# 2021 & 2025 Final LCR Study Results for LA Basin and San Diego-Imperial Valley Areas

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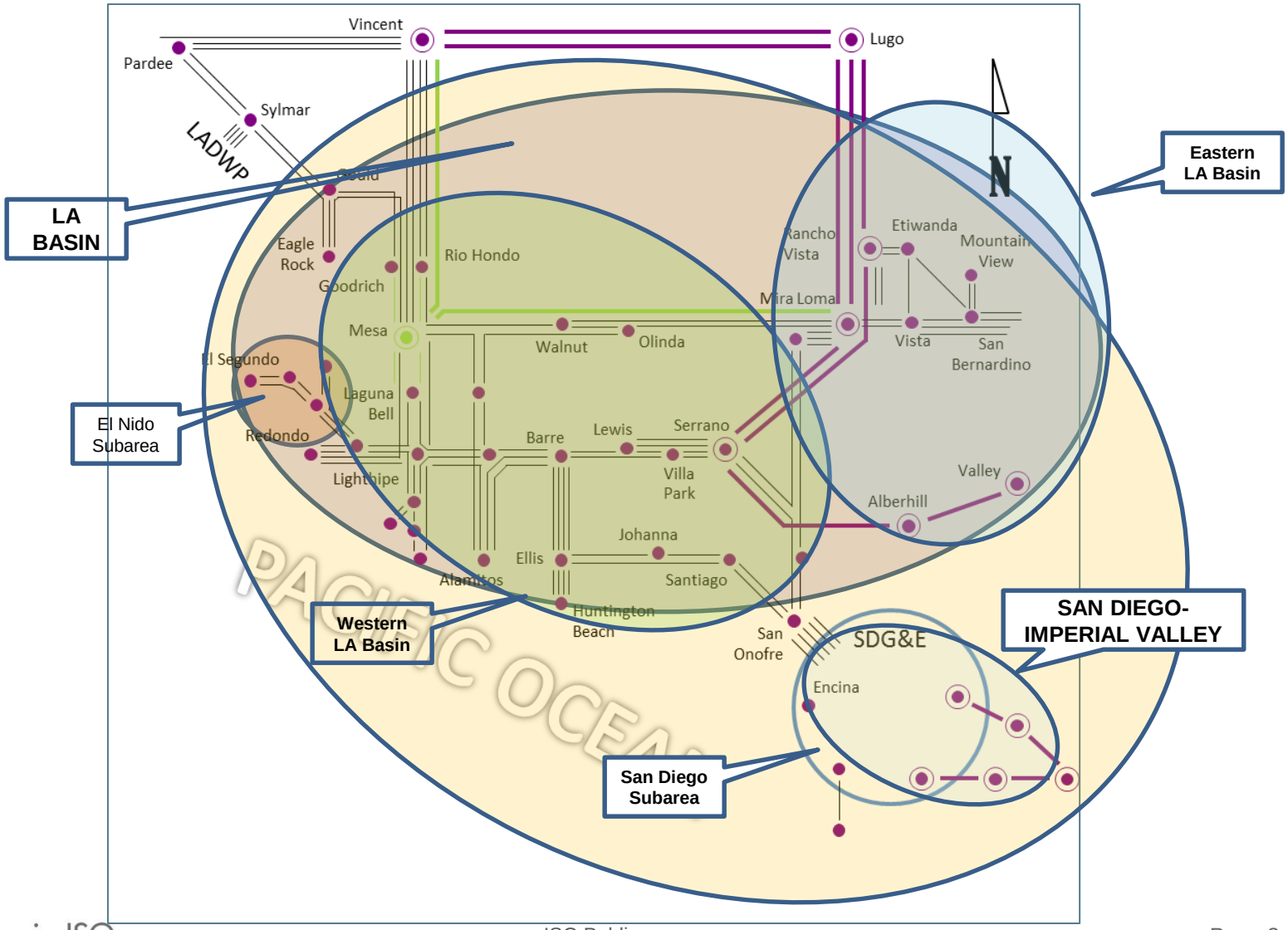
# Overview of the Changes between the Draft and Final Results

- Providing updated results for the western LA Basin LCR need
- Providing load shapes and estimated charging capability for energy storage under critical contingency and without local gas generation for the following:
  - El Nido sub-area
  - Overall LA Basin area
  - Overall San Diego – Imperial Valley area

# LA Basin and San Diego-Imperial Valley Areas



# Major New Transmission and Resource Assumptions

| Project Name | Service Areas | Expected ISD |
|---|---|---|
| **New Transmission Projects** | | |
| Imperial Valley – El Centro 230 kV ("S" line) upgrades | IID / SDG&E | 12/31/2021 |
| Mesa Loop-In Project (230kV Loop-In) | SCE | 6/1/2021 |
| Mesa Loop-In Project (500kV Loop-In) | SCE | 3/2022 |
| **New Resource Projects** | | |
| Alamitos Repowering Project | SCE | 2/7/2020 |
| Huntington Beach Repowering Project | SCE | 2/4/2020 |
| Stanton Energy Reliability Center | SCE | 6/1/2020 |
| Alamitos 100 MW Battery Energy Storage System | SCE | 12/2020 |
| Local Capacity Area Preferred Resources (EE, DR, BTM BESS) | SCE | 6/1/2021* |

Notes:
* Based on contract dates. The ISO is in the process of checking with SCE for actual implementation dates.

# LA Basin Area: Loads and Resources

| Loads (MW) | 2021 | 2025 | Resources NQC* (MW) | 2021 | 2025 |
|---|---|---|---|---|---|
| Gross Load | 20234 | 21065 | Market, Net Seller, Wind, IFM Battery | 7838 | 5597 |
| AAEE | -158 | -382 | Muni | 1056 | 1056 |
| Behind the meter DG (production) | -1450 | -2159 | QF | 141 | 141 |
| **Net Load** | **18626** | **18524** | LTPP LCR Preferred Resources (BTM BESS, EE, DR, PV) | 331 | 331 |
| Transmission Losses | 284 | 282 | Existing Demand Response | 287 | 287 |
| Pumps | 20 | 20 | Solar generation | 11 | 11 |
| **Loads + Losses + Pumps** | **18930** | **18826** | **Total Qualifying Capacity** | **9664** | **7423** |

*August NQC for RA accounting purpose

# San Diego-Imperial Valley Area: Loads and Resources

| Loads (MW) | 2021 | 2025 | Resources NQC* (MW) | 2021 | 2025 |
|---|---|---|---|---|---|
| Gross Load | 4443 | 4618 | Market, Net Seller, Battery, Wind | 3996 | 4431 |
| AAEE | -28 | -66 | Solar (Production is "0" at 20:00 hr.) | 356 | 378 |
| Behind-the-meter DG | 0 | 0 | QF | 2 | 2 |
| **Net Load** | **4415** | **4552** | Muni | 0 | 0 |
| Transmission Losses | 108 | 123 | LTPP Preferred Resources | 0 | 0 |
| Pumps | 0 | 0 | Existing Demand Response | 7 | 7 |
| | | | Mothballed | 0 | 0 |
| **Loads + Losses** | **4523** | **4675** | **Total Qualifying Capacity** | **4631** | **4818** |

*August NQC for RA accounting purpose

# El Nido Sub-area LCR (LA Basin)

| Year | Category | Limiting Facility | Contingency | LCR (MW) (deficiency) | 2020 and 2024 LCR (MW) |
|---|---|---|---|---|---|
| 2021 | P7 | La Fresa-La Cienega 230 kV | La Fresa – El Nido #3 & 4 230 kV lines | 394 | 365 |
| 2025 | P7 | La Fresa-La Cienega 230 kV | La Fresa – El Nido #3 & 4 230 kV lines | 409 | 393 |

Reasons for the changes in the LCR needs:

- LCR need increases due to reallocation of higher substation loads in the El Nido sub-area.

# Western LA Basin Sub-area LCR

| Year | Category | Limiting Facility | Contingency | Final LCR (MW) (deficiency) | Draft LCR Results (MW) | 2020 and 2024 LCR (MW) |
|---|---|---|---|---|---|---|
| 2021 | P3 | Barre-Lewis 230 kV line | G-1 of new Huntington Beach combined cycle plant, system readjusted, followed by Barre-Villa Park 230 kV line outage | 3303 | 3249 | 3706 |
| 2025 | P6 | Mesa-Laguna Bell 230 kV | Mesa-La Fresa 230 kV, followed by Mesa-Lighthipe 230 kV line, or vice versa | 3943 | 3943 | 3783 |

Reasons for the changes in the LCR needs:

- 2021 - the 2021 LCR need is lower than 2020 LCR need due the following:
  - Mesa 230 kV loop-in portion of the Mesa Loop-In Project is completed, bringing new sources to Mesa substation. The 230 kV bus tie breaker is operated in the closed position (while 500kV portion is constructed) to help mitigate loading concern.
  - The CEC's demand forecast for Cities of Vernon and Anaheim being lower compared to 2020 LCR study.
- 2025 - the LCR need is higher than the 2024 LCR need due to the following:
  - Loads are allocated higher for some substations in the western LA Basin and lower in the Big Creek/Ventura area based on updated load distribution information from the CEC and SCE.
- Changes between the draft and final for 2021 LCR need for the western LA Basin:
  - Previous draft result included the LCR need with one OTC unit; the final result included no OTC unit.
  - OTC unit is located in a more effective location, resulting in slightly lower LCR requirement (54 MW lower).

# Eastern LA Basin Sub-area LCR

| Year | Category | Limiting Facility | Contingency | LCR (MW) (deficiency) | 2020 and 2024 LCR (MW) |
|---|---|---|---|---|---|
| 2021 | Extreme (N-1-2) | Post-transient voltage stability | Serrano-Valley 500 kV line, followed by Devers – Red Bluff 500 kV #1 and 2 lines | 2867 | 2537 |
| 2025 | Extreme (N-1-2) | Post-transient voltage stability | Serrano-Alberhill 500 kV line, followed by Devers – Red Bluff 500 kV #1 and 2 lines | 2366 | 2477 |

Reasons for the changes in the LCR needs:

- 2021 - the LCR need for the Eastern LA Basin is higher than the 2020 LCR due to the following:
  - Bus loads at some locations in the Eastern LA Basin are reallocated higher than the 2020 LCR study based on updated load distribution information from the CEC and SCE.
  - Imports are higher due to lower availability of internal generation from based on updated lower NQC values for solar and wind generation in SCE and SDG&E areas (using latest ELCC values from the CPUC)
- 2025 - the LCR need for the Eastern LA Basin is lower due to the following reasons:
  - Lower import levels from the Southwest due to base-load generation retirement in Arizona. Lower import level results in less line voltage drop, lessening voltage stability concern.
  - Higher LCR level in the Western LA Basin results in lower voltage drop, lessening voltage stability concern.

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

# San Diego Bulk Sub-area LCR

| Year | Category | Limiting Facility | Contingency | LCR (MW) (deficiency) | 2020 and 2024 LCR (MW) |
|---|---|---|---|---|---|
| 2021 | P6 | Remaining Sycamore-Suncrest 230 kV | ECO-Miguel 500 kV line, system readjustment, followed by one of the Sycamore-Suncrest 230 kV | 2270 | 2642 |
| 2025 | P6 | Remaining Sycamore-Suncrest 230 kV | ECO-Miguel 500 kV line, system readjustment, followed by one of the Sycamore-Suncrest 230 kV | 2791 | 2898 |

Reasons for the changes in the LCR needs:

- The LCR needs are lower due to lower demand forecast from the CEC for San Diego area.

# Overall San Diego – Imperial Valley Area LCR

| Year | Category | Limiting Facility | Contingency | LCR (MW) (deficiency) | 2020 and 2024 LCR (MW) |
|---|---|---|---|---|---|
| 2021 | P3 | 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) | 3888 | 3895 |
| 2025 | P3 | El Centro 230/92 kV Transformer | TDM generation, system readjustment, followed by Imperial Valley-North Gila 500 kV line (N-1) | 3557 | 4025 |

Reasons for the changes in the LCR needs:

- Lower demand forecast results in lower LCR need.
- More effective units in the San Diego-Imperial Valley area are dispatched to mitigate the S line loading concern.
- Significant LCR need is reduced for 2025 timeframe due to implementation of the S-line upgrade and proposed battery energy storage system projects located in effective locations.

# Overall LA Basin LCR associated with the San Diego – Imperial Valley LCR need

| Year | Category | Limiting Facility | Contingency | LCR (MW) (deficiency) | 2020 and 2024 LCR (MW) |
|---|---|---|---|---|---|
| 2021 | P3 | 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) | 6127 | 7364 |
| 2025 | P3 | El Centro 230/92 kV Transformer | TDM generation, system readjustment, followed by Imperial Valley-North Gila 500 kV line (N-1) | 6281 | 6224 |

Reasons for the changes in the LCR needs:

- For 2021, significant LCR reduction is due to lower San Diego forecast demand and implementation of the Mesa 230 kV loop-in and operating the Mesa bus-tie breaker in the closed position.
- For 2025, there is slight increase in the LCR need for LA Basin (associated with contingency in San Diego area) due to significant LCR reduction for the overall San Diego-Imperial Valley area.

# Overall LA Basin LCR Need

| Year | Limiting Facility | Limiting Facility | Contingency | Final LCR (MW) (deficiency) | Draft LCR (MW) (deficiency) | 2020 and 2024 LCR (MW) |
|---|---|---|---|---|---|---|
| 2021 | Sum of Western and Eastern LA Basin LCR needs | See Western and Eastern LA Basin LCR results | See Western and Eastern LA Basin LCR results | 6170 | 6116 | 6243 |
| 2021 | P3 | 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) | 6127 | 6127 | 7364 |
| 2025 | Sum of Western and Eastern LA Basin LCR needs | See Western and Eastern LA Basin LCR results | See Western and Eastern LA Basin LCR results | 6309 | 6309 | 6260 |
| 2025 | P3 | El Centro 230/92 kV Transformer | TDM generation, system readjustment, followed by Imperial Valley-North Gila 500 kV line (N-1) | 6281 | 6281 | 6224 |

- The underlined values indicate the final LCR needs for the LA Basin for 2021 and 2025.
- The reasons for the changes in the LCR needs are provided for in the previous slide.
- For 2021, the final result for the sum of the western and eastern LA Basin increases slightly by 54 MW due to higher LCR need for the western LA Basin without OTC generation. Since this total LCR need is higher than the need associated with the contingency in San Diego – Imperial Valley area, this value is determined to be the final LCR need for the overall LA Basin.

# Changes Compared to Previous LCR Requirements

| Subarea | 2020 | | 2021 | | 2024 | | 2025 | |
|---|---|---|---|---|---|---|---|---|
| | Load | LCR | Load | LCR | Load | LCR | Load | LCR |
| El Nido | 1519 | 365 | 1590 | 394 | 1442 | 393 | 1596 | 409 |
| Western LA Basin | 11291 | 3706 | 11420 | 3303 | 10988 | 3783 | 11291 | 3943 |
| Eastern LA Basin | 6634 | 2537 | 7502 | 2867 | 7210 | 2477 | 7510 | 2366 |
| Overall LA Basin | 17925 | 7364 | 18922 | 6170 | 18198 | 6260 | 18801 | 6309 |
| San Diego Subarea | 4644 | 2642 | 4523 | 2270 | 4835 | 2898 | 4675 | 2791 |
| Overall San Diego – Imperial Valley Area | 4644 | 3895 | 4523 | 3888 | 4835 | 4025 | 4675 | 3557 |

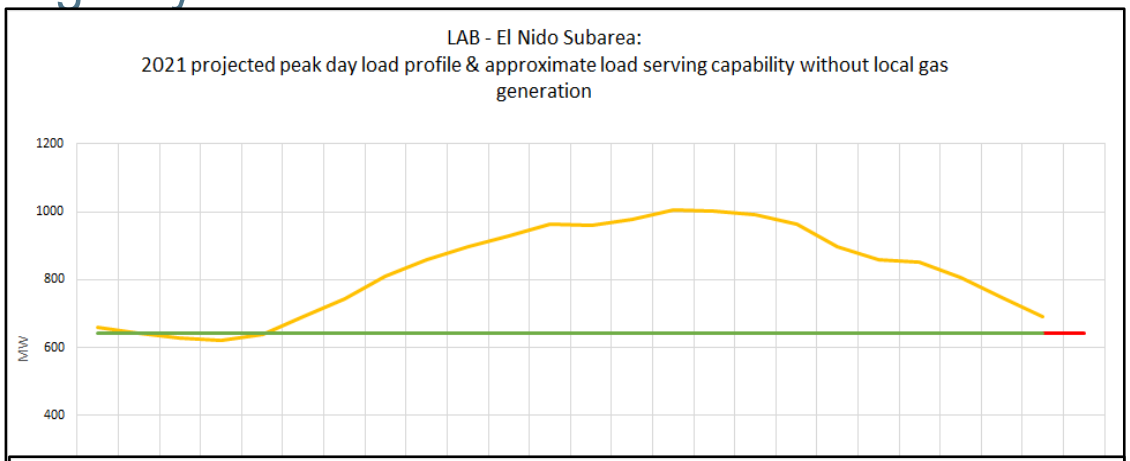
- Due to non-linearity performance results, please refer to each subarea and area for further detailed explanations on the reasons for differences between 2020 and 2021, 2024 and 2025 LCR results.
- The changes cannot be explained by changes in loads, but also by changes in system topology as well as resource additions in specific locations. The subareas and areas have further discussion on the reasons for the changes in LCR needs for each subarea and area.

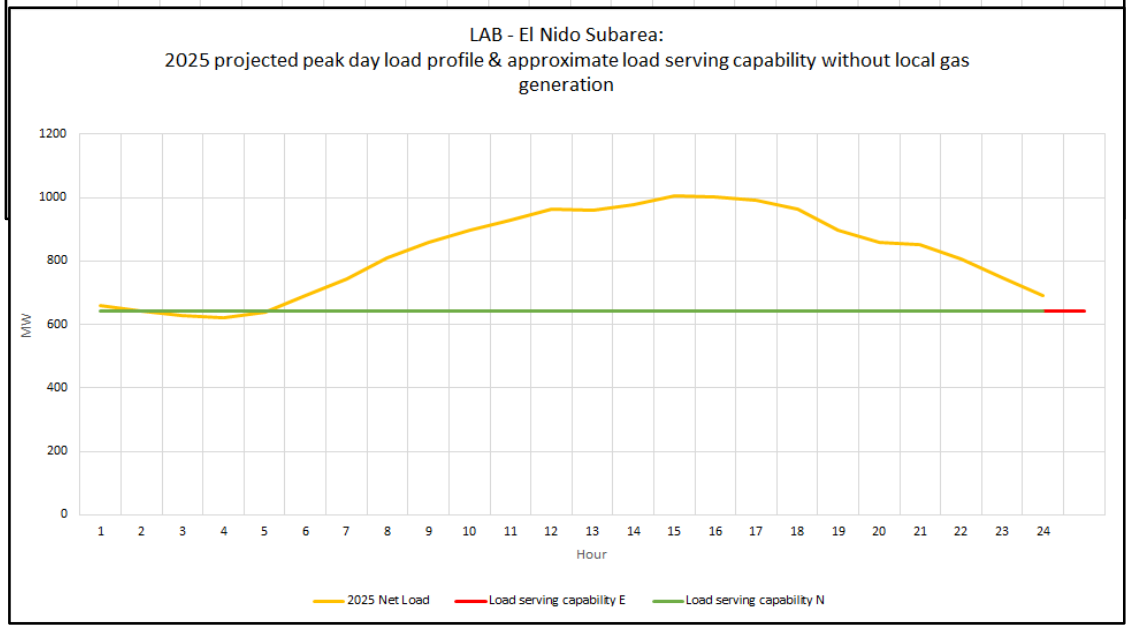
# Load Shapes and Estimated Storage Charging Capability Under Critical Contingency and Without Local Gas Generation Scenario

- The objective of this study is to evaluate following:
  - The potential transmission capability under a scenario in which a critical contingency could last more than a day and there is no local gas generation; this scenario looks at a potential future condition in which local gas-fired generation may not be available.
  - The estimated energy storage charging capability under the above scenario; storage charging represents load added to the local capacity area demand that may not be feasible if the transmission capability is limited (i.e., substation load plus storage charging exceeds transmission capability).
  - The estimated potential storage charging capability under a hypothetical transmission upgrade scenario and/or retaining some local gas generation; increased transmission capability could allow for more energy storage charging in a local capacity area.
- The study is preliminary and is considered an estimate at this time and can be refined further in the future with additional information on the state's future resource procurement and location-specific resources as they become available. In addition, potential future transmission development will provide further specific information for calculating transmission capability under critical contingency.
- The study is performed for the contiguous LA Basin and San Diego-Imperial Valley areas with both not having gas-fired generation dispatch.

# El Nido Subarea Load Shape and Estimated Energy Storage Charging Capability Under Critical Contingency and Without Local Gas Generation

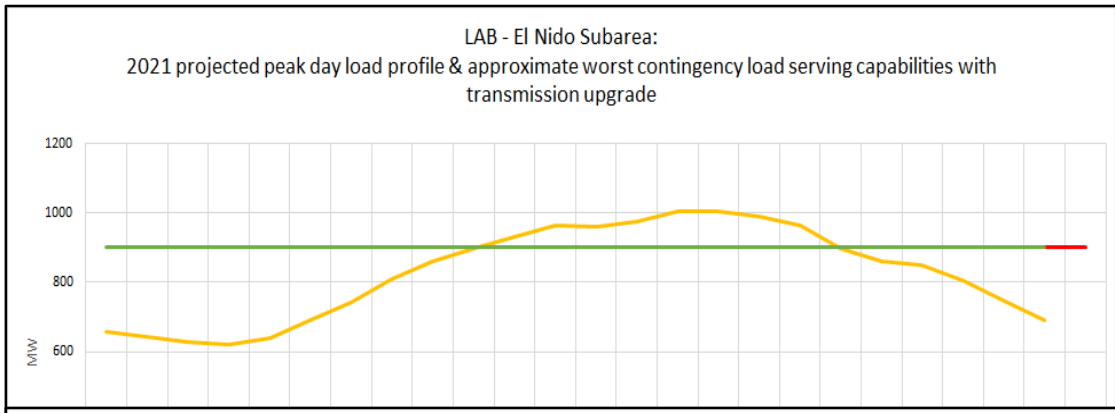
- It is estimated that the transmission load serving capability under continuous critical contingency condition and without local gas generation dispatch can serve about 64% of peak demand forecast.
- Based on the daily load duration curve on a summer peak day for this subarea, it does not appear to be feasible to accommodate local energy storage charging under continuous contingency condition during peak day due to insufficient time allowed for charging if the critical transmission outage were to last more than a day.
- However, if the transmission load serving capability can be increased by transmission upgrade, and/or retaining some local gas generation, some amount of energy storage can be accommodated to include charging capability under the extended transmission contingency (see next slide).

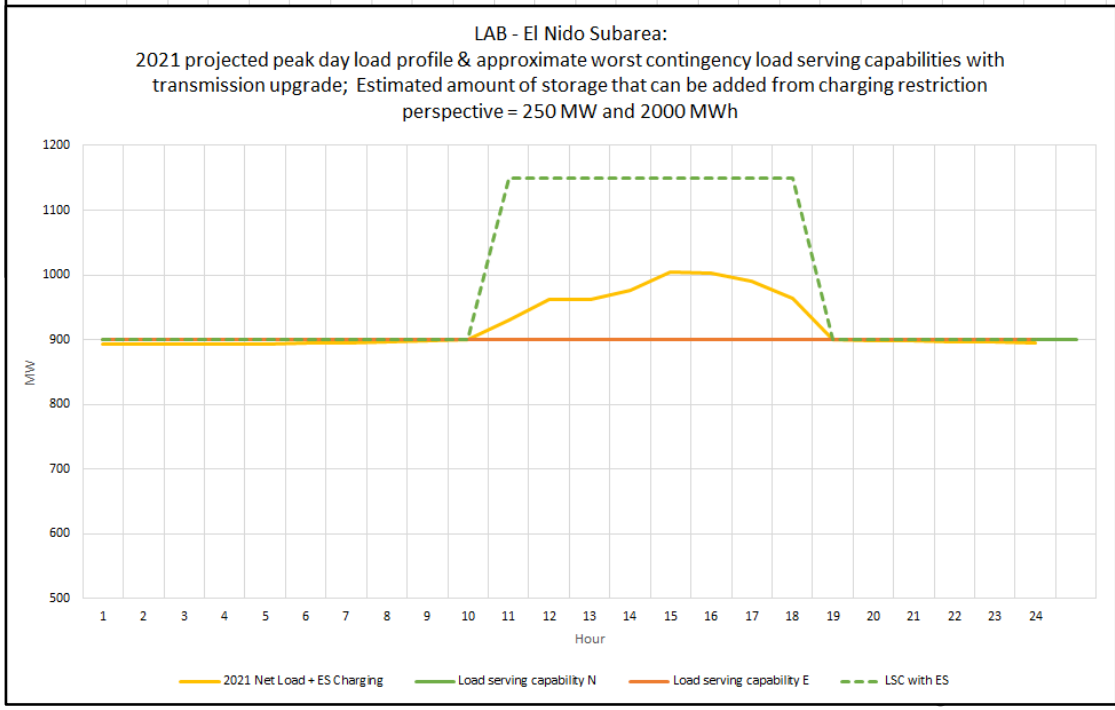


# El Nido Subarea Load Shape and Estimated Energy Storage Charging Capability Under Critical Contingency and Without Local Gas Generation (cont'd)

- In this example, the transmission is upgraded (and/or retaining some local gas generation) to provide contingency load serving capability of up to 900 MW.
- With the increase in transmission load serving capability under critical contingency without local gas generation, the amount of battery energy storage that can be included in this subarea based on charging restriction is estimated to be 250 MW and 2000 MWh.
- This example provides simple linear approximation at this time; further assessment is needed to evaluate the efficacy of the various potential transmission upgrades under no local gas generation, or combination of transmission and/or local gas generation as well as specific locations of energy storage projects.



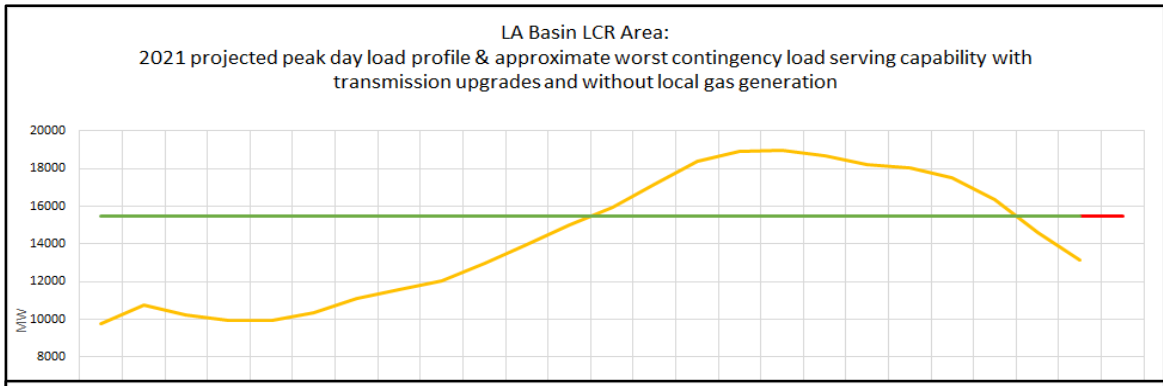



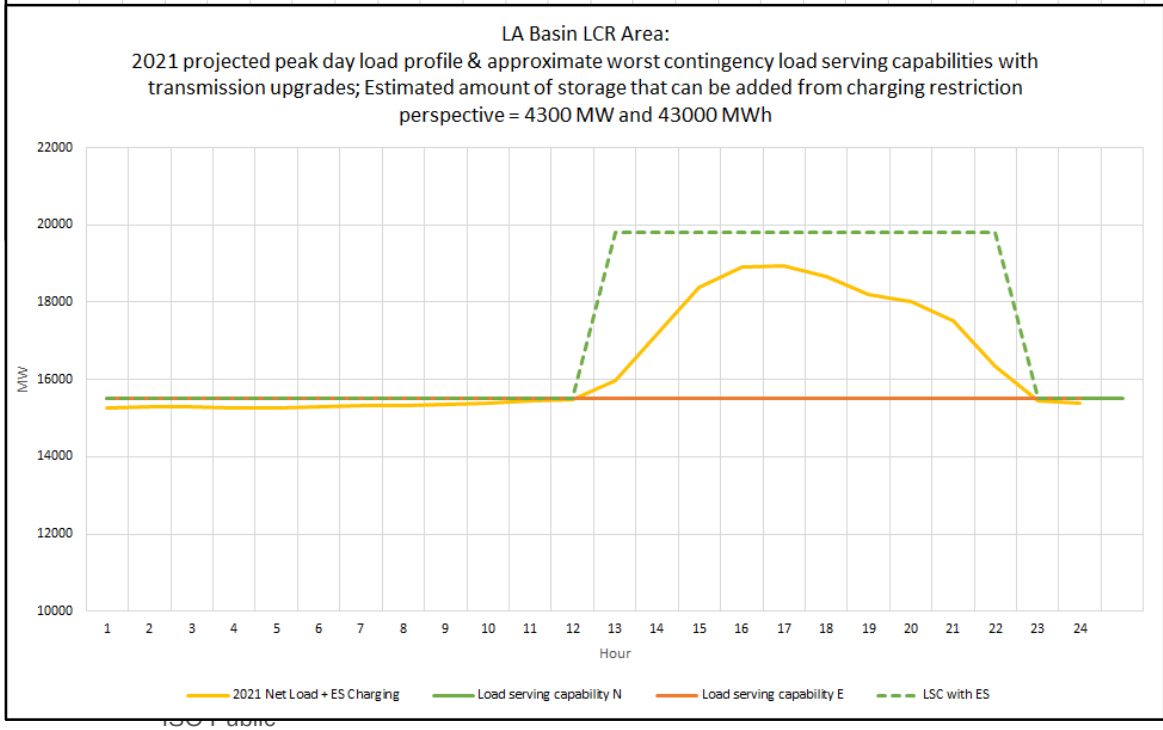
# LA Basin Load Shape and Estimated Energy Storage Charging Capability Under Critical Contingency and Without Local Gas Generation

- It is estimated that the transmission load serving capability under continuous critical contingency condition without local gas generation dispatch can serve about 53% of peak demand forecast. Critical contingency includes post-transient voltage stability concern due to an outage of the North Gila – Imperial Valley 500kV line.
- Based on the daily load duration curve on a summer peak day for this subarea, it does not appear to be feasible to accommodate local energy storage charging under continuous contingency condition during peak day due to insufficient time allowed for charging if the critical transmission outage were to last more than a day.
- However, if the transmission load serving capability can be increased by transmission upgrade, and/or retaining some local gas generation, some amount of energy storage can be accommodated to include charging capability under the extended transmission contingency (see next slide).

# LA Basin Load Shape and Estimated Energy Storage Charging Capability Under Critical Contingency and Without Local Gas Generation (cont'd)

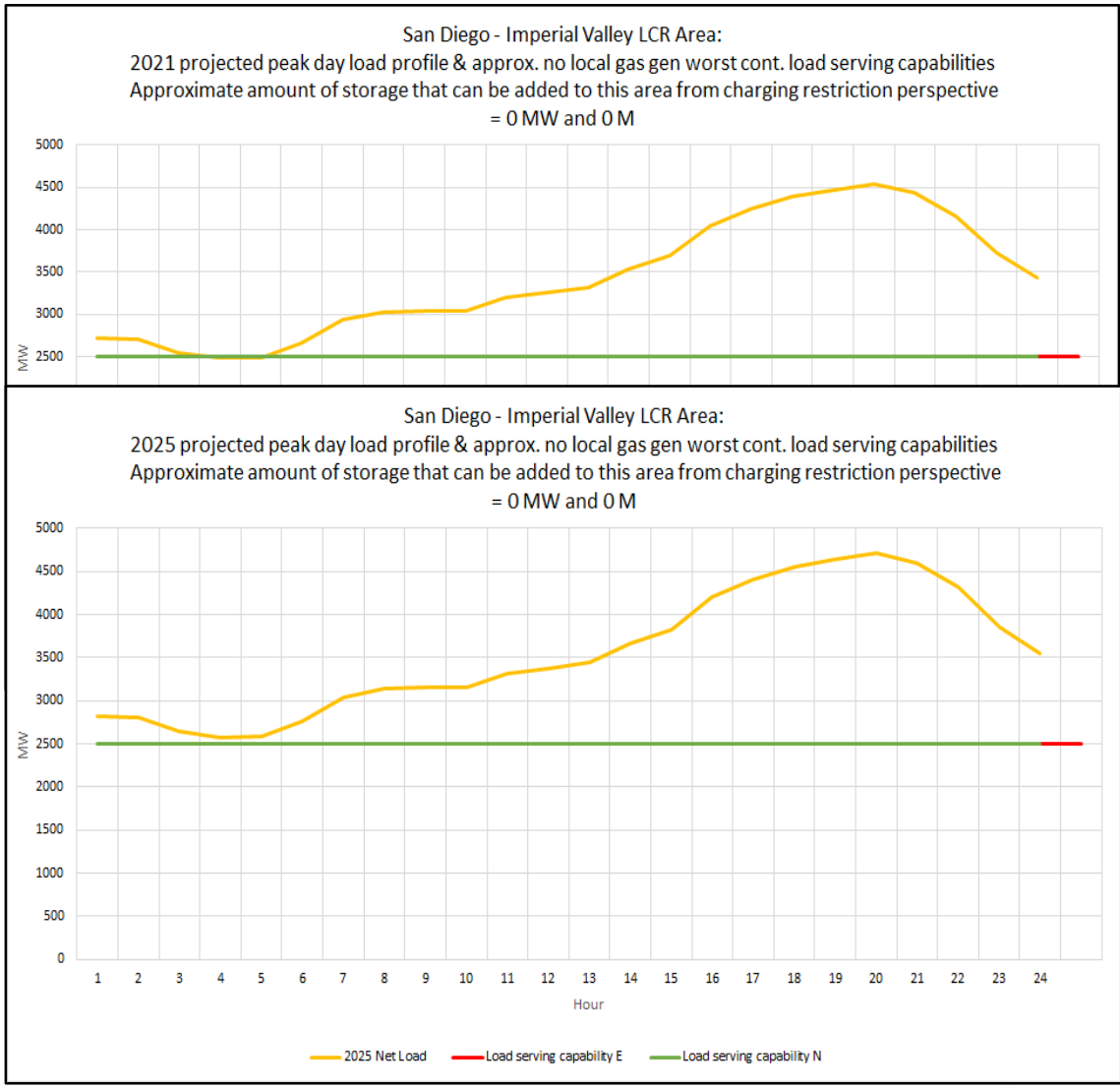
- In this example, the transmission is assumed hypothetically upgraded (and/or retaining some local gas generation) to provide contingency load serving capability of up to 15500 MW under continuous critical contingency condition.
- With the increase in transmission load serving capability under critical contingency without local gas generation, the amount of energy storage that can be included in this subarea based on charging restriction is estimated to be 4300 MW and 43000 MWh.
- This example provides simple linear approximation at this time; further assessment is needed to evaluate the efficacy of the various potential transmission upgrades under no local gas generation, or combination of transmission and/or local gas generation as well as specific locations of energy storage projects.



# San Diego-Imperial Valley Area Load Shape and Estimated Energy Storage Charging Capability Under Critical Contingency and Without Local Gas Generation

- It is estimated that the transmission load serving capability under continuous critical contingency condition and without local gas generation dispatch can serve about 53-55% of peak demand forecast. Critical contingency includes post-transient voltage stability concern due to an outage of the North Gila – Imperial Valley 500kV line.
- Based on the daily load duration curve on a summer peak day for this subarea, it does not appear to be feasible to accommodate local energy storage charging under continuous contingency condition during peak day due to insufficient time allowed for charging if the critical transmission outage were to last more than a day.
- However, if the transmission load serving capability can be increased by transmission upgrade, and/or retaining some local gas generation, some amount of energy storage can be accommodated to include charging capability under the extended transmission contingency (see next slide).




California ISO

# San Diego-Imperial Valley Area Load Shape and Estimated Energy Storage Charging Capability Under Critical Contingency and Without Local Gas Generation (cont'd)

- In this example, the transmission is assumed hypothetically upgraded (and/or retaining some local gas generation) to provide contingency load serving capability of up to 3600 MW under continuous critical contingency condition.
- With the increase in transmission load serving capability under critical contingency without local gas generation, the amount of energy storage that can be included in this subarea based on charging restriction is estimated to be 950 MW and 8550 MWh.
- This example provides simple linear approximation at this time; further assessment is needed to evaluate the efficacy of the various potential transmission upgrades under no local gas generation, or combination of transmission and/or local gas generation as well as specific locations of energy storage projects.