

Report of the Statewide Advisory Committee on Cooling Water Intake Structures

Encina Power Station 2018 Reliability Study

February 2017

1. Executive Summary

The joint-agency Statewide Advisory Committee on Cooling Water Intake Structures¹ (SACCWIS) was created to advise the State Water Resources Control Board (SWRCB) on whether the compliance schedule for the state's power plants with once-through cooling (OTC) technology would threaten reliability of California's electricity supply. SACCWIS has prepared this report for the SWRCB in connection with the Encina Power Station (Encina) OTC compliance date and as contemplated by the State Water Board's Statewide Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling (OTC Policy).²

Per the OTC regulation, NRG Energy (NRG), the Encina generation owner, submitted in its implementation plan and updates to the State Water Board to retire the entire facility no later than December 31, 2017. NRG, in collaboration with the City of Carlsbad and SDG&E, and with the approval of the California Public Utility Commission (CPUC), had planned to replace Encina³ (965 MW) with the Carlsbad Energy Center Project (Carlsbad), a 500 MW gas-fired generator comprised of five natural gas fired combustion turbines, before the start of summer of 2018.

Recent litigation of the CPUC's approval of the Carlsbad Power Purchase Tolling Agreement has delayed the construction completion date beyond the start of summer 2018. With the legal challenges resolved, NRG is optimistic that Carlsbad will be online in the fourth quarter of 2018.

To ensure sufficient time to consider reliability requirements and the potential need to extend OTC compliance for the Encina plant, the California Independent System Operator Corporation (CAISO) prepared an interim report, *Encina Power Station 2018 Once-Through Cooling Compliance Date Deferral Study, January 16, 2017* (CAISO Encina 2018 study), in consultation with the California Energy

¹ SACCWIS includes representatives from the California Energy Commission, California Public Utilities Commission, California Coastal Commission, California State Lands Commission, California Air Resources Board, the California Independent System Operator Corporation, and the State Water Resources Control Board.

² A copy of the Water Board's OTC Policy, effective on October 1, 2010, is available at the following Web site: http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/docs/policy100110.pdf

³ Encina power station is comprised of unit 1 (106 MW), unit 2 (104 MW), unit 3 (110 MW), unit 4 (300 MW), unit 5 (330 MW), and Encina GT (14.5 MW). The Encina GT does not use once-through cooling.

Commission (CEC) and the CPUC in advance of the annual resource adequacy⁴ study cycle. Based on that analysis, SACCWIS recommends that the SWRCB revise the OTC policy to extend the OTC compliance date for Encina units 2-5 through December 31, 2018 to maintain grid reliability, recognizing that the reliability results will be updated in the course of the 2018 local resource adequacy process. NRG has stated that Encina unit 1 will retire early (March 31, 2017 at the latest) in any event to allow construction of the Carlsbad interconnection facilities.

2. Background and purpose

The OTC policy created SACCWIS to advise the SWRCB on whether the compliance schedule for retiring the state's power plants with OTC technology would adversely impact the reliability of California's electricity supply, including local area reliability and statewide grid reliability, and permitting constraints. This report focuses on electric reliability concerns created by delays that would require a deferral of the Encina OTC compliance date.

Over the years since the OTC policy was adopted there have been numerous changes to the factors affecting local reliability in San Diego and how the existing capacity at Encina could be replaced. In its original April 1, 2011 implementation plan, NRG proposed different approaches for the five units. For Units 1-3 (an aggregate of 318 MW capacity), NRG proposed repowering with a new flexible combined cycle facility, the Carlsbad Energy Center, consisting of two combined cycle units with an aggregate capacity of 550 MW. In 2013, NRG informed the SWRCB that it still planned to replace Units 1-3 with the Carlsbad Energy Center but no longer intended to pursue Track 2 compliance options and would retire Units 4 and 5 no later than the final compliance date for Encina of December 31, 2017.

NRG originally submitted an application for certification (AFC) to the Energy Commission for a 558MW combined cycle replacement facility at the Encina site to be called Carlsbad on September 14, 2007. After a protracted licensing process, over the objections of the City of Carlsbad, the Energy Commission issued a permit for Carlsbad on May 31, 2012. NRG announced that it will seek to redesign the Carlsbad Energy Center as a set of peaking units, pursuant to an agreement reached among the company, the City of Carlsbad, and SDG&E. NRG submitted a petition to amend (PTA) to the CEC on May 2, 2014 to replace all five units plus a small combustion turbine at Encina with a 600 MW simple-cycle gas turbine power plant. The Energy Commission approved this PTA on November 12, 2015 with no opposition from the City of Carlsbad.

Legal Challenges

SDG&E submitted an application to the CPUC for approval of a Power Purchase Tolling Agreement (PPTA) with NRG, and NRG noted its intent to adhere to the compliance deadline of December 31, 2017, whether or not this application was approved. On May 21, 2015, the CPUC adopted a Decision (D.) 15-05-051 which approved 500 MW of the 600 MW originally requested and allocated the remaining 100 MW to preferred resources or energy storage. The decision ordered SDG&E to file the revised contract within 30 days. Pursuant to this decision, SDG&E filed an Advice Letter seeking approval of a revised Power Purchase Tolling Agreement (PPTA) with Carlsbad in June 2015. That Advice Letter was approved by the CPUC in July 2015, but six interveners filed Applications for Rehearing with the CPUC. In

⁴ Under the Resource Adequacy (RA) program, the California Public Utilities Commission (CPUC) requires jurisdictional load-serving entities to procure resources to meet their load requirements.

November 2015, the CPUC re-affirmed in Decision (D.) 15-11-024 its earlier approval of the Carlsbad PPTA in response to the Applications for Rehearing. In response, petitioners requested that the California First District Court of Appeals overturn the CPUC's decision. The Court of Appeals accepted the petition for consideration and ordered final briefing from the petitioner and respondents.

The First District Court of Appeals ruled December 1, 2016, that the CPUC's Decision (D.) 14-03-004 was supported by the evidence and that the plaintiffs were not hurt when the CPUC decided to approve only a scaled down PPA (from 600 MW to 500 MW). With this ruling, the First District Court of Appeals affirmed the CPUC's decision of granting the PPTA to SDG&E and NRG for the 500 MW Carlsbad Energy Center project. The Sierra Club, Protect Our Communities Foundation and the Center for Biological Diversity had until January 9, 2017 to seek Supreme Court review, which they did not.

Given the continuing delays in resolution of the intervener's petition to the courts, NRG began notifying the financial community of delays in Carlsbad online dates. NRG has delayed the commercial operation date of Carlsbad several times from November 1, 2017 (per the PPTA approved by the CPUC), to Q1 2018 (as reported in NRG's 10-K filing to the Securities and Exchange Commission (SEC)) and then again to Q2 2018 (as reported in NRG's 10-Q filing to the SEC) and finally to Q4 2018 (based on the latest NRG's 10-Q filing to the SEC).

In the generator update letter to the SWRCB dated January 4, 2017, NRG is optimistic that Carlsbad will be online in the fourth quarter of 2018⁵. With the recent litigation of the CPUC's approval of Carlsbad resolved, NRG can move forward with the project.

Triggering an OTC Deferral Request

An OTC deferral request should go through existing processes (i.e. existing SACCWIS process). There are three groups of steps that would be followed in sequence to trigger a deferral of an OTC compliance date⁶. One group of steps is preparing new analyses or adapting existing analyses that justify a deferral request for reliability reasons. A second group focuses on the public process of a SACCWIS request. A third group includes all the steps necessary for the SWRCB to review, consider, and act upon the request.

3. Reliability Analysis

As the timeline for approval of an OTC extension does not align with the local capacity requirements process conducted each year for the next year, the CAISO conducted an interim analysis of 2018 updating only key parameters from the 2017 analysis to determine whether the compliance schedule for Encina (December 31, 2017) and the revised online date for Carlsbad (Q4 2018) would adversely impact the reliability of California's electricity supply. In the CAISO's *2017 Local Capacity Technical Analysis*,

⁵http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/powerplants/encina/docs/information_letter_nrg_encina.pdf

⁶ Energy Commission staff presented *Staff Report: Mitigation Options for Contingencies Threatening Southern California Electric Reliability, August 2016* at the August 29, 2017 IEPB Commissioner Workshop on Southern California Electricity Reliability. The Once-Through Cooling Compliance Date Deferral mitigation measure is described in this report, http://docketpublic.energy.ca.gov/PublicDocuments/16-IEPR-06/TN212836_20160818T131005_Staff_Report_Mitigation_Options_for_Contingencies_Threatening_S.pdf.

April 29, 2016 (LCTA), Encina was modeled as offline at the end of 2017⁷, which creates a need for new resources to satisfy local reliability requirements. The energy agencies agreed that a new study was needed for 2018 to substantiate the need to extend Encina's OTC compliance date. The CAISO annual reliability requirements cycle calls for 2018 local capacity studies to be completed by May 1, 2017, which would be too late to start the deferral process. As an interim step, the CAISO conducted an interim Encina study between their annual 2017 and 2018 LCTA.

The CAISO, in consultation with the CEC and CPUC, developed study assumptions and scenarios for the interim CAISO Encina 2018 study, which is attached as Appendix A, *Encina Power Station 2018 Once-Through Cooling Compliance Date Deferral Study Report, January 16, 2017*. The CAISO started with the 2017 LCTA study for the Los Angeles Basin (LA Basin) and San Diego local capacity areas and made revisions based on study assumptions agreed to by the CEC and CPUC technical staff. The CAISO has performed its studies applying the methodologies employed in the 2017 analysis with modeling the proposed Carlsbad power plant and other resources identified by SDG&E in response to CPUC authorizations. Since the CPUC approval of the PPA for Carlsbad Energy Center per Decision (D.)15-05-051, the CAISO has performed local capacity requirement (LCR) analyses with the updated assumption of the 500 MW of CPUC-approved capacity, expected online in summer 2018. The CPUC Decision also authorized 100 MW for preferred resources and energy storage in lieu of the 100 MW of conventional resources. Under the circumstances of NRG's announced delay for Carlsbad, Carlsbad will be modeled offline for summer 2018.

Two important issues deserve mention as they provide additional context for the modeling CAISO performed that reflect current realities. The first is the unscheduled and ultimately permanent shutdown of the San Onofre Nuclear Generating Station (SONGS) in 2012, and the second is the current limitation on the Aliso Canyon natural gas storage facility that began in 2015. With the unscheduled shutdown of the SONGS, the energy agencies and Air Resources Board formed an ongoing inter-agency team to make plans and recommend actions to assure reliability for the Southern California region as a whole. Early on it became apparent that without SONGS the previously independent San Diego and LA Basin local capacity areas were, in fact, one single region with a common vulnerability to contingencies.

The detection of a leak at the Aliso Canyon natural gas storage field in October 2015 has created uncertainty around the use of Aliso Canyon, either limited or lack of availability, which directly affects the delivery of natural gas to generating facilities located in the western area of the LA Basin during summer peak load conditions. The gas generation in the LA Basin and San Diego subarea are served from two different gas transmission zones and different transmission gas pipelines. North and South LA Basin gas transmission zones, as well as Aliso Canyon, serve the LA Basin customers and gas-fired generation. For the San Diego subarea, the gas-fired generation is served from the South of Moreno/SDG&E gas transmission system. With the limitation on reinjection at Aliso Canyon and uncertainty over its long-term status, the CAISO analyzed the impact that the absence of Aliso Canyon has on the reliability of the electric transmission system in the LA Basin and San Diego area as a reduction in generation capacity in the LA Basin and a corresponding increase in the San Diego subarea.

For the interim CAISO Encina 2018 study, two scenarios were conducted: 1) one where Aliso Canyon is fully operational (unconstrained) and 2) one where Aliso Canyon is not available (constrained). The

⁷ <https://www.caiso.com/Documents/Final2017LocalCapacityTechnicalReportApril292016.pdf>

latter scenario has the effect of running more generation in the San Diego subarea that is not gas-fired or has ready access to natural gas to compensate for the reduction in gas-fired generation in the LA Basin.

Study Results

Table 2 presents the results of the interim CAISO Encina 2018 study for the two Aliso Canyon scenarios. The results show a range of need for Encina. Regardless of scenario, Encina is needed to mitigate reliability concerns on the electric transmission system. In the study, consistent with the 2017 analysis and the CAISO’s tariff, the CAISO evaluated multiple critical contingencies from thermal overloads to voltage instability on the electric transmission system in the LA Basin and San Diego areas. In Scenario 1 with Aliso Canyon unconstrained, the greatest local capacity requirements were found to be 7,383 MW in LA Basin and 2,886 MW in San Diego, which resulted in a need of 560 MW of Encina. In Scenario 2 with Aliso Canyon constrained, the local capacity requirements were found to be 7,079 MW in the LA Basin and 3,185 MW in the San Diego subarea, which resulted in a need of 859 MW of Encina. The unexpected constraints at the Aliso Canyon gas storage facility contribute to the higher need of Encina. In summary, the study found the reliability need for Encina capacity under the assumptions employed to range from 560 MW to 859 MW depending on the assumed impact of the Aliso Canyon uncertainty.

Based upon the CAISO analysis, SACCWIS considers the prudent course of action to be to commence the process to request the SWRCB to defer the compliance date for Encina until December 31, 2018 to maintain grid reliability.

It should be noted that the purpose of the interim study was solely to determine the need to commence this process at the earliest opportunity and accommodate SWRCB timelines. The interim study will not be relied upon to determine local capacity requirements for the 2018 Resource Adequacy year as those CPUC adopted requirements will ultimately be determined by the CPUC after consideration of the CAISO 2018 LCTA study that will be published by May 1, 2017 as part of its annual resource requirements cycle in support of the CPUC’s resource adequacy process.

Table 2 – Summary of CAISO Encina 2018 Study Results

Study scenario	LA Basin LCR (MW)	San Diego subarea LCR (MW)	Encina Generation (MW)	Encina required?
Scenario 1: Aliso Canyon Gas Storage Unconstrained Scenario				
Most critical thermal loading concerns in the San Diego subarea	7,383	2,886	560	Yes
Scenario 2: Aliso Canyon Gas Storage Constrained Scenario				
Most critical thermal loading concerns in the LA Basin	7,079	3,185	859	Yes

4. Alternatives

SACCWIS has considered the following alternatives to the Encina OTC compliance date extension:

Alternative 1: Do nothing – This option poses significant grid reliability risk.

Alternative 2: Fast-track preferred options in-service – It may be possible to require SDG&E to pursue procurement for the 100 MW of preferred resources faster but that alone would not address the bulk of the reliability issues without Carlsbad and Encina. As discussed in Appendix A, the CAISO included 37.5 MW of expedited procurement of battery energy storage system in the study.

Alternative 3: Stop-gap generation - Given the current timeframe, it would not be possible to construct alternative generation resources within the San Diego subarea that can provide the needed voltage support as well as capacity for thermal loading mitigations. The only possibility would be bringing in diesel generators with similar capacity; however, challenges in siting and interconnection, as well as the emissions from these resources would very likely make this an unworkable option.

Alternative 4: Transmission lines – No transmission alternatives would meet the reliability needs in this short timeline.

Considering these four alternatives, extending Encina's OTC compliance date until December 31, 2018 is the most prudent option at this time to maintain grid reliability.

Further Refinements

As noted above, the CAISO will complete the 2018 LCTA by May 1, 2017 as part of its annual resource requirements cycle, which will rely on the latest available information including the Energy Commission's *2016 Integrated Energy Policy Report Update* report and its adopted demand forecast.

Additionally, there remains uncertainty regarding the use of the Aliso Canyon gas storage facility and its impact on the electricity system. For example, Southern California Gas Company requested regulatory approval on November 1, 2016 to resume injection operations through approved wells at its Aliso Canyon gas storage facility. The Division of Oil, Gas, and Geothermal Resources (DOGGR) and the CPUC have completed their comprehensive review of the safety of the wells at the facility and are in the process of determining whether it is safe to allow injection of natural gas to resume. DOGGR issued a notice of public meetings on February 1 and 2, 2017 and a comment period. The public hearing is one of the required steps in the process of determining whether to approve SoCalGas' application. Depending on the results of those hearings, the assumptions may need to be refined for the CAISO 2018 LCTA.

Any changes in the need or options will be submitted to the SWRCB during the comment period before the SWRCB OTC policy amendment process is complete.

5. Conclusions

In the past two SACCWIS report cycles, SACCWIS did not recommend a change in compliance date for Encina, but clearly signaled that such a recommendation might be forthcoming as various uncertainties

were resolved. The legal challenges surrounding the CPUC's approval of the Carlsbad Power Purchase Tolling Agreement were resolved in early 2017, and NRG can move forward in construction of the Carlsbad project. The delays caused by the legal challenges mean that Carlsbad cannot be online in time for Encina to meet its OTC compliance date of December 31, 2017 as originally envisioned. NRG is optimistic that Carlsbad will be online in the fourth quarter of 2018.

CAISO conducted an interim Encina 2018 study to determine whether the compliance schedule for Encina (December 31, 2017) and the revised online date for Carlsbad (Q4 2018) would adversely impact the reliability of California's electricity supply. Two scenarios were studied: 1) Aliso Canyon gas storage facility unconstrained and 2) Aliso Canyon gas storage facility constrained. In both scenarios, Encina was found to be needed to mitigate reliability concerns on the electric transmission system.

Based on the CAISO interim study and the best available information at this time, SACCWIS recommends the SWRCB defer the compliance dates for Encina units 2-5 until December 31, 2018 to maintain grid reliability. Encina unit 1 is anticipated to retire early by March 31, 2017 to make way for Carlsbad construction. SACCWIS will update the SWRCB and if necessary provide any revisions to this recommendation when the CAISO's 2018 LCTA results become available.

Appendix A

CAISO

Encina Power Station 2018 Once-Through Cooling Compliance Date Deferral Study Report

January 16, 2017



**Encina Power Station
2018 Once-Through Cooling Compliance Date Deferral Study
Report**

January 16, 2017

Encina Power Station 2018 Once-Through Cooling Compliance Date Deferral Study Report

Executive Summary

This report is provided to the State Advisory Committee on Cooling Water Intake Structures¹ (SACCWIS) for consideration in its recommendation to the State Water Resources Control Board (SWRCB) for an extension of the Encina Power Station (Encina) OTC compliance date as contemplated by the State Water Board's Statewide Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling (OTC Policy).² The report documents the assumptions, study scenarios, results and recommendations of the 2018 Once-Through Cooling (OTC) Compliance Date Deferral Study (Encina Study).

The Encina Study base assumptions, processes, and criteria are documented in the California ISO (CAISO) 2017 Local Capacity Technical Analysis Final Report dated April 29, 2016 and are appended in this report to include updated resource and infrastructure information as agreed upon in discussions between the CAISO, the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC) in November 2016. The appended assumptions are documented in this report.

Per the OTC policy, NRG Energy (NRG), the Encina generation owner, submitted in its implementation plan to the State Water Board to retire the entire facility no later than December 31, 2017. NRG, in collaboration with the City of Carlsbad and SDG&E, and with the approval of the California Public Utility Commission (CPUC), plans to replace Encina with the Carlsbad Energy Center Project (Carlsbad), a 500 MW gas-fired

¹ SACCWIS includes representatives from the California Energy Commission, California Public Utilities Commission, California Coastal Commission, California State Lands Commission, California Air Resources Board, the California Independent System Operator Corporation, and the State Water Resources Control Board.

² A copy of the Water Board's OTC Policy, effective on October 1, 2010, is available at the following Web site: http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/docs/policy100110.pdf

generator comprised of five natural gas fired combustion turbines, before the start of summer of 2018.

Litigation of the CPUC's approval of the Carlsbad Power Purchase Tolling Agreement (PPTA) in 2016 has delayed the construction completion date beyond the start of summer 2018. With the current delays, NRG has projected that Carlsbad will not be in service until fourth quarter 2018.

The OTC policy created SACCWIS to advise the State Water Board on whether the compliance schedule for retiring the state's power plants with OTC technology would adversely impact the reliability of California's electricity supply, including local area reliability and statewide grid reliability, and permitting constraints.

The ISO conducted the Encina Study focusing on electric reliability concerns created by delays that could require a deferral of the Encina OTC compliance date. The Encina facility consists of five steam boiler generating units³ using OTC technology and one combustion turbine (non-OTC with 15 MW capacity) for an aggregated capacity of 965 MW.

Based on the local capacity requirement technical assessment for both the LA Basin and San Diego Local Capacity Area subareas, the need for the existing Encina generation was determined based on the thermal loading concern of the transmission facility in the LA Basin under the Aliso Canyon gas storage outage scenario. This scenario requires Encina generation capacity to help balance the need of the more effective western LA Basin generation that may not be available due to gas constraint under the Aliso Canyon gas storage outage condition.

The CAISO's current findings are that 859 MW is needed from Encina for the summer of 2018. These results will be updated to include the CEC 2016 California Energy Demand forecast update as adopted in January 2017 and the CAISO completes its 2018 LCTA report.

This study, an interim study between the 2017 and 2018 LCTAs, forms the basis for a

³ Unit 1 107 MW, Unit 2 104 MW, Unit 3 110 MW, Unit 4 300 MW, Unit 5 330 MW

specific request to the SWRCB to defer the compliance date for Encina until December 31, 2018. The results of this study should not be relied upon to determine Local Capacity Requirements for the 2018 RA year.

Assumptions and Scenarios

Load and resource assumptions

		Source or amount	Peak shift assumptions ⁴
1	2018 peak demand for LA Basin	2015 IEPR 1-in-10 peak load ⁵	114 MW for SCE TAC area
2	2018 peak demand for San Diego subarea	2015 IEPR 1-in-10 peak load	75 MW for San Diego TAC area
3	Expedited energy storage procurement ⁶ – SCE service area	67 MW ⁷	N/A
4	Expedited energy storage procurement – SDG&E service area	37.5 MW	N/A
5	Long-term power procurement for preferred resources that will be in service by June 1, 2018	143.5 MW ⁸	N/A
6	“Fast” (20-minute) demand response in the LA Basin ⁹	321 MW	N/A

⁴ The amount of peak shift was determined by the CEC.

⁵ The CEC’s currently adopted demand forecast is utilized for this analysis based on discussion with the state energy agencies.

⁶ Expedited energy storage procurement is related to the Aliso Canyon gas storage outage mitigation.

⁷ Of these amounts, 7 MW are from stand-alone battery energy storage system (BESS) projects; 60 MW are part of the hybrid gas plant/BESS projects. For normal scenario, unrelated to Aliso Canyon gas storage outage concern, the total capacity output of the hybrid gas plant/BESS projects cannot exceed the existing maximum capacity of the gas plant based on its existing deliverability study results. If the owners of the hybrid gas/BESS project have not requested full capacity status for their BESS portion of the project, those will be treated as energy-only under normal condition, and full capacity for the BESS for Aliso Canyon gas storage outage scenario with 0 MW output from the gas plants due to gas constraints.

⁸ These include projects in the western LA Basin that have received the CPUC PPA for long-term procurement plan of local capacity need. These preferred resources include energy efficiency, demand response, behind-the-meter energy storage and behind-the-meter photovoltaic distributed generation.

⁹ “Fast” demand response is demand response that can be implemented within 20 minutes in response to transmission contingency condition. These are activated and implemented post first contingency and pre second contingency condition.

		Source or amount	Peak shift assumptions ⁴
7	“Fast” (20-minute) demand response in San Diego subarea	19 MW	N/A
	Encina Unit 1 retirement ¹⁰	106 MW	

New transmission project assumptions

The existing transmission system was modeled and included all projects expected to be operational on or before June 1, 2018 and all other feasible operational solutions brought forth by the PTOs and as agreed to by the CAISO. Path flows were maintained below all established path ratings into the LCAs.

In addition to the above peak demand and resource assumptions, the following new transmission projects that have an in-service date prior to June 1, 2018 are included in the power flow study case:

- Sycamore – Penasquitos 230 kV transmission line – this project was recently approved by the CPUC as part of the environmental review. The CPUC staff has affirmed with SDG&E for an in-service date of June 1, 2018 or sooner. The ISO will continue to monitor the construction progress of this project and will update the study accordingly if the in-service is projected to be delayed.
- San Luis Rey synchronous condensers (2x225 MVAR) – SDG&E has continued to affirm the in-service date of this project of January 2, 2018 to the ISO as part of its monitoring of the construction progress of approved transmission projects.
- San Onofre synchronous condenser (1x225 MVAR) – similar to the above item, SDG&E has continued to affirm the in-service date of this project of June 1, 2018.
- Santiago synchronous condenser (1x240 MVAR) – SCE has continued to affirm

¹⁰ See discussion in Section 2b. SDG&E advised that the retirement of Unit 1 must occur by December 31, 2016 in order to maintain the current milestone schedule for the 138 kV interconnection of the Carlsbad Energy Center project.

to the ISO the December 2017 in-service date for this project.

- Miguel synchronous condensers (2x225 MVAR) – SDG&E has affirmed that this project has an in-service date of June 1, 2017.
- Imperial Valley phase-shifting transformers – SDG&E has continued to affirm that this project has an in-service date of June 1, 2017.

In the event that any of the above projects is found to be delayed, the ISO would need to re-run the study for an updated amount of capacity need for Encina OTC deferral.

Generation

The existing generation resources (regardless of technology) that were expected online and have commercial operating date on or before June 1, 2018 were modeled. Regulatory Must-take and similarly situated units like QF/State/Federal resources were modeled on-line at qualifying capacity output values for purposes of this LCT Study. Specific generation units and their qualifying capacity are documented in the published report.

NRG has indicated that Encina Unit 1 must be removed from service to begin construction of Carlsbad beginning in April 2017. As such, this unit was not included in the Encina Study.

The 2017 LCTA also documented effectiveness factors in the LA Basin and San Diego sub-area as needed to facilitate procurement.

Scenario Descriptions

Aliso Canyon

The Southern California Gas (SCG) Aliso Canyon natural gas storage facility (Aliso Canyon), in addition to SCG gas transmission pipelines, provides natural gas to customers in the LA Basin, including seventeen gas-fired electric generating facilities in the CAISO and LADWP Balancing Authority Areas. The detection of a leak at Aliso Canyon in 2015 has created limited use or unavailability of Aliso Canyon directly

affecting the delivery of natural gas to generating facilities located in the western area of the LA Basin during summer peak load conditions.

Due to uncertainty of availability of Aliso Canyon and in an effort to mitigate the Aliso Canyon gas storage constraint, the CAISO, in its short-term local capacity studies, has balanced the gas generation resource needs in the LA Basin and the San Diego sub-area to lessen the impact that the absence of Aliso Canyon has on the reliability of the electric transmission system in the LA Basin and San Diego areas. Consistent with the CAISO studies for the San Diego and LA Basin subareas, this study considered two scenarios – one where Aliso Canyon is fully operational (unconstrained) and one where Aliso Canyon is not available (constrained). The latter scenario has the effect of running more generation in the San Diego subarea that is not gas-fired or has ready access to natural gas to compensate for the reduction in gas-fired generation in the LA Basin.

Scenario 1 - Aliso Canyon gas storage unconstrained scenario

With this assessment, gas withdrawals from Aliso Canyon are possible and the CAISO evaluated other critical contingencies that would require the dispatch of Encina generation to maintain local reliability in the study area. This includes critical contingencies such as the overlapping outage of the 500 kV lines in southern San Diego area, and other combination of critical transmission contingencies (i.e., G-1/N-1) that would drive the need for Encina generation.

Scenario 2 - Aliso Canyon gas storage constrained scenario

With the limitation on reinjection at Aliso Canyon and uncertainty over its long-term status, the CAISO analyzed the impact that the absence of Aliso Canyon has on the reliability of the electric transmission system in the LA Basin in which gas-fired generating resources are served by Aliso Canyon gas storage. The reduction of the gas-fired generation in the western LA Basin is accomplished by reducing the gas-fired generation in the western LA Basin and utilizing other resources to help mitigate reliability need: (a) the use of battery energy storage projects that were expedited for an in-service date of early 2017 related to Aliso Canyon gas storage constraint scenario (see summary in Table 1); (b) the use of “fast” demand response in the LA Basin and San Diego areas (see Table 1); and (c) the use of generating resources in the San

Diego subarea including Encina generation.¹¹

Combined LA Basin Area and San Diego Subarea

Due to the electrical interdependency between the LA Basin and San Diego subarea since the retirement of San Onofre Nuclear Generation Station (SONGS), these two areas have consistently been studied together starting with the assessment of local capacity need from the CPUC long term procurement plan (LTPP) Track 4.¹² The needs of the LA Basin area and San Diego sub-area have been considered taking into account the critical circumstances which include concerns for the potential of a peak shift issue associated with the impact of behind the meter solar generation and the availability of the Aliso Canyon gas storage facility affecting the ability of LA Basin gas fired generation to be called upon on short notice.

Scenario Analysis and Results

Scenario 1 - Aliso Canyon gas storage unconstrained scenario

Most critical thermal loading concerns in the LA Basin

The most critical contingency resulting in thermal loading concerns located in the LA Basin is the N-1-1 (NERC P6 category) overlapping outage of Lugo-Victorville 500 kV line, followed by an outage of the Sylmar-Gould 230 kV line. This overlapping contingency causes the Sylmar-Eagle Rock 230 kV line in the northern LA Basin to overload. This resulted in an LCR need for the LA Basin of 7,383 MW, including 321 MW of “fast” demand response, 143.5 MW of LTPP-related preferred resources and 22 MW of battery energy storage system.¹³ The San Diego subarea local capacity need is 2,681 MW, including 19 MW of “fast” demand response and 37.5 MW of battery energy storage system. This would require 355 MW from the existing Encina generation. Table 2 provides a summary of the study results.

¹¹ This is assuming that Encina generation is granted an extension for OTC use while the permanent mitigation (i.e., Carlsbad Energy Center) is being implemented.

¹² Revised Scoping Ruling and Memo of the Assigned Commissioner and Administrative Law Judge R.12-03-014, May 21, 2013.

¹³ The other 40 MW BESS is associated with gas peakers and would be dispatched if the gas peakers are off-line due to gas constraint under Aliso Canyon gas storage outage scenario.

Most critical thermal loading concerns in the San Diego subarea

The most critical contingency resulting in thermal loading concern located in San Diego subarea is the G-1/N-1 (NERC P3 category) overlapping outage of Termoelectrica de Mexicali combined cycle plant¹⁴ (593 MW), followed by an N-1 contingency of the Imperial Valley – North Gila 500 kV line. This overlapping contingency causes the “S” line (EI Centro – Imperial Valley 230 kV line) between Imperial Irrigation District (IID) and SDG&E to overload. This resulted in a San Diego subarea local capacity need of 2,886 MW, including 19 MW of “fast” demand response and 37.5 MW of battery energy storage system. This would require 560 MW from the existing Encina generation. The LCR need for the LA Basin associated with this thermal loading constraint is 7,383 MW, including 321 MW of “fast” demand response, 143.5 MW of LTPP-related preferred resources and 22 MW of battery energy storage system. Table 2 provides a summary of the study results.

Most critical voltage stability concerns in San Diego subarea

The voltage stability concerns for the combined LA Basin and San Diego subarea is the loss of the ECO-Miguel 500kV line, system readjustment, followed by the loss of Ocotillo-Suncrest 500 kV line or vice versa. This assessment resulted in a San Diego subarea local capacity need of approximately 2,541 MW, including 19 MW of “fast” demand response and 37.5 MW of battery energy storage system. This would require 214 MW from the existing Encina generation. The LCR need for the LA Basin associated with this voltage stability assessment is 7,126 MW, including 321 MW of “fast” demand response, 143.5 MW of LTPP-related preferred resources and 22 MW of battery energy storage system. Table 2 includes a summary of the study results.

Scenario 2 - Aliso Canyon gas storage constrained scenario

The Aliso Canyon gas storage facility, in addition to gas transmission pipelines, provides gas to customers in the LA Basin, including seventeen gas-fired generating

¹⁴ The ISO Grid Planning Standards consider an outage of a combined cycle power as a single contingency (G-1).

facilities in the ISO and LADWP Balancing Authority Areas. Limited use or unavailability of Aliso Canyon would affect delivery of gas to generating facilities in the LA Basin during summer peak load conditions. In an effort to help mitigate the Aliso Canyon gas storage constraints, the ISO balanced the gas generation resource needs in the LA Basin and the San Diego sub-area to lessen the impact that the absence of Aliso Canyon has on the reliability of the electric transmission system in the LA Basin and San Diego area. The gas generation in the LA Basin and San Diego sub-area are served from two different gas transmission zones and different transmission gas pipelines. North and South LA Basin gas transmission zones, as well as Aliso Canyon, serve the LA Basin customers and gas-fired generation. For the San Diego subarea, the gas-fired generation is served from the South of Moreno/SDG&E gas transmission system. With the balance of required resources from the LA Basin to the San Diego sub-area, the binding constraint for the San Diego subarea becomes the same contingency that affects the overall LA Basin since the resources in San Diego subarea are needed to mitigate this overarching contingency as well as for the more localized reliability constraints.

The most critical contingency for the combined LA Basin and San Diego subarea under this condition is the loss of the Lugo – Victorville 500 kV line, system readjustment, followed by the loss of Sylmar – Gould 230 kV line or vice versa. This overlapping contingency thermally overloads the Sylmar - Eagle Rock 230 kV line. This contingency establishes a total local capacity need for the combined LA Basin-San Diego subarea of 10,264 MW in 2018 timeframe as follows: 7,079 MW in the LA Basin (which includes 321 MW of “fast” demand response, 143.5 MW of LTPP-related preferred resources and 62 MW of battery energy storage system) and 3,185 MW in the San Diego subarea (which includes 19 MW of “fast” demand response and 37.5 MW of battery energy storage system). This would require 859 MW of the existing Encina generation.

Table 2 – Summary of study results

	Study scenario	LA Basin LCR (MW)	San Diego subarea LCR (MW)	Encina generation requirement (MW/Units)
Scenario 1 - Aliso Canyon gas storage unconstrained scenario				

1	Most critical thermal loading concerns in the LA Basin	7,383	2,681	355 MW
2	Most critical thermal loading concerns in the San Diego subarea	7,383	2,886	560 MW
3	Most critical voltage stability concern	7,126	2,541	214 MW
Scenario 2 - Aliso Canyon gas storage constrained scenario				
1	Most critical thermal loading concerns in the LA Basin	7,079	3,185	859 MW ¹⁵

¹⁵ This requirement could be updated with the upcoming CEC 2016 IEPR updated demand forecast after it is adopted.