources

Loads (MW)	2020	2024	Resources NQC (MW)	2020	2024
Gross Load	4648	5532	Market, Net Seller, Battery, Wind	3875	4016
AAEE	-159	-158	Solar	439	523
Behind-the-meter DG	0	-670	QF	4	4
Net Load	4489	4704	Muni	0	0
Transmission Losses	124	101	LTPP Preferred Resources	0	0
Pumps	0	0	Existing 20-Minute Demand Response	16	16
			Mothballed	0	0
Loads + Losses	4613	4805	Total Qualifying Capacity	4334	4559
			Total Qualifying Capacity at Peak (8 p.m. PDT)	3895	4036

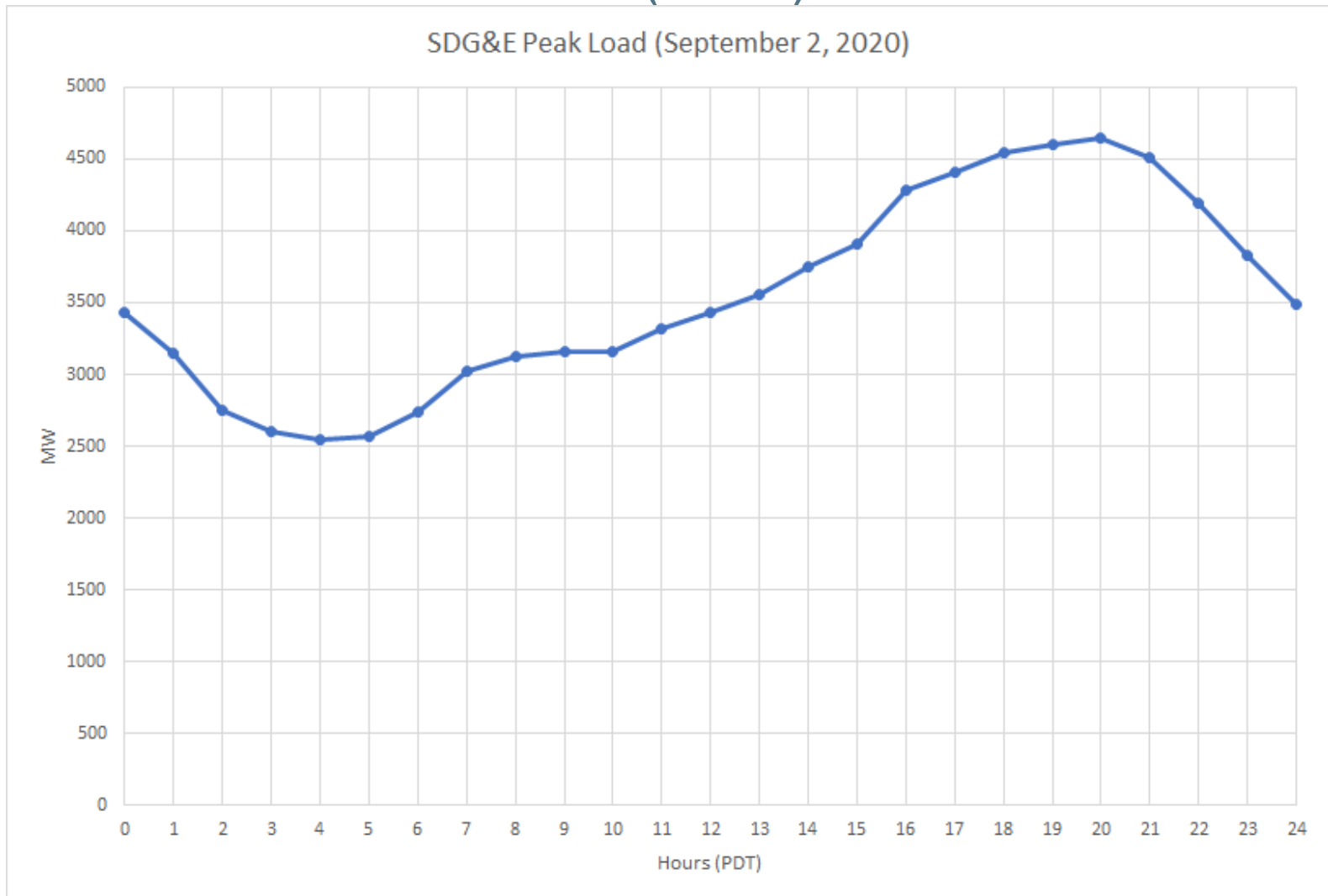
Hourly demand forecast profile for SCE service area (2020)



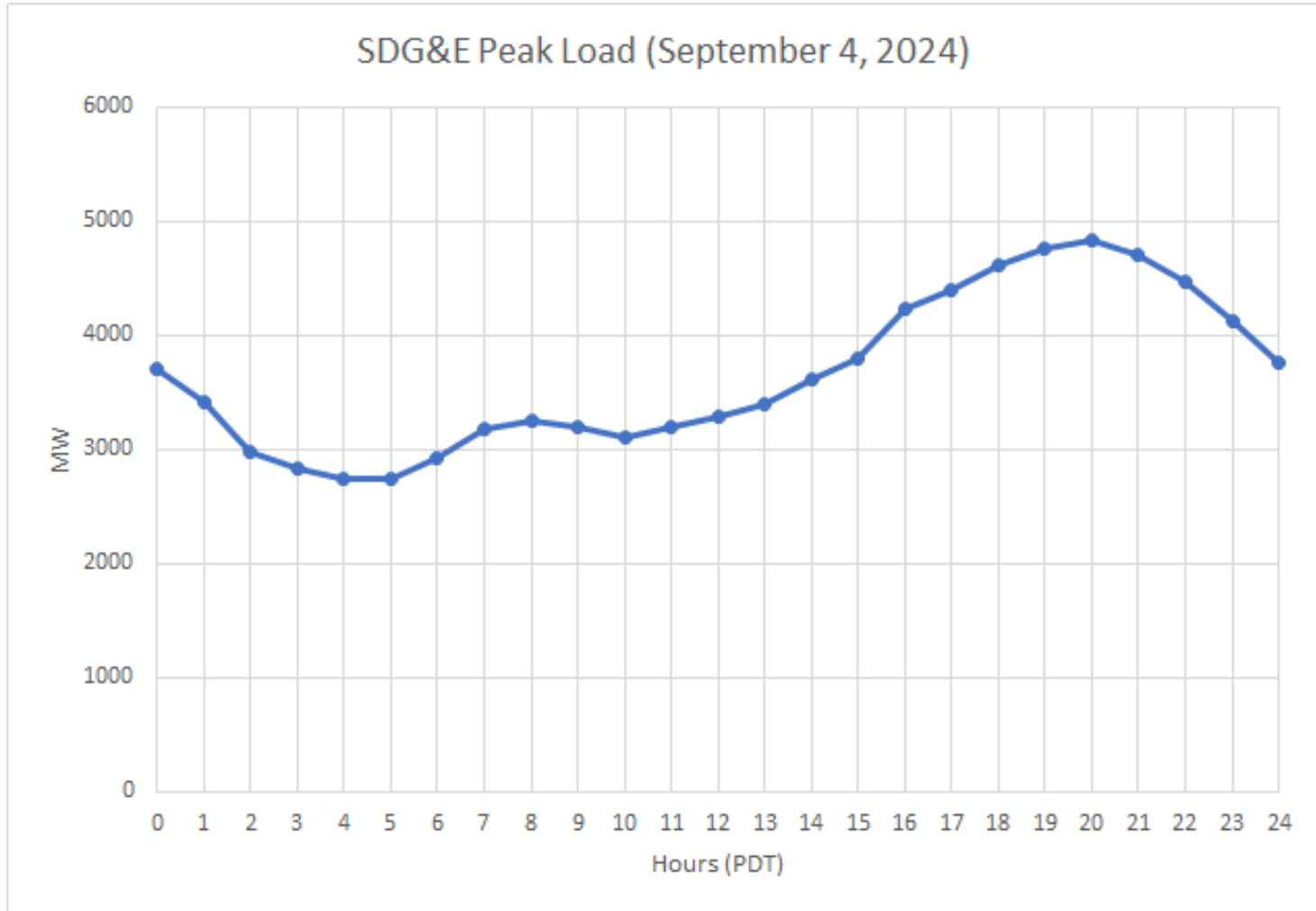
Hourly demand forecast profile for SCE service area (2024)



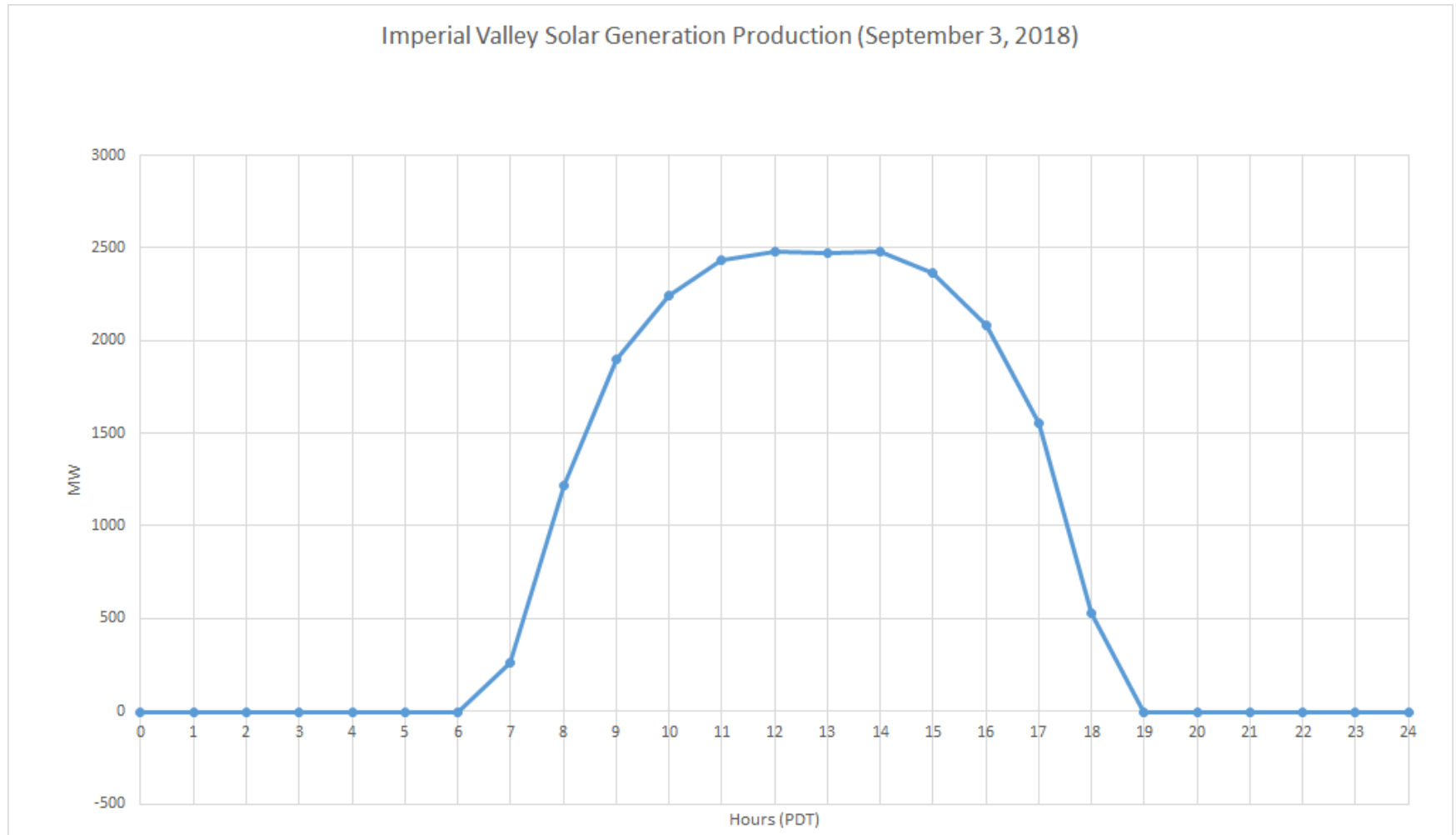
Hourly demand forecast profile for SDG&E service area (2020)



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



Total Imperial Valley Area Solar Generation Production (EMS Data)



El Nido Subarea LCR (LA Basin)

Year	Category	Limiting Facility	Contingency	Preliminary LCR (MW)	Final LCR (MW)
2020	C	La Fresa-La Cienega 230 kV	La Fresa – El Nido #3 & 4 230 kV lines	355	365
2020	B	None	Various contingencies	No requirements	No requirements
2024	C	La Fresa-La Cienega 230 kV	La Fresa – El Nido #3 & 4 230 kV lines	393	393
2024	B	None	Various contingencies	No requirements	No requirements

Reasons for the changes in the final 2020 LCR need:

- Bus loads were reallocated with the El Nido load slightly higher than the previous version.

Western LA Basin Subarea LCR

Year	Category	Limiting Facility	Contingency	Preliminary LCR (MW)	Final LCR (MW)
2020	C	Barre-Lewis 230 kV line	Barre-Villa Park 230 kV line, followed by G-1 of Huntington Beach new combined cycle plant	3571	3706
2020	B	Barre-Lewis 230 kV line	G-1 of Huntington Beach new combined cycle plant, followed by Barre-Villa Park 230 kV line	3571	3706
2024	C	Mesa-Laguna Bell 230 kV	Mesa-Redondo 230 kV, followed by Mesa-Lighthipe 230 kV line, or vice versa	3783	3783
2024	B	None-binding	Multiple combinations possible	N/A	N/A

Reasons for the changes in the final 2020 LCR need:

- Different G-1 for the G-1/N-1 contingency (i.e., Huntington Beach (final) vs. Alamitos (preliminary))

Eastern LA Basin Subarea LCR

Year	Category	Limiting Facility	Contingency	Preliminary LCR (MW)	Final LCR (MW)
2020	C	Post-transient voltage stability	Serrano-Valley 500 kV line, followed by Devers – Red Bluff 500 kV #1 and 2 lines	2416	2537
2020	B	Non-binding	Multiple combinations possible	N/A	N/A
2024	C	Post-transient voltage stability	Serrano-Valley 500 kV line, followed by Devers – Red Bluff 500 kV #1 and 2 lines	2477	2477
2024	B	Non-binding	Multiple combinations possible	N/A	N/A

Reasons for the changes in the final 2020 LCR need:

- Bus loads were reallocated in the Eastern LA Basin slightly higher than the previous version to factor in higher load growth for two major substations (Chino and Devers)

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

Overall LA Basin LCR independent from the overall San Diego-Imperial Valley

Year	Category	Limiting Facility	Contingency	Preliminary LCR (MW)	Final LCR (MW)
2020	C	Sum of Western and Eastern LA Basin LCR needs	See Western and Eastern LA Basin LCR results	5987	6243
2020	B	N/A	Non-binding, multiple combinations possible	N/A	N/A
2024	C	Sum of Western and Eastern LA Basin LCR needs	See Western and Eastern LA Basin LCR results	6260	6260
2024	B	N/A	Non-binding, multiple combinations possible	N/A	N/A

Reasons for the changes in the final 2020 LCR need:

- Updated LCR need (for final requirement) is higher due to higher Western and Eastern LA Basin LCR needs (see previous slides for further details)

San Diego Bulk Subarea LCR

Year	Category	Limiting Facility	Contingency	Preliminary LCR (MW)	Final LCR (MW)
2020	C	Remaining Sycamore-Suncrest 230 kV	ECO-Miguel 500 kV line, system readjustment, followed by one of the Sycamore-Suncrest 230 kV	2783	2642
2020	B	None-binding	Multiple combinations possible	N/A	N/A
2024	C	Remaining Sycamore-Suncrest 230 kV	ECO-Miguel 500 kV line, system readjustment, followed by one of the Sycamore-Suncrest 230 kV	2930	2898
2024	B	None-binding	Multiple combinations possible	N/A	N/A

Reasons for the changes in the final 2020 and 2023 LCR needs:

- Modeling additional battery energy storage connecting to Otay Mesa after confirmation from the developer regarding the capacity value for 4-hour duration and the in-service date

Overall San Diego – Imperial Valley Area LCR (2020)

- The following are two major factors that affected the change in the LCR need for the San Diego-Imperial Valley area when compared to last year's 2019 LCR study:
 - 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 limiting 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)

- The following three scenario studies were performed to determine the potential minimum LCR need for the overall San Diego-Imperial Valley area:
 - 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 500 kV and 230 kV lines

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

Year	Category	Limiting Facility	Contingency	SD-IV LCR (MW) Preliminary /Final	Deficiency in SD-IV area (MW) Preliminary/ Final	Total LA Basin LCR (MW) Preliminary/ Final
2020	B/C (1)	Imperial Valley – El Centro 230 kV Line (S-Line)	G-1 of TDM generation, system readjustment, followed by Imperial Valley-North Gila 500 kV line (N-1), or vice versa	4579 / 4434	537 / 539	5839 / 6214
2020	B/C (2)	Imperial Valley – El Centro 230 kV Line (S-Line)	G-1 of TDM generation, system readjustment, followed by Imperial Valley-North Gila 500 kV line (N-1), or vice versa	4042 / 4028	0 / 133	9579 / 9650
2020	B/C (3)	Imperial Valley – El Centro 230 kV Line (S-Line)	G-1 of TDM generation, system readjustment, followed by Imperial Valley-North Gila 500 kV line (N-1), or vice versa	4042 / 3895	0	7712 / 7364

Reasons for the changes in the final 2020 LCR needs (**Scenario 3**):

- Updated NQC list of available resources has fewer resources available at the time of peak for the San Diego-Imperial Valley area; this affects the total available resources used to meet toward the LCR need at peak load
- Yucca 69 kV Overload Scheme (RAS) was utilized to protect Yucca 161/69 kV transformers
- In reducing import flows on the 500 kV and 230 kV lines to mitigate loading impact to the “S” line for post contingency condition, effective generating units were curtailed to minimize reduction in imports and generation redispatch.

Overall San Diego – Imperial Valley Area LCR (2024)

- Similar to the 2020 LCR study, the following are two major factors that affected the change in the 2024 LCR need for the San Diego-Imperial Valley area when compared to last year's 2023 LCR study:
 - 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 limiting 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) Preliminary / Final	Deficiency in SD-IV area (MW) Preliminary / Final	Total LA Basin LCR (MW) Preliminary / Final
2024	B/C	El Centro 230/92 kV Transformer	TDM generation, system readjustment, followed by Imperial Valley-North Gila 500 kV line, or vice versa	4295 / 4025	0 / 0	6260 / 6224

Reasons for the changes in the final 2024 LCR needs:

- Same reasons as provided on slide 21

Summary of Overall San Diego – Imperial Valley Total LCR Need

<u>2020 LCR Need</u>	Existing Generation Capacity Needed (MW) Preliminary / Final	Deficiency (MW) Final / Preliminary	Total LCR (MW) Preliminary / Final
Category B (Single)	4042 / 3895	0	4042 / 3895
Category C (Multiple)	4042 / 3895	0	4042 / 3895
<u>2024 LCR Need</u>			
Category B (Single)	4295 / 4025	0	4295 / 4025
Category C (Multiple)	4295 / 4025	0	4295 / 4025

Reasons for the changes in the final LCR needs:

- See slides 21 and 22 for reasons

Summary of Overall LA Basin LCR Need

<u>2020 LCR Need</u>	Existing Generation Capacity Needed (MW) Preliminary / Final	Deficiency (MW) Preliminary / Final	Total LCR (MW) Preliminary / Final
Category B (Single)	7712 / 7364	0	7712 / 7364
Category C (Multiple)	7712 / 7364	0	7712 / 7364
<u>2024 LCR Need</u>			
Category B (Single)	6260 / 6224	0	6260 / 6224
Category C (Multiple)	6260 / 6260	0	6260 / 6260

Reasons for the changes in the final 2020 LCR need:

- See slides 21 and 23 for reasons

Reasons for the 2024 LCR need at 6260 MW for the LA Basin:

- The LCR need above is based on the study case for SCE peak load that occurs at 5 p.m. PDT with a different contingency than for the LCR need associated with SDG&E peak load. The LCR need of 6260 MW includes the use of LTPP preferred resources in which some amount is not available at a later 8 p.m. SDG&E peak load (i.e., behind the meter solar).