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Witnesses:	Garry Chinn Colin Cushnie Mark Nelson Jonathan Rumble Carl Silsbee

SOUTHERN CALIFORNIA EDISON®

An *EDISON INTERNATIONAL®* Company

(U 338-E)

TRACK 4 TESTIMONY OF SOUTHERN CALIFORNIA EDISON COMPANY

Before the
Public Utilities Commission of the State of California

Rosemead, California
August 26, 2013

LTPP TESTIMONY VERSION TRACK 4

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I.

EXECUTIVE SUMMARY

This Exhibit SCE-1 is Southern California Edison Company's (SCE) direct testimony addressing long term Local Capacity Requirements (LCR) needs in SCE's service area with all Once Through Cooling (OTC) generating facilities, including San Onofre Nuclear Generating Station Unit Nos. 2 and 3 (SONGS), retired in 2022. San Diego Gas and Electric Company (SDG&E) is a co-owner of SONGS. SCE closely collaborated with SDG&E on this study and relied on SDG&E's information regarding the configuration of its transmission system as an input. SDG&E is concurrently separately filing testimony focused on its service area.

SCE's testimony provides additional studies beyond those provided by the California Independent System Operator (CAISO) on August 5, 2013, concerning the need for new resources in SCE's western Los Angeles Basin (LA Basin) local capacity area. SCE, like the CAISO, presents a scenario in which gas fired generation (GFG) meets any identified need for new generation. However, unlike the CAISO, SCE presents transmission upgrade scenarios and an aggressive Preferred Resource,[1] Scenario as ways of reducing the need for additional GFG in the LA Basin.

There is a need for a balanced approach to the replacement of all OTC facilities, including SONGS. This balanced approach includes development of Preferred Resources, transmission facilities, and additional conventional GFG. Decision No. (D.) 13-02-015, on Track 1 of this proceeding, authorized SCE to procure between 1400 and 1800 MW of new

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[1] Preferred Resources are defined in the State's Energy Action Plan II as follows:
"The Energy Action Plan supports a "loading order" of Preferred Resources to meet California's increasing energy needs. Energy efficiency and demand response are first, followed by renewable sources and clean distributed generation. To the extent that these efforts are unable to satisfy increasing energy and capacity needs, the state supports clean and efficient fossil-fired generation. Concurrently, electricity transmission infrastructure must be improved to support the development of renewable energy sources."
Energy Storage is a potential enabling technology, but is not a Preferred Resource because it stores power regardless of how that power is produced. That said, in this document, when SCE refers to Preferred Resources, SCE is also including Energy Storage in that definition for ease of use.

generation in the LA Basin, and between 215 and 290 MW in the Moorpark subarea. This procurement is to meet the LCR need associated with retirement of all OTC facilities, except SONGS. To start on a timely path to the development of new generation to meet the LCR need identified in Track 1, SCE plans to move forward with procurement authorized in D.13-02-015 following receipt of necessary Energy Division approval.

Both SCE and the CAISO use transmission power flow studies to identify the need for new local reliability resources. SCE's studies are based on meeting the applicable North American Electric Reliability Corporation (NERC) Reliability Standards (NERC Reliability Standards),[2] which are less stringent than the assumptions and other criteria used in the CAISO's Local Capacity Technical (LCT) studies. As a result, SCE's identified NERC-based reliability need is lower than the CAISO's identified local reliability need. Meeting SCE's identified reliability need will not assure the level of reliability that the CAISO deems necessary in California.

SCE's studies in this Track 4 show a need for 2800 MW of new LCR generation, if sited in the most effective locations, to meet LCR need with all OTC facilities, including SONGS, retired in 2022. The CAISO's analysis fills LCR generation need for the combined LA Basin and SDG&E service areas in two different ways: (1) SCE meets 80% of the need for new LCR generation and SDG&E meets 20%; or, (2) SCE meets two-thirds of the need for new LCR generation and SDG&E meets one-third. In the 80%/20% case, the CAISO finds a need for 3722 Megawatts (MW) of new LCR generation in SCE's LA Basin and for 920 MW of new LCR generation in SDG&E's service area.[3] For the two-thirds/one-third case, the CAISO's analysis finds a need for 3022 MW of new LCR generation in SCE's LA Basin and 1485 MW in SDG&E's service area.[4]

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[2] NERC transmission planning Reliability Standards include TPL-001-3 (Category A), TPL-002-2b (Category B), TPL-003-2b (Category C), and TPL-004-2a (Category D).

[3] Testimony of Robert Sparks, Table 11, p. 23.

[4] Testimony of Robert Sparks, Table 12, p. 24.

After subtracting the LA Basin maximum procurement authorized of 1800 MW in Track 1 of this proceeding from the need identified in the CAISO's Track 4 studies, there is a remaining need of 1922 MW for new resources in the LA Basin in the 80%/20% case and a remaining need for 1222 MW in the two-thirds/one-third case. After subtracting the LA Basin procurement already authorized in Track 1 of this proceeding from the 2800 MW need identified in SCE's Track 4 studies, there is a remaining need for about 1000 MW. SCE's studies analyzed the effectiveness in meeting local reliability need of constructing transmission facilities, primarily the Mesa Loop-In Transmission Project (Mesa Loop-In), described in Chapter III. SCE's studies also analyzed aggressive use of Preferred Resources utilizing the Preferred Resources strategy, also described in Chapter III, in high impact areas. The development of Mesa Loop-In and the strategically located Preferred Resources could displace the need for any additional new LCR resources, while still meeting NERC Reliability Standards. However, about 500 MW of new resources is still needed to meet the CAISO's higher expectation of need.

In this Track 4, SCE recommends that the Commission authorize procurement of an additional 500 MW to bridge the gap between the CAISO need assessment and SCE's estimate of the LCR need. Procurement of this additional 500 MW will assure that sufficient resources are available in 2022 to meet CAISO's expectations of LCR resource need. SCE proposes to procure the additional 500 MW of new LCR resources through its existing Track 1 procurement process and bring the resulting power purchase agreements to the Commission for review and approval in its application which should be filed in third quarter 2014.

SCE's and the CAISO's studies focus on the year 2022. However, with SONGS now retired, the compliance dates for the OTC facilities in 2020 become significant milestones. While SCE has not studied the need for generation in 2020, the demand forecast used in both CAISO and SCE's studies show limited demand growth of about 1% per year in the period 2020-2022. So, the LCR need for 2020 is probably similar to the need in 2022.

SCE's Track 1 testimony is incorporated into this Track 4. As a result, this Track 4 testimony does not reiterate its Track 1 Testimony discussing significant challenges to siting new

generation in the LA Basin and the significant time constraints to construct new generation and new transmission now faced by the State.[5] This Track 1 Testimony indicated that there was an urgent need in 2012 to start procurement of GFG so that it could be available even by 2020. SCE is aware that CAISO will likely request a delay in considering the Track 4 procurement need to allow CAISO more time to perform additional analysis. It would be imprudent to delay making a decision on SCE's proposed 500 MW of increased LCR procurement authority because SONGS has been permanently closed and expedited procurement action is warranted. SCE and the Commission will be aware of CAISO's additional analysis at the time SCE closes its LCR solicitation (from Track 1) and submits its proposed contracts to the Commission for approval. If CAISO's analysis suggests that the additional LCR resources are not required, the Commission can withhold its approval until it fully deliberates the CAISO's additional Track 4 analysis and procurement recommendations. Conversely, if CAISO analysis suggests that more than 500 MW of LCR resources are needed, the incremental LCR need above SCE's 500 MW recommendation can be combined with any Track 2 procurement authorization that the Commission grants.

Given the urgent need for new resources, SCE will pursue construction of a LA Basin transmission project, the Mesa Loop-In, through requests to the CAISO and through an application to the CPUC. This project reduces the need for new generation in the LA Basin.

SCE plans to aggressively pursue Preferred Resources in a targeted high-need area in Orange County through its Preferred Resources "Living" Pilot Program (Pilot). The specific quantity of Preferred Resources needed to avoid GFG in the targeted area may be reduced by SCE's Track 1 procurement. However, since Track 1 is seeking Preferred Resources across the entire LA Basin, SCE may need funding to support additional Preferred Resources development. There is the potential that sufficient Energy Efficiency (EE), Demand Response (DR), and

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[5] See, SCE's Track 1 Testimony in Exhibit SCE-1, Chapters III-V. SCE understands that the CPUC is incorporating this testimony into Track 4. As a result, there is no need for further testimony and/or cross-examination related to it.

renewable generation may not be available to meet LCR need in the target area. As a result, SCE also plans to pursue contingent generation site development that could be used by third parties in case they are needed to backstop the Pilot. SCE plans to seek any necessary funding for the Pilot and for costs of acquiring and permitting of generation sites through separate applications. SCE plans to seek authority to make these generation sites available for bidding by third party developers to complete construction quickly in the event that the Preferred Resources do not materialize in sufficient quantities.

Finally, there are risks associated with pursuing both a transmission project and a Preferred Resources strategy that could place LA Basin reliability at risk in the future. The CAISO has not yet reviewed the Mesa Loop-In and environmental review of the project will be necessary before it moves forward. There also remain significant uncertainties about the ability of Preferred Resources to meet LCR need. For these reasons, SCE intends to solicit option contracts (i.e. contracts with a buyer's right to terminate subject to a termination payment) as part of its Track 1 procurement efforts. SCE will bring any such contracts that are ultimately negotiated to the Commission for approval.

II.

OVERVIEW OF TRACK 4 NEED

A. SCE's Track 4 Procurement Authorization Request

SCE requests procurement authorization for new resources up to 500 MW consistent with the LTPP Track 4 need demonstration that SCE explains below so that southern California can meet CAISO's higher LCR need assessment. While some scenarios described in SCE's studies show that no new generation is needed to meet NERC Reliability Standards, SCE has a responsibility as a California utility to support and meet CAISO's need based on California reliability standards and criteria. The use of the CAISO need assessment will also provide the State with additional margin to respond quickly to near term unexpected changes, such as increased load growth due to unanticipated economic activity or accelerated transportation electrification.

Both SCE and the CAISO performed studies to determine the need for new local reliability resources in the LA Basin to replace retiring OTC plants and SONGS. Figure II-1 below reconciles SCE's results with the CAISO's results. SCE developed its studies in collaboration with SDG&E which recommended using a load shedding scheme to plan for certain transmission contingencies arising in its service territory.[6] When SCE incorporates this load-shedding scheme, it reduces SDG&E's dependence on imports from the LA Basin to meet its transmission contingency needs. The overall effect of the scheme reduces the need for new generation in the LA Basin by 436 MW.

The CAISO identified an overall need for new generation of 3,722 MW in the LA Basin, while SCE identified an overall need of 2,802 MW. After accounting for the 436 MW associated with SDG&E load shed, there remains a residual difference of 484 MW between the two

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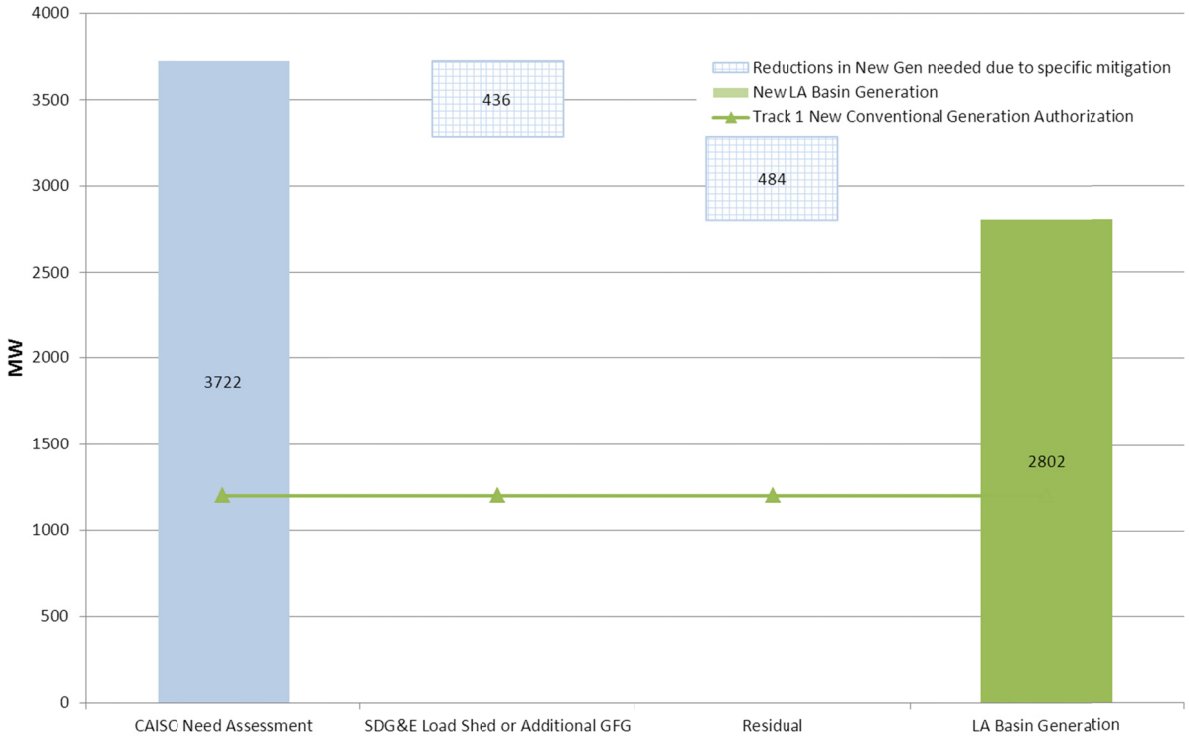
[6] *See* Chapter III.B which describes the transmission contingencies identified by SDG&E dealt with through a load shedding scheme.

estimates.[7] An additional 500 MW (484 MW rounded to 500 MW) of new generation in the LA Basin above the need identified in SCE's studies is needed to assure that sufficient resources are available to meet CAISO's expectations of need. As discussed above, SCE requests authorization to procure up to 500 MW of new resources to meet CAISO's assessment of need.

[7] The residual is due to slightly difference planning criteria and some differenced in load and resource assumptions.

Figure II-1
Need In the LA Basin



B. <u>SCE's Recommendations For Use Of Transmission Projects To Meet Local Reliability Needs</u>

SCE investigated two transmission scenarios, the Mesa Loop-In and a regional transmission project that strengthens the interconnection between SCE and SDG&E, as described in Chapter III. Figure II-2 below shows the results of certain SCE scenarios only. Figure II-2 shows that the Mesa Loop-In further reduces the need for LCR resources in the LA Basin by 1,196 MW.[8] While the Mesa Loop-In reduces the need for LA Basin generation, it does not

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[8] While the Mesa Loop-In will reduce the need for generation in the LA Basin, it assumes there are 503 MW of sufficient generation out of the LA Basin to meet load. For modeling purposes only, additional capacity was

Continued on the next page

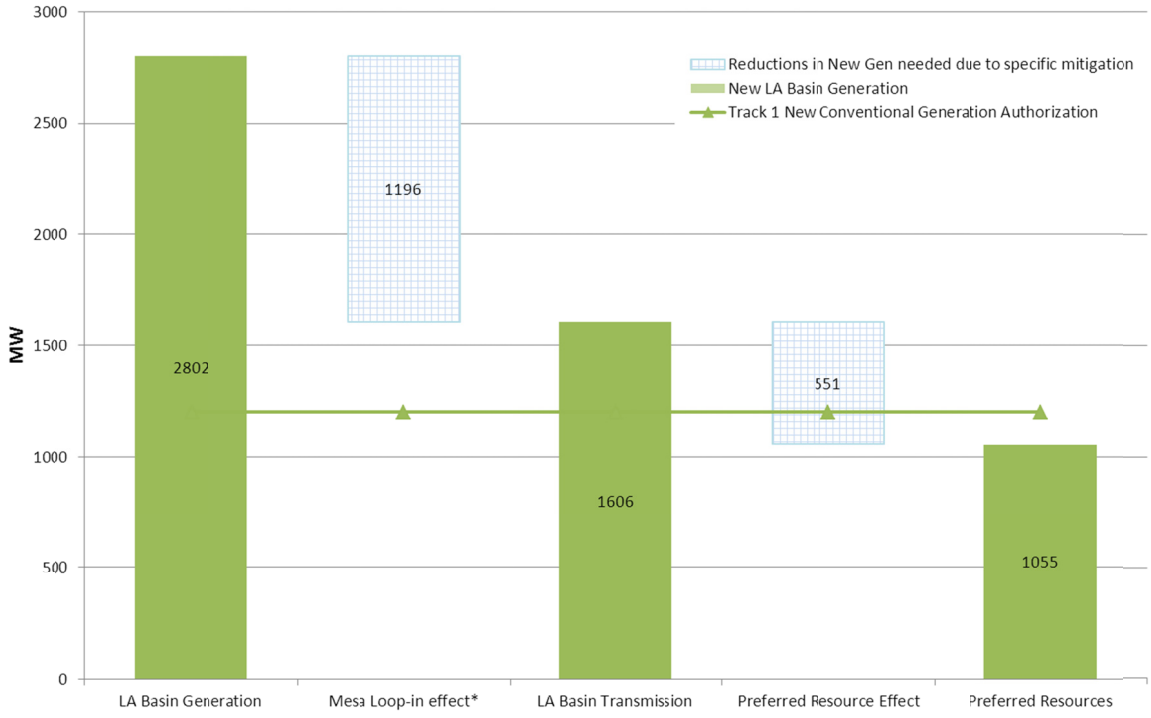
reduce overall generation necessary to maintain system reliability. Thus, new generation resources may be needed in SCE's service area outside of the LA Basin as a result of successful pursuit of the Mesa Loop-In. SCE is not asking to procure new generation to meet system reliability needs at this time. SCE intends to submit the Mesa Loop-In to the CAISO for review and approval as part of its 2013-2014 Transmission Planning Process (TPP), and subsequently bring the project to the CPUC for approval.

SCE also evaluated an alternative transmission option identified in the Regional Transmission Scenario. This scenario adds a regional transmission line in addition to the Mesa Loop-In. This scenario reduced the local reliability need by 408 MW compared to the scenario taking Mesa Loop-In only into account. This is a relatively small reduction in new generation need for a major transmission project. Moreover, it is likely to be very difficult to complete a regional transmission project of this magnitude in the 2020 timeframe before LCR resources will be needed. SCE did not use this option to formulate its recommendations to address LCR needs. Instead, SCE includes it in testimony to provide the Commission with assurance that it has studied as many feasible solutions as possible.

Continued from the previous page

added out of the LA Basin to ensure there were sufficient resources available for the model to resolve contingencies. The Commission will establish whether there is or is not a need for additional resources in the system generally in other tracks of the LTPP, the Commission should not address any consequential out of LA Basin resource need in this Track 4.

Figure II-2
Results of SCE's Studies



* The Mesa Loop-in allows a reduction in LA Basin generation needs but may require additional resources out of the LA Basin

C. <u>SCE's Preferred Resources Strategy</u>

SCE's studies, like the CAISO's studies, anticipate the continued development of Preferred Resources through existing programs, and do not account for the new resources approved in D. 13-02-015 on Track 1 of the 2012 LTPP. Figure II-2 shows the effect of implementing both the Mesa Loop-In and 678 MW of a selection of different Preferred Resources and Energy Storage with approximately half located across the LA Basin and the other half located in southern Orange County area in the vicinity of Santiago and Johanna substations. As discussed in Chapter III below, the Preferred Resources represent a combination of existing DR programs (adjusted to account for trend growth in enrollment and potentially re-engineered), aggressive new DR and EE programs, additional solar photovoltaic

(PV) generation, and Energy Storage to meet LCR need. SCE assumed construction of these Preferred Resources results in 551 MW of effective reduction of LCR need. This results in a remaining need of 1055 MW of combined need for Tracks 1 and 4, which is below the maximum amount of GFG (1200 MW) authorized to be procured through Track 1 procurement.

As discussed in Chapter V below, SCE will propose a Pilot to implement an aggressive Preferred Resources strategy to meet LA Basin LCR needs in a separate application. This Pilot will not necessarily implement the same combination of resources utilized in the Preferred Resources Scenario, but will be designed to meet LA Basin LCR needs. The Pilot will assist SCE in expanding its already substantial commitment to development of Preferred Resources. Preferred Resources that D.13-02-015 assumed would be implemented will contribute over 1,800 MW[9] to the capacity needed in the LA Basin. This is substantially more than the maximum amount of 1200 MW of conventional GFG generation authorized by the Commission in D.13-02-015.

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9 The Commission assumed 339 MW of rooftop Distribution Generation (DG), 180 MW of customer side Combined Heat and Power (CHP), 200 MW of DR and 1,121 MW of uncommitted EE.

III.

SCE'S TRACK 4 STUDIES

A. Study Approach

1. Overview

The impending closures of coastal GFG stations affected by State Water Resources Control Board (SWRCB) OTC regulations and the retirement of SONGS will stress the ability of the existing transmission network to import sufficient power into the LA Basin. This is particularly true during contingency conditions with one or more network facilities (major generators or transmission lines) out of service. As described in this section, SCE evaluated and identified mitigations that address the reliability implications of the retirements.

SONGS is located near the service area boundary between SCE and SDG&E, and its retirement affects both areas. In addition, the transmission path connecting the service areas through the SONGS switchyard is affected by contingencies involving major import transmission lines owned by SDG&E. So, electrical conditions in one area affect the other area. For this reason, SCE has worked closely with SDG&E transmission planners to develop the scenarios included in this testimony, and has relied on SDG&E inputs to represent the configuration of the SDG&E service area.

Mitigating the reliability challenges caused by the OTC closures and SONGS retirement creates an unprecedented opportunity to modify the power grid in southern California. As such, SCE has developed a series of scenarios that explore different options for meeting reliability needs, including emphasis on highly flexible conventional GFG, expansion of the transmission network to increase import capability, and an aggressive effort to enable Preferred Resources to contribute to meeting local reliability needs. These scenarios are presented in Section III.A.4. The purpose of presenting a

number of scenarios is to explore the tradeoffs among these different approaches. In addition, there may be significant challenges associated with permitting new generation (both conventional and renewable) and transmission in an urban area. So, the scenarios allow development of contingency plans should any particular initiative prove impracticable.

2. Key Assumptions

a) All Scenarios Used The California Energy Commission Adopted Load Forecast

Each of the scenarios presented in this testimony are based on the 2013 California Energy Commission (CEC) load forecast for 2022, net of uncommitted EE, allocated to individual substations. To the extent practical, SCE relied on the Revised Scoping Ruling and Memo of the Assigned Commissioner and Administrative Law Judge issued on May 21, 2013 (the "Track 4 Scoping Memo"), which identified the assumptions the CAISO should use for Track 4 studies. The assumptions included in Attachment A to the Track 4 Scoping Memo direct that the load data be based on mid-range economic assumptions from the 2012 Integrated Energy Policy Report (IEPR) Update, August 2012 revision, forms 1.5c & d.[10] Consistent with the Track 4 Scoping Memo's Attachment A, SCE used the 1-in-10 load forecast for its studies, as explained in Section III.C. SCE chose the Mid-Case Load Serving Entity (LSE) and Balancing Authority forecast updated June 20, 2013. SCE's studies also include incremental uncommitted EE savings (low savings case).[11]

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[10] Revised Scoping Ruling and Memo of the Assigned Commissioner and Administrative Law Judge dated May 21, Attachment A, p. 4.

[11] *Id.*

SCE's CEC load forecast data is consistent with the Track 4 Scoping Memo, Attachment A, and thus, is consistent with the assumption used by the CAISO. SCE included DR resources as a load reduction to substation loads. However, results from the transmission modeling show DR resources as a supply side resource, which is appropriate since DR is a dispatchable resource.

b) <u>SCE's Assumed Thermal Unit Retirements And Additions Compared to The Track 4 Scoping Memo's Assumptions</u>

The Commission made certain assumptions about additions and retirements of thermal units. In addition to the retirement of OTC generation in the LA Basin, the Commission assumed 1,645 MW of additional resources would retire due to age in 2018 and 2022, including Etiwanda 3 and 4 and Coolwater 3 and 4. SCE assumed some thermal unit retirements, but did not assume the retirement of Etiwanda units 3 and 4 or Coolwater units 3 and 4. The owners of these units have not announced their retirement. SCE does not have any information from the current owners of these units regarding their future operation. SCE assumed that these units would continue to operate based upon the fact that some facilities in California have operated beyond 40 years, and there are other facilities in California and outside California that are close to 40 years old. Most importantly, because these units are outside the LA Basin their continued operation has very limited influence on the amount of local generation needed in the LA Basin.

3. <u>Generation Resource Approach</u>

SCE's analysis began with the development of an initial generation build out, which is input to the transmission power flow studies described below. An initial configuration of generation resources was developed, placing heavy reliance on

repowering at known favorably situated OTC sites and/or nearby electrically equivalent locations (i.e. 1400 MW near Alamitos Generating Station and 1000 MW near Huntington Beach Generating Station) in the LA Basin. The initial configuration of generation resources also sited some additional generation at locations outside of the LA Basin. In addition, SCE identified additional potential greenfield locations at or nearby existing substations and OTC sites in the LA Basin and at SONGS. SCE's transmission planners used this information to determine which locations would be most effective at meeting LCR need.

OTC replacement generation was included in the vicinity of the existing Mandalay generating station in the Big Creek/Ventura area. This is consistent with analysis conducted by the CAISO as part of its 2011-2012 TPP.[12] This OTC replacement generation contributes to meeting LCR need, but was not varied across the various scenarios since Track 1 procurement will address Big Creek/Ventura LCR needs identified to date.

4. Description and Purpose of the Scenarios

The scenarios analyzed in Section III.C.1-5 evaluate a number of different strategic approaches to meeting LA Basin reliability needs. These include heavy reliance on LA Basin GFG at existing OTC sites, reliance on LA Basin transmission to reduce LA Basin generation needs, aggressive reliance on Preferred Resources as an alternative to GFG, and reliance on regional transmission upgrades (i.e., increasing transmission capability between SCE and SDG&E) to reduce SCE's LA Basin generation needs. The purpose for each of these scenarios is described below.

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[12] Track 1 Testimony of Robert Sparks on Behalf of the California Independent System Operator Corporation, CAISO Exhibit 1, p. 6.

a) LA Basin Generation Scenario

This scenario assumes that LA Basin reliability needs will be principally met with construction in the LA Basin of additional GFG capacity. As such, it is most comparable to previous local capacity area reliability studies in the 2010 Long-Term Procurement Plan (LTPP) proceeding,[13] which did not directly address transmission and Preferred Resource alternatives. This scenario assumes new generation would be sited at or near existing generation sites at Alamitos and Huntington Beach.

The LA Basin Generation Scenario provides a clear identification of the reliability issues associated with the potential closure of coastal OTC generation facilities and the retirement of SONGS. It also serves as a comparison to scenarios which rely on transmission and Preferred Resource alternatives. As described in Sections IV.A and IV.B, based on indicative cost estimates, the LA Basin Generation Scenario appears to be the lowest cost scenario. The Commission has endorsed California's Preferred Loading Order, which prioritizes the development of Preferred Resources before consideration of clean GFG. Thus, this scenario provides an "order of magnitude" estimate of the relative cost premium associated with other scenarios that lower LA Basin generation requirements through the use of transmission and Preferred Resources. This scenario also serves to identify the GFG options available to meet reliability needs in the event that transmission and Preferred Resource alternatives prove to be impractical. Furthermore, to the extent that the Commission identifies an additional requirement for flexible generation to integrate increasing amounts of renewable generation expected to be in operation by 2022 in Track 2 of the 2012

[13] R.10-05-006.

LTPP, this scenario identifies LA Basin resources that can meet this integration need and provide local reliability benefits.

b) <u>LA Basin Transmission Scenario</u>

While siting additional high voltage transmission in an urban area is challenging, SCE identified the Mesa Loop-In as a potentially viable reliability project. The Mesa Loop-In involves rebuilding and upgrading the existing Mesa 230 kV substation in the LA Basin to 500 kV and looping the Vincent – Mira Loma 500 kV line and two 230kV lines into the substation. The Mesa Loop-In has relatively limited impact outside of SCE's existing right of way. This scenario investigates the potential for the Mesa Loop-In to reduce LA Basin generation requirements, allowing greater flexibility for generation locations to meet local reliability needs. While pursuing a transmission solution appears more costly than the LA Basin Generation Scenario discussed above, the LA Basin Transmission Scenario reduces the amount of GFG that would be sited in areas most affected by stringent air emission requirements, including those associated with fine particulate matter of less than 10 microns diameter (PM-10). In addition, transmission expansion creates additional pathways for electricity to be imported to loads in the LA Basin, making the transmission grid more robust in its ability to meet future uncertainties. For these reasons, SCE anticipates that the Commission will support pursuing the LA Basin Transmission Scenario.

c) <u>Preferred Resources Scenario</u>

Given the priority provided to Preferred Resources in the Preferred Loading Order, SCE investigated a scenario involving an aggressive reliance on Preferred Resources (and Energy Storage) to meet LA Basin reliability needs. For the purpose of modeling the impact of Preferred Resources, SCE assumed

310 MW of a selection of different resources were located across the LA Basin, and an additional 368 MW were located in SCE's southern Orange County area in the vicinity of Santiago and Johanna substations, as shown in Table III-1.

Table III-1
Preferred Resources Scenario Assumptions

Preferred Resource Scenario	
Effective MW by Resource Type	
Energy Storage	50
Commercial Roof Top Solar	126
Demand Response	452
Energy Efficiency	50
Total	**678**

SCE intended the Preferred Resources Scenario assumptions to provide a reasonable basis for modeling an aggressive Preferred Resources strategy. However, these assumptions do not forecast the results of the Track 1 LTPP procurement efforts. SCE will select Preferred Resources in the LA Basin consistent with D.13-02-015 and the Energy Division approved Track 1 Procurement Plan. The competitively priced Preferred Resources chosen through Track 1 procurement and their locations may vary from SCE's assumptions.

Also, analysis of this scenario does not imply that the Preferred Resources included in the modeling are necessarily capable of mitigating the reliability issues identified in the transmission power flow modeling. Whether or not a specific type of Preferred Resources can be effective depends on how quickly Preferred Resources can respond to a contingent need (if it is controllable), whether it is available across all or most of the times when needed, and the

duration of time it can be available.[14] Transmission power flow modeling is traditionally performed under extreme stress conditions (high peak loads with major generation and/or transmission assets out of service). However, reliability issues may occur under less stressful conditions and at times other than system peak conditions. Therefore, it is challenging to understand the specific attributes that Preferred Resources must have to address all reasonable contingent conditions. SCE continues to collaborate with the CAISO to develop an understanding of the attributes a portfolio of Preferred Resources must have to meet reliability needs.

The current reliability challenges addressed in this testimony create an opportunity to explore a "real world" application of Preferred Resources to meeting reliability needs. Section V describes SCE's proposal for a "living" Pilot that would aggressively pursue Preferred Resources in SCE's southern Orange county area as an alternative to conventional generation. A necessary part of this Pilot effort will be a process to develop an understanding of the specific attributes a portfolio of Preferred Resources must satisfy to actually meet reliability needs. Because of the uncertainty regarding the actual effectiveness of Preferred Resources, the amount of Preferred Resources in the target area was designed based on the amount of need that could reasonable be backstopped with development of sites for GFG resources to be used only if needed.

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[14] Each individual Preferred Resource does not necessarily need to meet all required attributes. A Preferred Resource that meets some attributes can be used as part of an overall portfolio that satisfies all required attributes. For example, if a four-hour duration is needed, two Energy Storage devices, each with two-hour capacity, could be used sequentially to meet need.

d) Regional Transmission Scenario

This scenario addresses the potential effectiveness of strengthening the transmission interconnections between the SCE and SDG&E service areas to reduce the need for LA Basin generation resources below the reduction identified in the LA Basin Transmission Scenario. The CAISO has considered a number of different projects in recent years, including an inland route evaluated by the CAISO in the 2012-2013 TPP.[15] In coordination with SDG&E, for study purposes, SCE identified a project that would strengthen the existing SONGS transmission corridor between the Valley, Alberhill and San Onofre substations by upgrading transmission from 230 kV to 500 kV. This project would predominately rely on existing transmission corridors. As any major upgrade of transmission lines in a populated area is subject to significant public scrutiny, timely completion is unlikely. SCE anticipates that the CAISO will continue to study a variety of potential regional transmission solutions to address longer term regional needs, and this scenario is intended to inform this work effort.

B. Power Flow Studies

1. Methodology

a) These Power Flow Studies Examine Contingencies On The Transmission System

SCE's transmission power flow studies assess the capability of the electric system to operate under normal and emergency conditions. This involves determining whether an initiating fault (short circuit) and subsequent loss of electric facilities (such as transmission lines, generators, transformers, bus

[15] http://www.caiso.com/Documents/BoardApproved2012-2013TransmissionPlan.pdf, at p. 190.

sections and breakers) violates system performance requirements specified by the NERC Reliability Standards.[16]

The United States Congress created an electric reliability organization (ERO) through the Energy Policy Act of 2005. The Federal Energy Regulatory Commission (FERC) certified NERC as the ERO on July 20, 2006. NERC develops, implements, and enforces mandatory reliability standards for the bulk power system. NERC performs its duties in accordance with Section 215 of the Federal Power Act. The statute requires users, owners and operators of the bulk power system in the United States to be subject to FERC approved NERC Reliability Standards.

These standards require the simulation of a range of potential conditions from no contingencies (Category A) to extreme events (Category D). The two intermediate categories of contingencies, Category B, events resulting in the loss of a single element and Category C, event(s) resulting in the loss of two or more elements constitute the majority of contingencies examined in SCE's studies. An example of a Category B contingency is the fault and loss of one transformer bank. An example of a Category C contingency is the fault and simultaneous loss of two transmission lines that share a common tower.

Attachment 1 is Table 1 from NERC Reliability Standard TPL-001-3 which provides a complete description of Category A through D contingencies and the associated system performance requirements. Table 1 is common to transmission planning standards TPL-001-3, TPL-002-2b, TPL-003-2b, and TPL-004-2a. These NERC Transmission Planning (TPL) Reliability Standards require the system to be stable and both thermal and voltage limits to be within facility

[16] NERC transmission planning Reliability Standards include TPL-001-3 (Category A), TPL-002-2b (Category B), TPL-003-2b (Category C), and TPL-004-2a (Category D).

ratings for Categories A through C. NERC TPL Reliability Standards generally do not permit loss of demand, such as load shedding, for Categories A and B. However, if planned and controlled, NERC TPL Reliability Standards permit loss of demand for Category C. Category D contingencies are extreme events with no specific performance requirements other than an evaluation for risks and consequences. SCE's power flow studies examined Category A through D conditions for facilities in SCE and SDGE's service areas.

b) <u>SCE's Studies Look For Thermal Overloading and Voltage Violations During These Contingencies</u>

SCE's studies identify both thermal overload and voltage violations for Category A through D conditions. The studies look for power flows in excess of normal (Category A) and emergency (Categories B through D) thermal ratings of transmission facilities. SCE establishes the thermal ratings of transmission facilities as the owner of these facilities to prevent damage to equipment and assure safe clearances are maintained in accordance with General Order No. 95. The studies also look for voltages at substations outside of specific bandwidths and percentage deviations in excess of thresholds established by the CAISO as provided in Table III-2 below[17]. Maintaining voltages at substations prevents voltage collapse events in which voltages in a portion of the electric system decrease catastrophically causing a blackout. The CAISO established these voltage limits via an open stakeholder process in 2011. Based on the identified thermal overloads and voltage violations, SCE develops mitigation options to improve system performance.

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[17] "California ISO Planning Standards", June 23, 2011, Section II.3., page 4

Table III-2
CAISO VOLTAGE REQUIREMENTS

(Voltages are relative to the nominal voltage of the system studied)

Voltage level	Normal Conditions (TPL-001)		Contingency Conditions (TPL-002 & TPL-003)		Voltage Deviation	
	Vmin (pu)	Vmax (pu)	Vmin (pu)	Vmax (pu)	TPL-002	TPL-003
≤ 200 kV	0.95	1.05	0.90	1.1	≤5%	≤10%
≥ 200 kV	0.95	1.05	0.90	1.1	≤5%	≤10%
≥ 500 kV	1.0	1.05	0.90	1.1	≤5%	≤10%

c) <u>SCE Then Adds New Generation At Key Locations To Mitigate Violations</u>

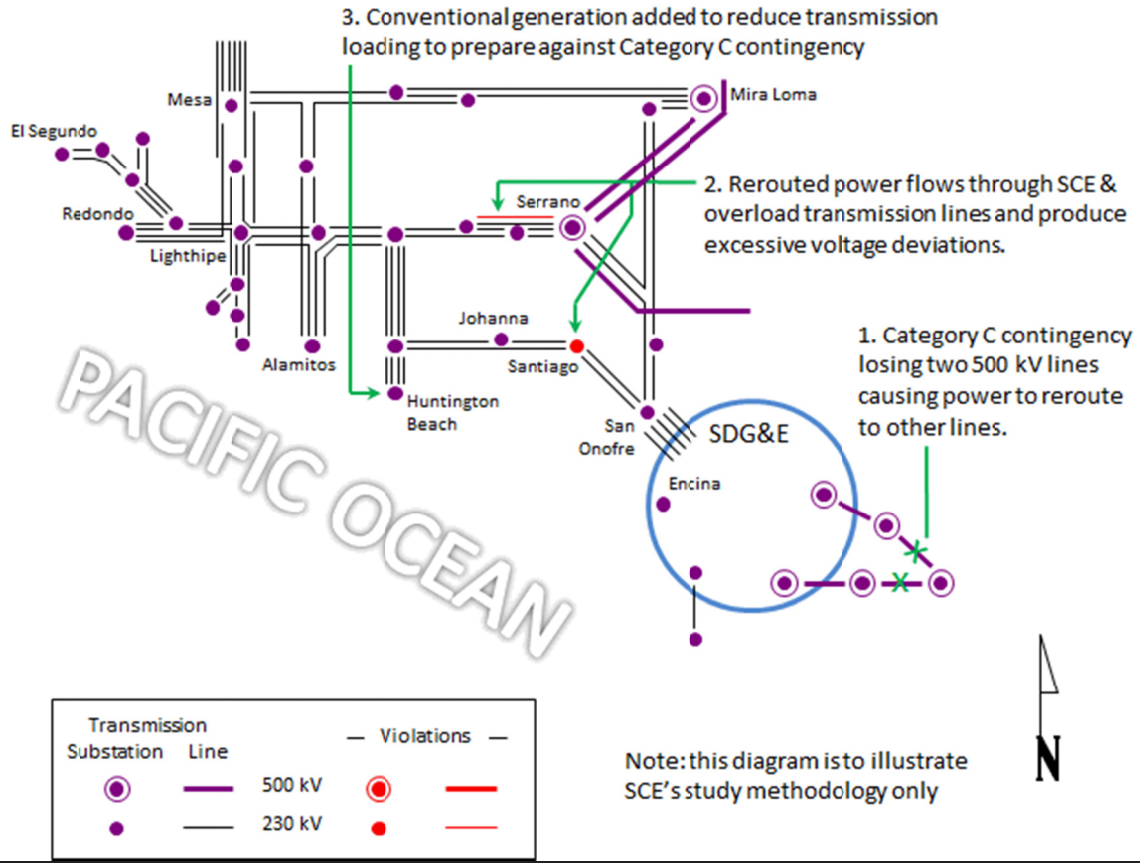
SCE's studies first use generation as mitigation to establish a base line to address violations. SCE located the generation at several existing substations including: Alamitos, Huntington Beach, Johanna, Santiago, and San Onofre. SCE selected Alamitos, San Onofre, and Huntington Beach substations because they are existing OTC sites and are favorably located to relieve identified violations. Coastal southern California is both densely populated and well regulated. So, locating sufficient land for new generation development is challenging. Developing new generation at existing OTC sites may be possible. However, not all existing OTC sites were favorably located to relieve identified violations. Johanna and Santiago are not existing OTC sites, but proved beneficial locations to minimize the total generation needed to address violations in specific scenarios.

The generation modeled at these substations is a proxy for any generation in the vicinity that is electrically equivalent. SCE adds the minimum amount of generation required to mitigate all identified thermal and voltage violations. After establishing a minimum generation solution, SCE then tests transmission projects and Preferred Resources to determine the incremental reduction in the amount of generation required for each alternative.

Figure III-3 below provides an example of SCE's methodology. The diagram focuses on the transmission system encompassing the LA Basin and SDG&E's service area. SDG&E's service area is simplified as a circle with only the transmission lines that feed into the area or link to SCE shown. Figure III-3 shows the LA Basin with all in-service substations and lines. Under a scenario where OTC (including SONGS) units are off-line during peak load, both the LA Basin and SDG&E service area rely on the transmission system to import a significant amount of power from outside the local area to serve load. The power on transmission lines that serve these two areas would flow into the areas from the east and north.

A Category C contingency, where two 500 kV transmission lines that feed SDG&E are lost, will reroute power to the remaining lines that feed SDG&E (see No. 1 in Figure III-3). The rerouted power flows through lines in the LA Basin and produce thermal overloads and voltage deviation violations (see No. 2). Adding generation at key substations will mitigate these violations by reducing power flows pre-contingency and providing voltage support on specific portions of the transmission system in preparation for the contingency (see No. 3).

Figure III-3
SCE METHODOLOGY



2. Comparison With The CAISO's Studies

a) SCE's Studies Did Not Look For The Effect of The Contingencies on System Transient Stability

The CAISO 2012-2013 Transmission Plan, dated March 20, 2013, includes a Section 3.5.6 titled "Grid Reliability Assessments for the Absence of San Onofre Nuclear Generating Station." Section 3.5.6 provides the results of an assessment considering all OTC (including SONGS) units out of service. The

CAISO did not identify transient stability[18] issues associated with this scenario. Given this study result, SCE did not commit resources to perform a transient stability analysis.

b) <u>SCE's Power Flow Studies Are Not Local Capacity Technical Studies</u>

SCE's studies meet the performance requirements of the NERC Reliability Standards, rather than more stringent requirements used in the CAISO's LCT study. SCE's studies identify contingencies in which the electric system may fail to meet NERC Reliability Standards. There is discretion to exceed performance requirements beyond the NERC Reliability Standards. However, failure to meet the minimum federally mandated NERC Reliability Standards is subject to monetary sanctions. SCE's identified mitigations are necessary to avoid reducing system reliability to less than even minimum NERC Reliability Standards and exposing the CAISO, SCE and SDG&E to monetary sanctions. An example of a monetary sanction is the $25 million civil penalty assessed against Florida Power and Light Company. This penalty resolved an investigation by FERC and NERC into possible violations of NERC Reliability Standards associated with a black-out event in the State of Florida on February 26, 2008.[19]

State agencies can initiate mitigations for system performance that may exceed NERC Reliability Standards. In Track 1, the CAISO recommended the long-term procurement of 2,400 MW in the LA Basin and 430 MW in the Moorpark sub-area based on an LCT study. Decision (D.) 13-02-015 provided 1,400 to 1,800 MW for the LA Basin and 215 to 290 MW for the Moorpark sub-area. The authorized procurement was adequate to meet NERC Reliability

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[18] Transient Stability refers to the time period seconds after a fault in which the electric system is in transit to a steady state condition. System parameters such as voltage and frequency may show oscillations or instability.

[19] FERC Docket No. IN08-5-000, "Order Approving Stipulation and Consent Agreement" issued October 8, 2009.

Standards, but was insufficient to meet the more stringent CAISO performance requirements in the LCT study for both areas.

The following are two examples of more stringent performance requirements than NERC Reliability Standards used in the CAISO's LCT study to fully mitigate for the loss of OTC units:

1) The CAISO required the electric system to maintain positive reactive margin[20] with the load forecast increased by 5% for Category A or B and 2.5% for Category C contingencies.[21] SCE's study did not.
2) The CAISO determined that using load shedding for the loss of the Imperial Valley-Suncrest 500 kV line[22] followed by the loss of ECO-Miguel 500 kV line is not prudent.[23] This contingency is classified as a Category C.3 (also known as an N-1-1). Category C.3 contingencies are permitted to load shed pursuant to NERC TPL-003-2b Reliability Standard. So, SCE's studies allowed for load shedding for this C.3 contingency.

CAISO's assumed performance requirements improve the reliability of the electric system. They assure system performance levels above NERC Reliability Standards. SCE conducted its studies to provide data on minimum requirements in Southern California to meet NERC Reliability Standards to: (1) ensure a

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[20] Generally, positive reactive margin means that the electric system can maintain acceptable voltages during contingencies.

[21] Section III.A.2 of the CAISO's 2014 LCT Analysis dated April 30, 2013 provides the reactive margin criteria: "positive margin based on the higher of imports or load increase by 5% for N-1 contingencies, and 2.5% for N-2 contingencies". This performance requirement is also specified by the Western Electricity Coordinating Council as "System Performance TPL-001-WECC-RBP-2 Regional Business Practice" requirements WR3.1 & WR3.2.

[22] The recently in-service Ocotillo Substation changes this line to Imperial Valley – Ocotillo – Suncrest 500 kV.

[23] Application 11-05-023. Application of San Diego Gas & Electric Company (U902E) for Authority to Enter into Purchase Power Tolling Agreements with Escondido Energy Center, Pio Pico Energy Center and Quail Brush Power. Rebuttal Testimony of Robert Sparks on Behalf of the California Independent System Operator Corporation, June 6, 2012, pages 8-12.

minimum level of reliability in Southern California and (2) reduce the risk of monetary sanctions to the CAISO, SCE and SDG&E.

c) <u>SCE Included Transmission Additions In Some Scenarios Not Approved By The CAISO Transmission Planning Process</u>

Table III-3 lists several transmission projects included as part of SCE's studies. All SCE scenarios assume that Projects 1 through 8 are in operation in 2022. Projects 9 through 11, located in SCE's service area, are used in certain scenarios to test their efficacy in addressing the identified system performance violations.

The first two transmission projects went into service earlier this year. The next three were approved as part of the CAISO's 2012-2013 TPP and located in SDG&E's service area. Projects 6 through 8 are conceptual transmission upgrades not yet approved by the CAISO also located in SDG&E's service area. SCE coordinates with SDG&E who provides SCE with the modeling information for projects located within SDG&E.

Table III-3
List of In-Service, CAISO Approved, and Conceptual Transmission Projects

TRANSMISSION PROJECT		STATUS	SERVICE AREA
1.	Four 80 MVAR capacitors at Johanna (1), Santiago (1) & Viejo (2)	In-Service	SCE
2.	Barre - Ellis No. 1 & 2 230 kV lines reconfigured into four lines	In-Service	SCE
3.	South Orange County dynamic reactive support (+500/-250 MVAR)	CAISO Approved	SDGE
4.	Talega area dynamic reactive support (+240/-120 MVAR)	CAISO Approved	SDGE
5.	Sycamore - Penasquitos 230 kV line	CAISO Approved	SDGE
6.	NCGEN 230kV Switchyard and loop-in new ESCNDIDO -TALEGA 230kV No. 2 line	Conceptual	SDGE
7.	Suncrest +/- 240 MVAR synchronous condenser	Conceptual	SDGE
8.	Cannon/Encina +/- 240 MVAR synchronous condenser	Conceptual	SDGE
9.	Upgrade Ellis-Johanna & Ellis-Santiago 230 kV lines to conductor rating	Conceptual	SCE
10	Mesa loop-in	Conceptual	SCE
11	Valley - Alberhill - SONGS 500 kV line	Conceptual	SCE

d) SDG&E Load Shedding

SCE's studies include load shedding for the critical Category C.3 contingency of Suncrest – Ocotillo 500 kV followed by ECO – Miguel 500 kV in SDG&E's service area. SDG&E will provide testimony on its load shedding scheme for this contingency. SCE also examined two cases without load shedding for the critical Category C.3 contingency in SDG&E's service area to determine the impact on the Mesa Loop-In.

C. Results of Power Flow Studies

1. Overview

As discussed above, SCE studies identify system performance violations of the NERC Reliability Standards. SCE's studies examined three mitigation options to address these violations: (1) generation in the LA Basin, (2) transmission to increase import capability into LA Basin or SDG&E, and (3) use of Preferred Resources. Table III-4 describes the four scenarios and two sensitivity cases performed by SCE. The LA Basin Generation Scenario (Scenario 1) added generation as mitigation and establishes a base line generation need in the LA Basin. The LA Basin Transmission Scenario (Scenario 2) examined the amount of reduced generation needed in LA Basin with the Mesa Loop-In. Scenarios 1S & 2S are sensitivities of Scenarios 1 & 2 without load shed in SDG&E for the critical Category C.3 contingency. The Preferred Resources Scenario examined the amount of reduced generation needed with Mesa Loop-In and Preferred Resources. The Regional Transmission Scenario examined the impact of Mesa Loop-In & Valley – Alberhill – SONGS 500kV line on the generation needed in the LA Basin.

Table III-4, column C, provides the transmission projects modeled in the scenarios. SCE's studies model over 7,000 MW of OTC generation off line (column D). This includes, rounding to the nearest thousand MW, 4,000 MW of OTC units in LA

Basin, 2,000 MW of SONGS and 1,000 MW of OTC modeled off line in SDG&E's service area. Load and Incremental Uncommitted Efficiency Savings (IUES) within the LA Basin (columns E & F) are CEC forecasts of the year 2022 and are the same for all cases. Column G provides the Preferred Resources in the LA Basin included in Scenario 3. Column H tabulates the total load in the LA Basin. Columns I through K provide SDG&E's modeling. SDG&E's load, imports into its local capacity area, and the amount of new generation dispatched is fixed or approximately the same for all scenarios.

Table III-4
SOUTHERN CALIFORNIA RELIABILITY SCENARIOS

A	B	C	D	E	F	G	H	I	J	K
Scenario	Description	Trans Upgrades (1)	OTC (2)	Western LA Basin				SDG&E		
				Load				Load	Import	New Gen Dispatch (6)
				Load (3)	IUEE (4)	PR (5)	Total			
1	LA Basin Generation	A	7,091	13,609	-508	0	13,101	5,483	2,754	1,170
2	LA Basin Transmission (Mesa Loop-In)	A+B	7,091	13,609	-508	0	13,101	5,483	2,745	1,170
1S	Scenario 1 sensitivity without SDG&E Load Shed	A	7,091	13,609	-508	0	13,101	5,483	2,754	1,170
2S	Scenario 2 sensitivity without SDGE Load Shed	A+B	7,091	13,609	-508	0	13,101	5,483	2,745	1,170
3	Preferred Resources	A+B	7,091	13,609	-508	-578	12,423	5,483	2,748	1,170
4	Regional Transmission (Valley-Alberhill-SONGS)	A+B+C	7,091	13,609	-508	0	13,101	5,483	2,754	1,170

NOTES:

1. Transmission Upgrades — Status
   - A. Four 80 MVAR capacitors at Johanna (1), Santiago (1) & Viejo (2) — In-Service
     - Barre - Ellis No. 1 & 2 230 kV lines reconfigured into four lines — In-Service
     - South Orange County dynamic reactive support (+500/-250 MVAR) — CAISO Approved
     - Talega area dynamic reactive support (+240/-120 MVAR) — CAISO Approved
     - Sycamore - Penasquitos 230 kV line — CAISO Approved
     - NCGEN 230kV Switchyard and loop-in new ESCNDIDO -TALEGA 230kV No. 2 line — Conceptual
     - Suncrest +/- 240 MVAR synchronous condenser — Conceptual
     - Cannon/Encina +/- 240 MVAR synchronous condenser — Conceptual
     - Upgrade Ellis-Johanna & Ellis-Santiago 230kV lines to conductor rating — Conceptual
     - Huntington Beach Units 3 & 4 off line (not modeled as synch condensers)
   - B. Mesa loop-in — Conceptual
   - C. Valley - Alberhill - SONGS 500kV line — Conceptual
2. Generation capacity of OTC units (MW):

Western LA Basin		3,995
El Segundo 4	335	
Redondo Beach 5-8	1,280	
Alamitos 1-6	1,950	
Huntington Beach 1-2	430	
SONGS 2-3		2,150
SDG&E Encina		946
Total		7,091

3. CEC load forecast, August 2012, 1-in-10, mid-case
4. CEC Incremental Uncommitted Energy Efficiency, September 20, 2012
5. Preferred Resources
6. New San Diego In-basin generation. Pio Pico (300 MW) and Quail Brush (1,000 MW) are modeled in all cases to replace OTC units and not counted as new generation.

Table III-5 tabulates the amount of new generation required in the LA Basin to address all violations for each scenario. SCE describes the study results of the scenarios and sensitivities in more detail below.

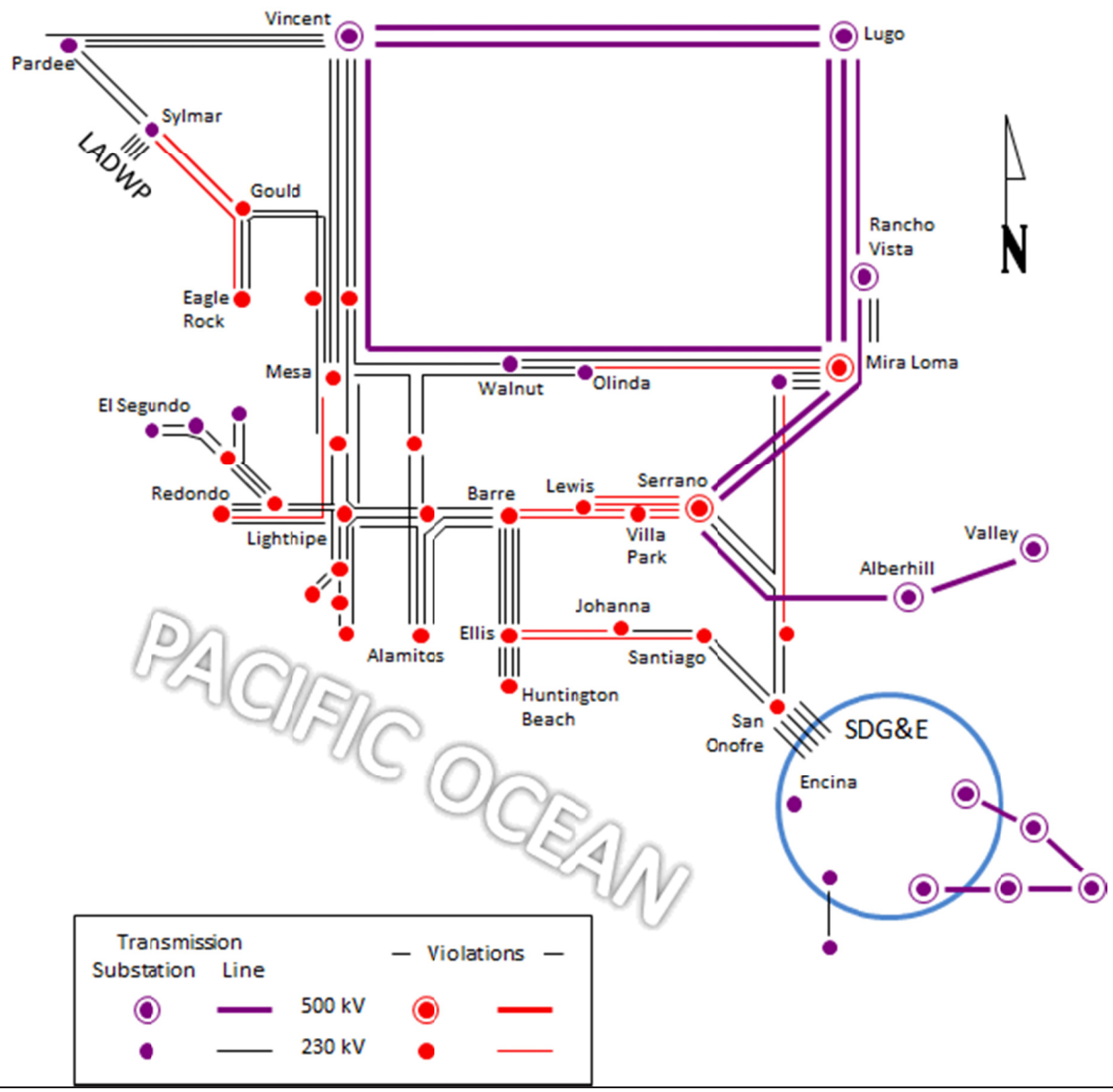
Table III-5
SOUTHERN CALIFORNIA RELIABILITY STUDY RESULTS

		L	M	N	O	P	Q
Scenario	Description	Western LA Basin New Generation Dispatch					
		Alamitos	Hunt. Beach	Johanna	Santiago	San Onofre	Total
1	LA Basin Generation	1,892	910	0	0	0	2,802
2	LA Basin Transmission (Mesa Loop-In)	836	770	0	0	0	1,606
1S	Case 1 without SDGE Load Shed	1,892	910	192	246	0	3,240
2S	Case 2 without SDGE Load Shed	836	770	0	0	900	2,506
3	Preferred Resources	460	595	0	0	0	1,055
4	Regional Transmission (Valley-Alberhill-SONGS)	428	770	0	0	0	1,198

2. <u>LA Basin Generation Scenario</u>

With over 7,000 MW of generation off-line in Southern California, SCE's studies identify violations under normal and emergency conditions throughout the LA Basin, as Figure III-4 shows. The increased imports into the LA Basin, due to the generation deficit, drop voltage below the CAISO's limits at a majority of substations in the LA Basin. The increased flow into the LA Basin also overloads the 500/230 kV transformer banks at Mira Loma and Serrano Substations along with numerous 230 kV transmission lines. The 230 kV transmission line overloads include (1) Ellis corridor, composed of Ellis – Johanna and Ellis – Santiago 230 kV lines and (2) Serrano corridor, 230 kV lines west of Serrano Substation extending to Barre Substation.

Figure III-4
SCENARIO 1 VIOLATIONS



The thermal overloads in the Ellis corridor are below the conductor ratings of the lines. So, a relatively low cost upgrade within SCE substations and transmission right-of-way would address the violations in the Ellis corridor. SCE's studies assume that this upgrade will occur for all scenarios. This upgrade is Project 9 in Table III-3. It is also included as Transmission Upgrades "A" in Table III-3 above.

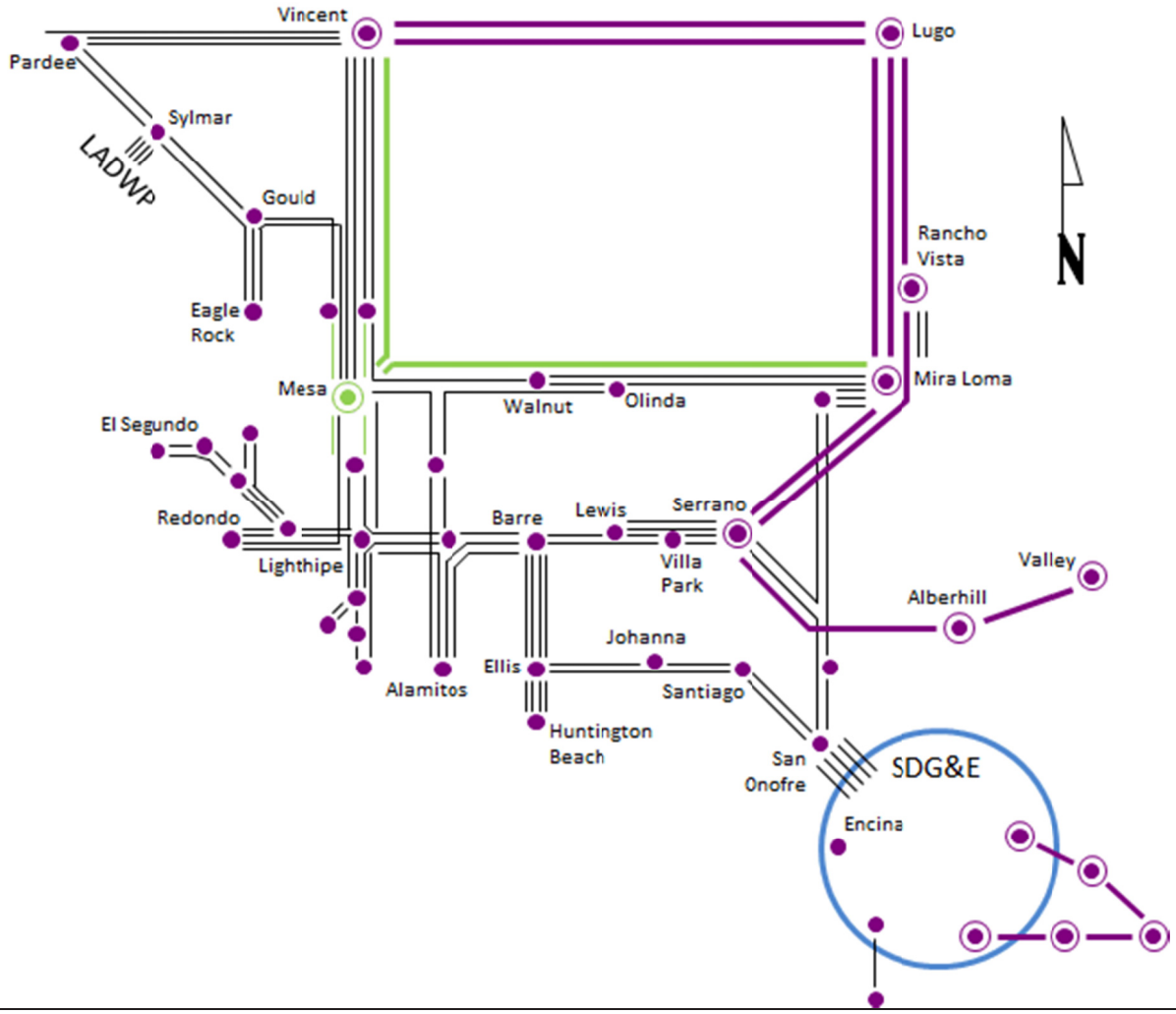
The Serrano corridor includes several 230 kV lines which move power from SCE's 500 kV system to the LA Basin. These 230 kV lines provide some back-up transmission assistance to SDG&E if SDG&E loses significant transmission capability.

The remaining lines do not overload above conductor rating and can be simultaneously addressed along with the Serrano corridor. A total of 2,802 MW of new generation is required in the LA Basin to relieve the Serrano corridor, all remaining overloaded lines, 500/230 kV transformer banks, and improve voltage performance. Table III-5 shows that 1,892 MW is required at Alamitos and 910 MW at Huntington Beach. Locating generation at Alamitos & Huntington Beach addresses the Serrano corridor and several other 230 kV lines. However, the Ellis corridor is mitigated by a relatively low cost upgrade. The LA Basin Generation Scenario sets the benchmark using primarily generation as mitigation.

3. <u>LA Basin Transmission Scenario</u>

The LA Basin Transmission Scenario examines the Mesa Loop-In. Figure III-5 shows this project in green.

Figure III-5
Mesa Loop-In (Scenario 2)



This project expands SCE's existing Mesa 230/66/16 kV Substation to include 500 kV service. This allows SCE to bring an additional 500 kV electric service into its load center. The project includes three 500/230 kV and four 230/66 kV transformer banks providing significant capacity to deliver power from the 500 kV transmission system to load in the LA Basin. The Vincent – Mira Loma 500 kV, Laguna Bell – Rio Hondo 230 kV & Goodrich – Laguna Bell 230 kV lines will loop into the substation to provide new source lines and to distribute power toward coastal cities to the south. The majority of work will be at Mesa Substation. The project provides several benefits:

1. It relieves the loading on the Serrano corridor by delivering power into LA Basin from the northwest, i.e., Vincent and Big Creek/Tehachapi resources.
2. A new 500 kV substation in the LA Basin allows flexibility of type and geographic diversity of electrical resources and improves overall reliability. A significant portion of the replacement capacity for any lost generation including OTC and SONGS could be located outside the LA Basin fostering more competition and reducing procurement costs.
3. It reduces need to build from 734 MW to 1,200 MW of new resources in the LA Basin.

Mesa Loop-In reduces the amount of new generation required in the LA Basin, but does not eliminate the need for new generation. The total new generation required is 1,606 MW in the LA Basin with the project modeled. The LA Basin Transmission Scenario includes Mesa Loop-In, while the LA Basin Generation Scenario does not. The difference in total generation need between the LA Basin Generation Scenario and the LA Basin Transmission Scenario can be attributed to the Mesa Loop-In. The project reduces generation needed in the LA Basin by approximately 1,200 MW (2,802 MW minus 1,606 MW).

The LA Basin Generation Scenario and the LA Basin Transmission Scenario both assumed that SDG&E would load shed for the critical loss of the Ocotillo – Suncrest 500 kV line, ECO – Miguel 500 kV line and the automatic cross-trip of Otay Mesa – Tijuana 230 kV line (Category C.3 also known as a N-1-1). The Otay Mesa – Tijuana 230 kV line overloads after the loss of the first two lines and is removed from service automatically by relay equipment. This critical contingency reroutes all SDG&E imports, approximately 2,750 MW through SCE's transmission lines in Orange County. However, SDG&E is assumed to load shed for this contingency. Shedding load in SDG&E's service area reduces the power flows through Orange County. As a result,

there is no performance violation in SCE's system assuming the load shed in SDG&E for this critical C.3 contingency.

The CAISO stated that it is not prudent to load shed for this critical SDG&E C.3 contingency. So, SCE created two more cases to examine the impact of load shedding on the benefits of the Mesa Loop-In. Scenarios 1S and 2S are the same as Scenarios 1 & 2 (the LA Basin Generation Scenario and the LA Basin Transmission Scenario), respectively, except they do not assume SDG&E load shed for the critical Category C.3 contingency. SCE studies show additional generation needed in the LA Basin in Scenarios 1S & 2S relative to Scenarios 1 & 2 to address the critical SDG&E C.3 contingency.

A comparison of Scenarios 1S and 2S shows that the Mesa Loop-In decreases need in LA Basin by only 734 MW (3,240 MW minus 2,506 MW). As previously discussed, the Mesa Loop-In shows a benefit of 1,200 MW if load shed in SDG&E is assumed. Thus, the Mesa Loop-In demonstrates a much greater ability to reduce generation need (1,200 MW compared to 734 MW) in the LA Basin, if the critical SDG&E C.3 contingency is addressed by load shed in SDG&E's service area.

Another way to address the critical SDG&E C.3 contingency is by increasing the amount of new generation inside SDG&E's service area and reducing its import level. The Mesa Loop-In is located closer to the LA Basin OTC units than SDG&E service area. It is, therefore, not highly effective in addressing SDG&E contingencies. Load shed or additional generation in SDG&E would be more effective to address the critical C.3 contingency.

4. <u>Preferred Resources Scenario</u>

The Preferred Resources Scenario examines 678 MW of Preferred Resources in LA Basin in addition to the Mesa Loop-In, as discussed in Chapter III.A.5(c) above. The Preferred Resources Scenario utilizes the entire 678 MW for any contingency that

may require the Preferred Resources as mitigation. The Preferred Resources Scenario reduces generation needed in the LA Basin to 1,055 MW, a drop of 551 MW relative to the LA Basin Transmission Scenario. The ratio of generation reduced to Preferred Resources is 81% (551 MW divided by 678 MW),[24] a measure of the effectiveness of a MW of Preferred Resources in reducing the generation need.

5. Regional Transmission Scenario

The Regional Transmission Scenario (Scenario 4) studies the effects of a 500 kV line running from Valley, Alberhill and San Onofre Substations, as Figure III-6 shows. This 500 kV transmission project is approximately 63 miles along existing SCE right-of-way running from Valley 500 kV Substation to Alberhill 500 kV Substation and terminating at San Onofre 230 kV Substation. San Onofre Substation would upgrade to 500 kV and install three 500/230 kV transformer banks. This project is designed to provide another route for generation to flow to San Onofre Substation. Adding this transmission line provides additional power flows in this generation deficient area. The total generation need in the LA Basin was 1,198 MW for the Regional Transmission Scenario, a reduction of 408 MW relative to the LA Basin Transmission Scenario.

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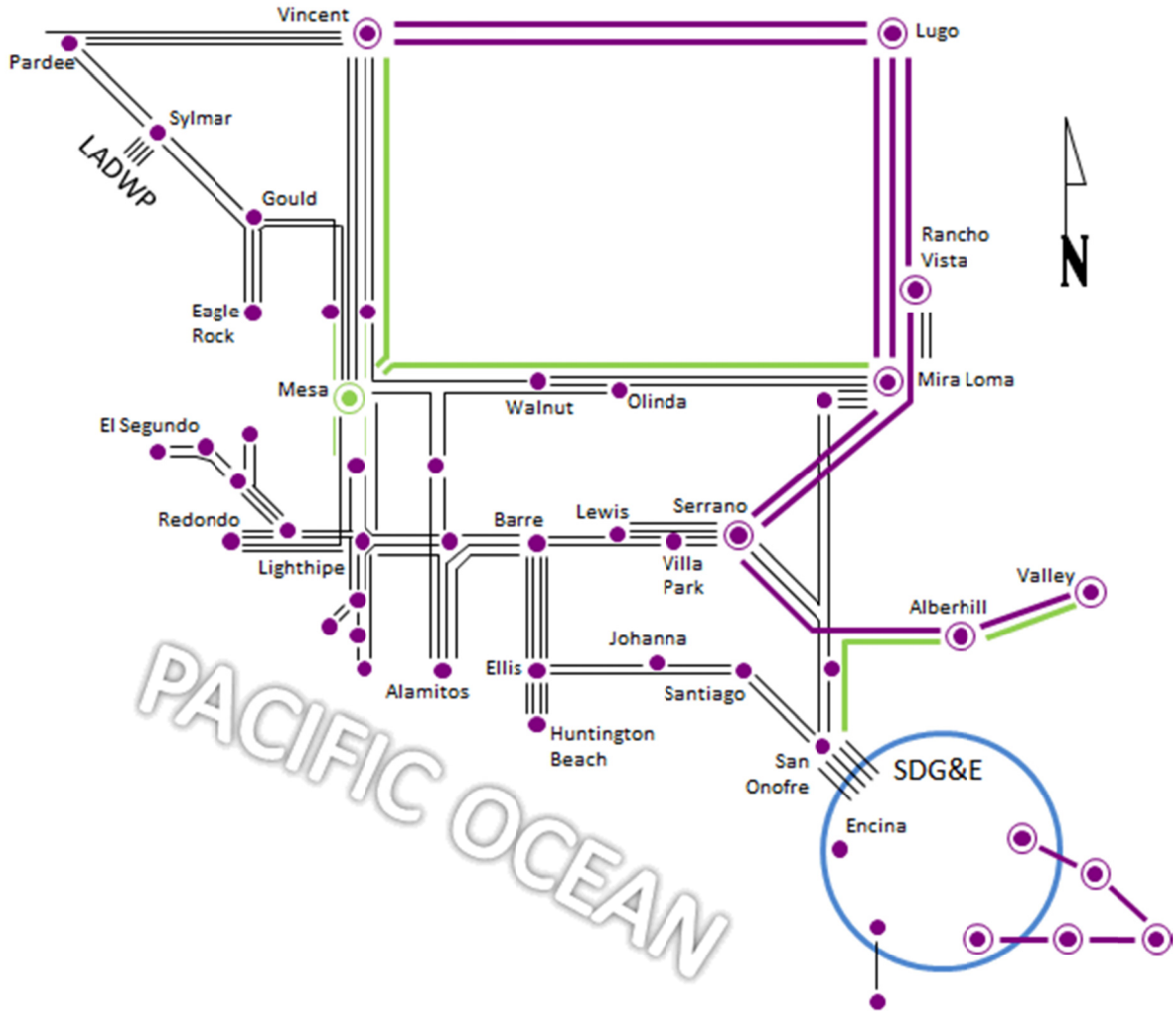
[24] This effectiveness ratio is specific to the assumptions of this study and should not be interpreted to generally apply for any Preferred Resources.

Figure III-6
VALLEY – ALBERHILL – SAN ONOFRE 500 KV LINE



SCE expected this line to relieve its 230 kV lines in Orange County by providing additional capacity to serve SCE and SDG&E from San Onofre. However, simulations showed limited ability to reduce flows in Orange County. Therefore, the amount of generation needed in LA Basin only reduced by 408 MW.

IV.

ANALYSIS OF THE SCENARIOS

A. Description of the Scenario Analysis

The scenarios described in Section III vary in terms of the amount of GFG required to meet LA Basin reliability needs, the reliance on transmission upgrades, and the amount of Preferred Resources and Energy Storage that are distributed across the LA Basin. The LA Basin Generation Scenario mitigates LA Basin reliability with GFG located within the LA Basin. The LA Basin Transmission Scenario and the Regional Transmission Scenario use transmission upgrades to increase the capacity of the transmission grid to import power to the LA Basin, reducing LA Basin generation. Both of these scenarios include the Mesa Loop-In. The Regional Transmission Scenario adds a regional project that extends a 500 kV line from the Valley substation into the San Onofre substation.

Both transmission scenarios assume there are sufficient resources outside of the LA Basin available to be delivered into the LA Basin through the respective transmission projects. As an input to the power flow modeling, additional GFG resources were located outside of the LA Basin to provide a source of generation that would meet a portion of the reduced generation needs in the LA Basin. For the LA Basin Transmission Scenario, 600 MW of generation was modeled and for the Regional Transmission Scenario, 1055 MW was modeled.[25] This isolates the effect of OTC generation retirement within southern California. These assumptions are not intended to suggest that additional resources are needed within the overall CAISO area, or suggest what kind of resources might be needed to meet system reliability needs. The Preferred Resources Scenario substitutes Preferred Resources for GFG in the LA Basin, with an emphasis on the area targeted by the Pilot. As such, this scenario shows the locational effectiveness of

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[25] These amounts were an input to the power flow modeling and were used for developing indicative costs for the scenarios. The amount of generation actually dispatched in the power flow modeling was below these amounts.

Preferred Resources relative to GFG located in effective locations (assuming that Preferred Resources have the attributes necessary to meet reliability needs). As with the transmission scenarios, SCE modeled additional generation outside of the LA Basin, in this case 400 MW.

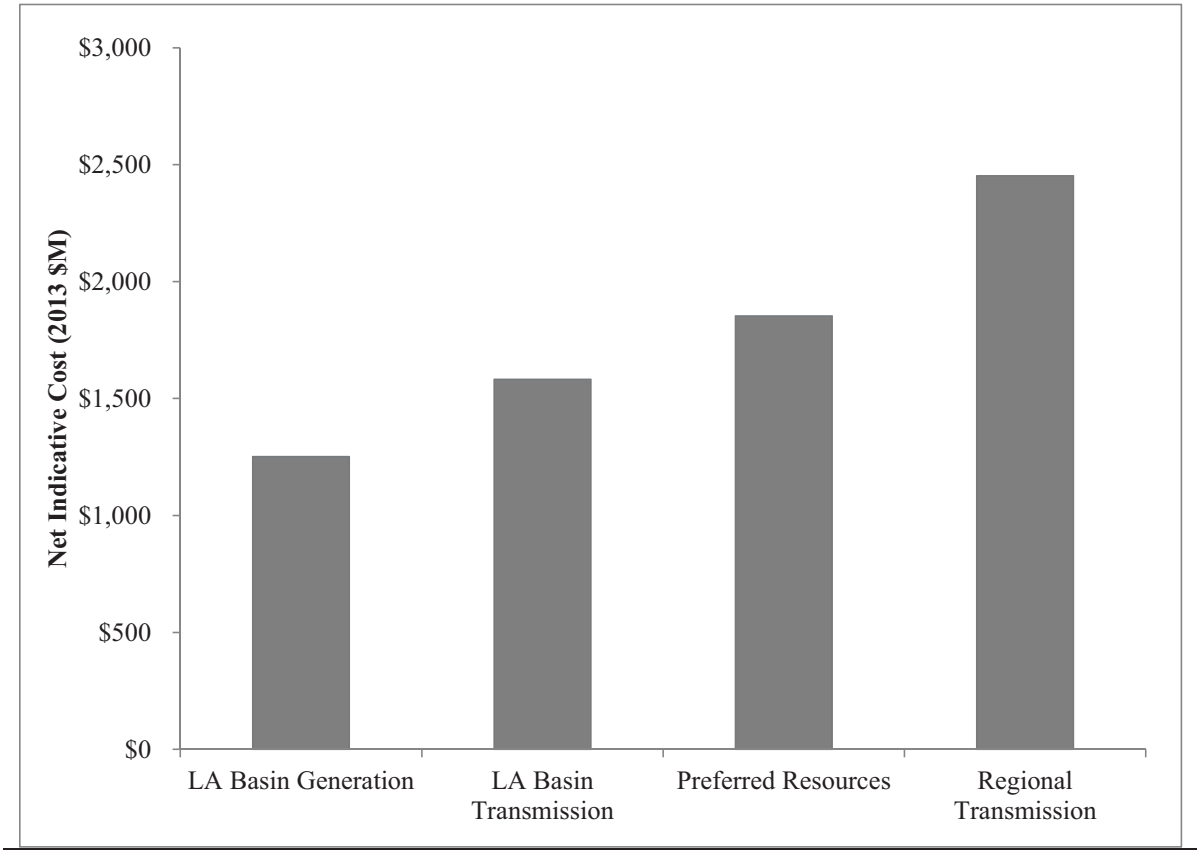
Figure IV-7 provides indicative costs of each scenario expressed as net present value over a 20-year period (2013-2032). The purpose of providing these costs is to give a broad cost ranking of the scenarios. None of the costs are based on site-specific cost information or a detailed costing of any new programs needed to support the scenario.

Since generation assets (both GFG and renewables) supply energy, capacity and ancillary service value, an assessment was done to quantify each of these value streams for the different scenarios, offsetting the associated capital costs. Production simulation modeling was used to estimate market energy prices and resulting net revenues for generation resources. Published values for resource adequacy and ancillary service revenue in California were used to estimate these value streams. The total costs and benefits from each scenario were then converted to a net present cost in 2013 at a 10 percent discount rate.

In general, the costs of GFG and Preferred Resources were estimated using publicly available sources. Where SCE anticipates significant cost reductions in the future, such as for Energy Storage, SCE used projected costs. In some instances, such as new EE programs, SCE used internal estimates of cost. For transmission assets, the Mesa Loop-In reflects a conceptual understanding of likely project elements, but is subject to considerable variability. SCE estimated the cost of the Regional Transmission Scenario using SCE's standard unit costs. SCE did not incorporate estimations for any preliminary evaluation of project scope or potential siting challenges.

The costs in Figure IV-7 are indicative, but subject to potentially wide variations. SCE will have a better understanding of potential generation costs once it receives bids in its Track 1 solicitation. SCE will develop improved transmission cost estimates for the Mesa Loop-In as it moves forward with regulatory approvals.

Figure IV-7
Relative Net Indicative Cost

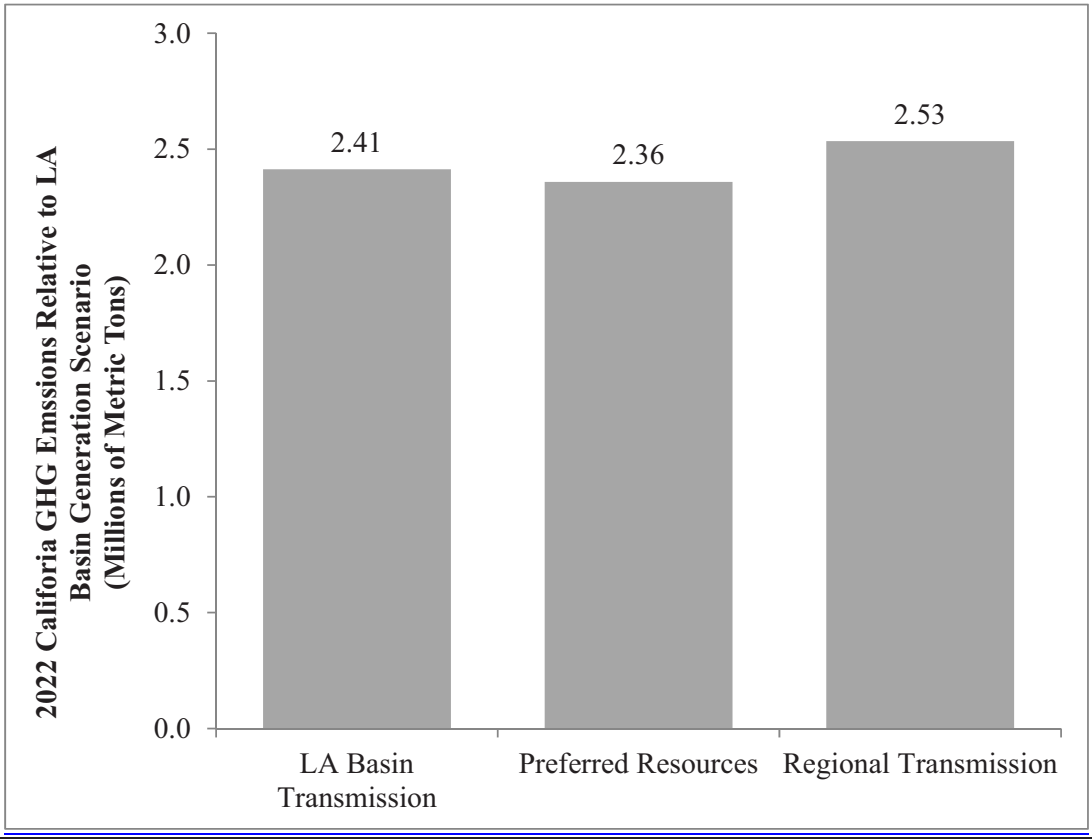


Finally, Figure IV-8 shows the GHG implications associated with each of the four scenarios. As a compliance entity under the California Air Resources Board GHG cap-and-trade program, SCE and its suppliers will procure compliance instruments to address the GHG emissions for each scenario. As such, the differences in emissions these scenarios do not affect California's GHG reduction targets established under AB 32 generally. The function of a cap-and-trade market is to achieve specified GHG emission levels without regard to the performance of specific generating units. However, the information shown in Figure IV-9 is indicative of how the different scenarios affect GHG compliance obligations.

The GHG impacts of the scenarios were developed using the same production simulation model used to develop market prices for the assessment of relative costs, considering only the GHG emissions created by generating resources within California for 2022. Relative to the

impact of retiring SONGS, which avoided approximately 10 million metric tons (MMT) each year, the impact of each scenario on electricity emissions in California is small. The difference between the greatest and least emitting scenarios is 2.53 MMT. However, it should be noted that the LA Basin Generation Scenario has the lowest emissions. This is because new generation is highly efficient, which reduces California's reliance on less efficient resources. The other three scenarios are virtually identical from a GHG emissions perspective, varying by 0.17 in MMT in 2022. Of the scenarios that significantly reduce the need for new LA Basin generation, the Preferred Resources scenario is the lowest emitting, reducing emissions by 170,000 metric tons in 2022 relative to the highest emitting scenario.

Figure IV-8
Change in California Greenhouse Gas Emissions



B. Discussion of Tradeoffs Among the Scenarios

This section of testimony offers the rationale for using the Preferred Resources Scenario as the basis for recommending specific strategies for maintaining local reliability after retirement of all OTC facilities, including SONGS. As discussed in Chapter II above, SCE recommends procurement of 500 MW of additional resources to meet the more stringent applicable CAISO Planning Criteria, pursuit of the Mesa Loop-In, and the Pilot backstopped with contingent development of potential generation sites.

1. LA Basin Generation Scenario

The LA Basin Generation Scenario uses new LA Basin GFG coming from a combination of existing repowered sites and/or new generation sites to meet the entire LCR need. This is the least expensive scenario of the four scenarios considered by SCE, with an indicative cost of approximately $1.25 billion over the analysis time horizon. Despite its lower cost, there are a number of reasons why SCE does not consider this scenario the recommended approach. This scenario has the highest level of LA Basin generation of the four scenarios considered by SCE. Adding new or repowered generation in the LA Basin is currently limited by the availability of PM-10 emission reduction credits (ERC), which are required by the federal and state Clean Air Act. ERCs are very difficult to obtain. Additionally, developing generation in the LA Basin has siting challenges. These issues increase the risk of unsuccessful development of new LA Basin generation resources.

The South Coast Air Quality Management District (SCAQMD) regulates the South Coast Air Basin (SCAB). The SCAB has been recently redesignated as "in attainment" for the federal PM-10 National Ambient Air Quality Standards (NAAQS). But, the SCAB is still in nonattainment for the state PM-10 standard and therefore ERCs are still required for new sources of PM-10 emissions in the SCAB. Access to ERCs is limited, and may make it difficult for some developers to participate in SCE's Track 1 procurement solicitation.

The SCAQMD has an internal bank of ERCs, with sufficient credits available to site new generation. However, access to SCAQMD's internal bank of ERCs for new generation is only possible if the provisions of District Rule 1304(a)(2) are satisfied, which can be onerous. But, under this rule, if a project proponent is shutting down an old steam utility boiler and replacing it with new, state of the art generation capacity, ERCs are provided from the SCAQMD's internal bank.

Recently, the SCAQMD proposed to add a fee requirement to the Rule 1304(a)(2) existing shutdown exemption. SCAQMD would use the fee to fund projects that would reduce

air pollution in the LA Basin. SCE and the CAISO filed comments with the SCAQMD suggesting the requirement for the shutdown of existing steam boilers should be eliminated. Instead, SCE and the CAISO recommended that access to the SCAQMD internal bank should be based solely on the fee requirement, which would increase competition for siting new generation. The SCAQMD has not yet resolved the issue. It continues to be a source of uncertainty.

If ERCs can be acquired by developers, site availability is the next obstacle to tackle. The two choices for siting generation are repowering existing sites or developing new greenfield sites. Using existing sites would allow continuing use of transmission infrastructure already in place. In addition, at existing sites, a significant number of environmental requirements have already been satisfied, thereby lowering project costs.

New greenfield sites are a challenge in the highly urbanized area of the LA Basin. There are limited vacant, electrically suitable locations that are of sufficient size, zoning, and meet the environmental requirements necessary to build a new GFG power plant. Once identified, the likelihood of public opposition to building the new GFG plant will be a significant factor in the timeline for completion or whether it is completed at all. For these reasons, SCE does not view pursuing this scenario as prudent.

2. LA Basin Transmission Scenario

The LA Basin Transmission Scenario is estimated to cost approximately $300 million more than the LA Basin Generation Scenario. This scenario includes the Mesa Loop-In, which is estimated to cost between $550 and $700 million (conceptual cost estimate, subject to revision), which adds to the overall cost. Transmission projects do not generally eliminate the need for generation but rather expand the locations where generation can be located to meet reliability needs. This scenario reduces generation needed in the LA Basin by approximately 1,200 MW; over the next decade, only a portion of that reduction is assumed to be replaced outside the LA Basin. This reduces the cost of this scenario. Typically transmission projects in the LA Basin area suffer from concerns similar to new generation siting (i.e., availability,

electrically suitability, and public opposition). However, SCE considers Mesa Loop-In to be feasible as most infrastructure changes take place within the boundaries of current substations.

Assuming minimal public opposition and aggressive scheduling of regulatory agency reviews, SCE may be able to accomplish siting, licensing, permitting, and construction by 2020, when the OTC generation is retired.

3. Preferred Resources Scenario

The net cost of the Preferred Resources scenario could be approximately 50 percent more than that of the LA Basin Generation Scenario, depending upon the future cost of Preferred Resources, and their effectiveness at meeting LCR needs. However, Preferred Resources are first in the state's Loading Order, and the Commission has indicated that SCE should procure resources consistent with the Preferred Loading Order.[26] SCE regards the Pilot, which is built around this scenario, as an important step towards effectuating the Loading Order, which justifies pursuing the Preferred Resources Scenario despite the higher overall cost. In addition, some Preferred Resources (i.e. EE, DR, and distributed generation) may be implemented without the lengthy permitting and construction time lines associated with GFG and transmission projects. Preferred Resources are counted as a system resource in the CPUC's Resource Adequacy proceedings, but have not been used when planning for resources to mitigate transmission contingencies. Whether they can respond where and when needed for as long as needed to resolve a transmission contingency is uncertain. SCE plans to use the Pilot to measure, document and improve the performance of Preferred Resources to enable their continued and increased use to meet LCR needs.

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[26] *See*, D.12-01-033, in the 2010 LTPP proceeding (R.10-05-006), p.20: "Accordingly, to clarify the Commission's position, we expressly endorse the general concept that the utility obligation to follow the loading order is ongoing. The loading order applies to all utility procurement, even if pre-set targets for certain preferred resources have been achieved. This is only a clarification of our existing policy, and does not modify any Commission decision relating to procurement of specific resources, such as energy efficiency or renewable generation."

4. Regional Transmission Scenario

The Regional Transmission Scenario is the most expensive of all the scenarios. It includes development of a major transmission line through south Orange County connecting SCE's transmission system with SDG&E's system, at a roughly estimated cost of approximately $1.5 billion (based on standard unit cost estimates). The indicative cost of the entire scenario is $2.5 billion. While the GFG required for this scenario is substantially lower than the LA Basin Generation Scenario, the incremental reduction beyond the LA Basin Transmission Scenario is only 408 MW. The amount of new right of way needed and the associated public opposition would make completion of this project by 2020 highly unlikely.

V.

PREFERRED RESOURCES "LIVING" PILOT PROGRAM

SCE proposes to undertake a Preferred Resources "Living" Pilot Program (Pilot) to procure and evaluate the ability of Preferred Resources to meet LCR needs. The Pilot will focus on Preferred Resources that are located in the southern portion of SCE's service area in Orange County; specifically the areas served by Johanna and Santiago substations. Over the last year, transmission upgrades and the addition of reactive elements (e.g., synchronous condensers and shunt capacitors) have mitigated some of the reliability concerns created by the unexpected outage at SONGS. SCE's studies show that reliability in this area can be managed without LCR generation above the amounts authorized in Track 1.[27] However, there is nevertheless concern based on recent experience that load growth could result in a reemergence of reliability concerns. Moreover, Preferred Resources in the vicinity of Johanna and Santiago substations are also effective in meeting these needs identified in Track 1 for replacement of OTC generation. All of this makes the southern Orange County area particularly appropriate for an aggressive, targeted initiative to rely on Preferred Resources.

To date, SCE has procured Preferred Resources to meet specific compliance targets (e.g. the 33% Renewables Portfolio Standard (RPS) target), but not to meet reliability needs. Procurement of Preferred Resources to meet reliability needs must take into consideration location, timing, and duration of energy savings or load reductions. Increasing the amounts of Preferred Resources, while ensuring grid stability and resiliency, will require numerous changes to how Preferred Resources are planned procured, operated, and monitored for performance. Effectuating these changes will be a key objective of the Pilot.

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[27] *See* Chapter III, Table III-5, showing that generation near Johanna and Santiago substations is only associated with a sensitivity case without the Mesa Loop-In and without implementation of a SDG&E load shedding scheme.

If the Track 1 Preferred Resources strategy is successful at developing resources at the most effective locations with the necessary delivery dates, SCE's Track 1 procurement will likely result in some amount of Preferred Resources being procured in the area targeted by the Pilot. While this procurement may offset a portion of the Preferred Resources need in the Pilot area, it will not obviate the importance of the Pilot. The Pilot differs from the Track 1 Preferred Resources procurement directed by D.13-02-015 in a number of fundamental respects. First, SCE proposes to define the necessary procurement amounts to manage the maximum peak loads at these substations over time. As a result, the Pilot does not have a specific MW target for Preferred Resources. SCE will base the amount of Preferred Resources to be developed for use in this area on what is needed to manage loads. The amount of Preferred Resources acquired may vary based on ex ante load growth trends, area economic development, and Preferred Resources effectiveness.

Second, SCE intends to use the Pilot to demonstrate the value that Preferred Resources can contribute to meeting LCR needs. This may require fundamentally different performance attributes than using Preferred Resources to meet system capacity requirements or to produce energy/reduce energy consumption.

Third, SCE proposes to backstop the Pilot with contingent development of sites for new GFG that would deliver to Johanna and/or Santiago substations through a separate application. This contingency plan will assure that reliability needs in the southern Orange County area are met, regardless of the success or failure of the Pilot, as discussed in Chapter VII, below.

The Pilot may also rely in part on existing DR programs. Currently, the CAISO does not dispatch DR to meet LCR needs. SCE anticipates that existing DR capacity may be useful to meet a portion of the Pilot's goals. SCE intends to measure the performance of this existing DR capacity in meeting LCR need as part of the Pilot. SCE recognizes, however, that such use to meet LCR need may restrict the ability of these programs to meet system capacity needs. To the extent additional DR procurement authority is needed, SCE will seek such authority.

While SCE is very interested in maintaining reliable service for its customers, the primary responsibility for reliability resides with the CAISO and the state energy agencies. For this reason, the details regarding the Pilot should be developed in an open, collaborative process involving SCE, the CAISO, the state energy agencies, and interested stakeholders. SCE presently plans to submit an application detailing a proposal for the Pilot to initiate this collaborative process and to seek any necessary funding to support the Pilot. SCE also plans to submit a separate application for the development of the contingent GFG sites. The development and administration of the Pilot will be focused on measuring, assessing, identifying, and implementing improvements in the program/system design associated with the very aggressive use of Preferred Resources (and Energy Storage). This will enable the use of these resources to contribute to a reliable and sustainable resource portfolio, which as a whole meets LCR need at competitive prices. At a broad level, SCE's plan for the Pilot consists of four primary elements, as described below.

A. Develop Actionable Goals Based On Managing Load Growth In The Affected Areas

Currently, load in the southern Orange County area most affected by SONGS retirement (in the vicinity of Johanna and Santiago substations) is around 1,200 MW during hot summer peak conditions (one-in-five peak loads). Load growth in this area is expected to be about 25 MW per year, or 250 MW over the next decade, which may degrade reliability over time. SCE anticipates adopting a Pilot goal for managing net load (peak load measured at the substation level, taking local generation into consideration) over the next decade to maintain acceptable reliability. Meeting this goal would avoid the need for building GFG plants in the area. SCE will work with the CAISO and other stakeholders to gain concurrence that the managed load goal is what is needed to maintain local reliability.

B. Develop An Understanding Of The Contribution That Preferred Resources Can Make To Meeting Local Reliability Needs

At present, whether Preferred Resources can contribute to supporting local reliability during major contingencies (such as the loss of major transmission lines) is unclear. Preferred Resources often are limited in terms of their available and length of operation. In general, Preferred Resources can support local reliability if they can produce sustained output (or sustained load reduction) for the entire period when a major contingency would otherwise result in violations of operating criteria. Typically, power flow studies investigate peak load conditions. They do not assess the entire range of hours when Preferred Resources might be called upon to meet reliability needs. This is why the potential contribution of Preferred Resources is not clearly understood. The Pilot will improve understanding of the value that Preferred Resources can contribute to supporting local reliability in "real world" situations with actual needs.

SCE anticipates working with the CAISO and other stakeholders to improve understanding of how Preferred Resources can be used for meeting local reliability needs. This analysis will identify the times during the year (seasons and hours within the day) that Preferred Resources would need to be available to reduce net loads or to provide energy and the necessary length of their operation to meet LCR needs. This work should identify overall portfolio attributes rather than requiring all Preferred Resources to have the same attributes. For example, it may be sufficient for some Preferred Resources to have two-hour availability (to cover the most extreme peak loads) if the remainder of the Preferred Resources have four-hour or greater availability.

The Pilot will require specific measurement protocols. Both net loads and the specific contribution of Preferred Resources must be measured at a detailed level (e.g., 10 minutes or hourly). These measurements will then be used to assess performance. Depending on the nature of the measurement protocols, SCE may need ratepayer funding to install and operate

measurement devices. It will be challenging to identify the stress periods (in addition to peak load conditions) when Preferred Resources can manage load. A complete understanding of LCR needs in operations requires a detailed understanding of historical performance compared to reliability requirements. SCE will collect historical substation/circuit data to identify times of reduced system margin. SCE hopes to work closely with the CAISO to fully understand LCR needs in operations.

C. Develop Staged Plans For Relying On Preferred Resources To Meet Reliability Needs

The Pilot will develop a plan to deploy Preferred Resources over time to meet the established goals. The Pilot will generally seek a "least cost, best fit" plan to produce greatest value for SCE's customers. Initially, efforts will focus on "repurposing" existing DR resources already in the local area that the CAISO can use to meet LCR needs. While these are existing resources, the CAISO may need to modify its tariff and/or operating procedures to use these resources to meet LCR need.

Next, for purposes of staging Preferred Resources procurement, SCE will seek to rely on LTPP Track 1 procurement process. SCE expects to review bids from the New LCR RFO to be conducted in late 2013 with the objective of targeting procurement into the Johanna-Santiago substation area. If this solicitation is not fully subscribed with cost competitive offers, SCE may conduct subsequent solicitations. Finally, SCE will consider other options for staged installation of Preferred Resources consisted with the goal of reducing or eliminating load growth.

SCE expects these Preferred Resources to include expanded EE programs, commercial rooftop solar, Energy Storage and expansion of demand DR programs in the local area. Combination technologies will also be used to leverage the synergies between technologies (i.e. DR enabled dimmable ballasts and high efficiency Heating Ventilation Air Conditioning (HVAC) would be automatically enrolled in the Summer Discount Program.) Given the location

of the Pilot in south Orange County, there may also be opportunities to use findings from SCE's Irvine Smart Grid Demonstration Project in the Pilot.

D. Develop Success Measures

SCE plans two key milestone dates. SCE will organize Pilot implementation around these dates. First, SCE will assess Pilot performance in the 2017 period.

Second, SCE will assess the performance of the Pilot around 2022. The objective of this assessment will be to transfer lessons learned into continuing operation. This is the reason for describing this effort as a "living" Pilot.

SCE plans to work with stakeholders groups throughout this process for consultation, input, advice, and recommendations and participation throughout the process. Stakeholders include state agencies, non-governmental groups, and local communities as appropriate.

VI.

SCE REQUESTS AUTHORIZATION TO PROCURE AN ADDITIONAL 500 MW OF RESOURCES CONSISTENT WITH THE PREFERRED LOADING ORDER

A. SCE Proposes To Combine Its Requested Track 4 Procurement Authorization With Its Current Track 1 Procurement Authorization

In this Track 4, SCE requests procurement authorization for up to 500 MW of new resources that can meet reliability requirements in the LA Basin for the benefit of all customers. SCE currently has Track 1 procurement authorization for 1,400 MW to 1,800 MW of new LCR resources pursuant to D.13-02-015.[28] SCE's current LCR procurement authorization requires SCE to procure a minimum of 150 MW of Preferred Resources,[29] 50 MW of Energy Storage, and 1,000 MW of GFG. An additional 200 MW can be sourced from any mix of technology, provided the procurement is consistent with the Preferred Loading Order. The balance of the 400 MW of LCR procurement authorization is limited to Preferred Resources and Energy Storage.[30] SCE proposes that its requested Track 4 new resource procurement authorization of 500 MW be combined with SCE's current Track 1 authorization Specifically, SCE proposes that the 500 MW Track 4 request be combined with the 200 MW of Track 1 LCR resources that can be sourced from any technology, provided the procurement is demonstrated to be consistent with the Preferred Loading Order. Table VI-6 shows the impact of SCE's request to increase its current LCR procurement authorization by 500 MW.

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[28] SCE's D.13-02-015 LCR procurement authorization allows SCE to utilize the Cost Allocation Mechanism (CAM) to recover net costs from all benefiting customers. *See* Ordering Paragraph No. 15.

[29] Preferred Resources do not include Combined Heat & Power (CHP) resources for LCR procurement purposes. *See* D.13-02-015, Footnote 211, page 82.

[30] D.13-02-015, Ordering Paragraph No. 1.

Table VI-6
Impact of SCE's Track 4 Request on Total Tracks 1 and 4 Authorization

Resource Type	Track 1 LCR Resources (D.13-02-015)	Track 4 Authorization	Total Authorization
Preferred Resources (min)	150 MW	N/A	150 MW
Energy Storage (min)	50 MW	N/A	50 MW
Gas-Fired Generation (min)	1000 MW	N/A	1000 MW
All Technologies (min)	200 MW	500 MW	700 MW
Additional Preferred Resources and Energy Storage	400 MW	N/A	400 MW
Total	1400 MW to 1800 MW	500 MW	1900 MW to 2300 MW

Utilizing SCE's existing Track 1 LCR procurement process to fulfill the requested 500 MW of Track 4 new LA Basin reliability resources is an efficient and cost-effective approach. Conducting solicitations for new resources is a time intensive effort that requires a substantial commitment of utility and bidder resources. Additionally, requiring SCE to conduct a separate procurement process for its requested Track 4 procurement authorization will easily add one year or more to the procurement effort, introducing unnecessary reliability risk for customers given the closure of SONGS. SCE's Track 4 request for 500 MW of new reliability-based resource procurement authorization is a modest quantity relative to SCE's previous reliability-based new resource procurement, and does not warrant a separate procurement effort.

The CAISO may request a delay in the Track 4 proceeding to allow it to provide additional analysis in early 2014. SCE is supportive of the Commission considering CAISO's additional analysis and related procurement recommendations, but recommends that the Commission do so in a separate phase of Track 4 (Residual Phase). The Commission should authorize SCE to proceed with combining its requested 500 MW of Track 4 procurement authorization with its existing Track 1 LCR procurement effort in recognition that the SONGS

closure requires immediate action.[31] Any Track 4 Residual Phase procurement authorization that the Commission provides can be met in conjunction with any Track 2 procurement authorization that the Commission provides for SCE. In this manner, SCE can immediately proceed with its requested 500 MW of Track 4 procurement in a combined effort with SCE's existing Track 1 procurement process, and target submission of its procurement application(s) to the Commission in the third quarter of 2014. SCE's subsequent Track 2 procurement effort combined with any Track 4 Residual Phase procurement authorization can commence at the end of 2014 with a planned submission of procurement application(s) to the Commission no later than early 2016.

SCE has not identified a specific resource technology need at this time for its requested 500 MW of new resource procurement authorization in Track 4. As a result, the procurement should be based on market responses and opportunities, instead of predetermining the technology mix. Additionally, combining SCE's requested 500 MW of new resource Track 4 procurement authorization with SCE's current 200 MW of "all source" Track 1 procurement authorization may yield economies of scale for SCE's planned procurement. The combined 700 MW of proposed "all source" procurement authorization will allow SCE to consider expanded resource portfolio outcomes consistent with the Preferred Loading Order, which should result in a lower cost outcome for customers.[32]

To the extent that SCE's Track 1 LCR procurement solicitation fails to meet the combined current Track 1 procurement authorization of 200 MW and requested Track 4 new resource procurement authorization of 500 MW for "all source" projects, SCE's July 15, 2013 LCR Procurement Plan specifies that SCE may conduct subsequent solicitations, seek to modify existing utility programs for Preferred Resources, and/or pursue bilateral negotiations to

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[31] SCE and the Commission will be able to account for the CAISO's updated Track 4 analysis at the time that SCE is completing its LCR procurement solicitation activities in second quarter 2014. If the CAISO's updated analysis demonstrates that some or all of the 500 MW of Track 4 procurement authorization SCE has requested is unnecessary, the Commission can withhold its approval of a portion of SCE's LCR contracts.

[32] Basic portfolio theory suggests that more options exist to meet a combined 700 MW authorization compared to two separately procured portfolios of 200 MW followed by a 500 MW portfolio.

complete the procurement of necessary new resources.[33] SCE proposes that if subsequent procurement activity is required after the completion of the initial Track 1 "all source" solicitation, the 500 MW of reliability-based new resource procurement authorization it is requesting in Track 4 continue to be considered with SCE's Track 1 LCR procurement.

To summarize, SCE proposes that the LCR procurement authorization it was provided in D.13-02-015, including Energy Division approval of SCE's LCR procurement plan, be combined and fully extended to include SCE's Track 4 request of 500 MW of procurement authorization for reliability-based resources in the LA Basin. Any CAISO proposal to delay consideration of Track 4 procurement authority to allow CAISO to complete updated analysis can be bifurcated into a subsequent Track 4 Residual Phase as explained above.

B. SCE Plans To Pursue Contracts For Contingent Gas-Fired Generation Resources

SCE plans to pursue securing contingent contracts for GFG resources to meet the needs discussed in Chapter VII, below. The contingent contracts will allow SCE to more quickly develop any GFG that may be required to enhance grid reliability in the event that a need arises. A need may arise to exercise the option contract(s) for a variety of reasons, including: (1) failure to successfully develop GFG procured in SCE's Track 1 LCR procurement process; (2) inability to develop sufficient Preferred Resources to meet SCE's Track 1 LCR procurement authorization; (3) planned local area grid enhancements are not completed; and (4) planning assumptions on the availability and effectiveness of resources do not materialize.

Because it can take seven years to develop new GFG resources, securing a contingent contract to develop new generation will reduce the lead-time needed to make a decision on the need to pursue new GFG resources. The contingent contracts will require the seller to perform the necessary pre-development work to site, permit, and construct a specified GFG resource,

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[33] Track 1 Procurement Plan Of Southern California Edison Company Submitted To Energy Division Pursuant To D.13-02-015, pages 4-5.

which should reduce the development and procurement timeline by two years.[34] SCE would structure the contingent contract in the form of a buyer's right to terminate the contract subject to a termination payment (i.e., an "option" to terminate). SCE would only proceed with completing commercial operation of the contingent contract for GFG if a demonstrated need existed, and after receiving Commission approval to do so.

Due to the unique nature of a contingent contract for GFG,[35] SCE plans to bilaterally negotiate its proposed contingent GFG contracts. SCE will consider proposals received for GFG projects in its Track 1 LCR procurement solicitation, as well as proposals received through its separate bilateral negotiations pursuant to the AB 1576 "cost of service" contracting authority the Commission provided in D.13-02-015,[36] as a basis for negotiating any contingent GFG contracts. SCE will submit any proposed contingent GFG contracts to the Commission for approval, along with the projected expense of terminating the contingent contract(s) at various stages of development if it is determined that they are not necessary.

C. SCE's Track 4 Procurement Should Be Eligible For Cost Allocation Mechanism Treatment

SCE's request for Track 4 procurement authorization for 500 MW of new resources and potential contingent GFG contracts is premised on SCE receiving Cost Allocation Mechanism (CAM) treatment. These procurements will be performed to maintain system reliability, and are therefore eligible for CAM. The Commission has already litigated this issue in Track 1, and

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[34] SCE could elect to proceed with a contingent GFG contract in 2016 to achieve an on-line date for a new gas-fired generation resource by 2021. The need to continue with or terminate such a contingent GFG contract will be better understood after assessing the effectiveness of SCE's Track 1 LCR procurement authorization and requested Track 4 procurement authorization of 500 MW.

[35] A contingent contract to develop a gas-fired generation resource will entail numerous issues surrounding siting, timing, funding, feasibility, technology, and terms that will be unique for each option considered. Because these will be non-standard products, a competitive solicitation will not be conducive for selecting and contracting for such a commercial arrangement.

[36] D.13-02-015, Ordering Paragraph No. 9.

found that these kinds of procurement are eligible for CAM.[37] Any procurement as a result of a Track 4 decision will be performed to maintain local area reliability. As PU Code Section 365.1(c)(2)(B) provides:

> If the commission authorizes or orders an electrical corporation to obtain generation resources pursuant to subparagraph (A), the commission shall ensure that those resources meet a system or local reliability need in a manner that benefits all customers of the electrical corporation. The commission shall allocate the costs of those generation resources to ratepayers in a manner that is fair and equitable to all customers, whether they receive electric service from the electrical corporation, a community choice aggregator, or an electric service provider.

Therefore, any Track 4 procurement is eligible for CAM. The Commission fully considered this issue and resolved it in Ordering Paragraph No. 21 of D.13-02-015 which states:

> The cost allocation mechanism established in D.06-07-029 and refined in D.07-09-044, D.08-09-012 and D.11-05-005 remains reasonable for application in this proceeding without modification, and is fair and equitable as required by Section 365.1(c)(2)(A)-(B).[38]

Nothing has changed since the Commission issued D.13-02-015 to change this finding. As a result, any Track 4 procurement authorized by the Commission should be eligible for CAM consistent with the Commission's findings in Track 1.

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[37] D.13-02-015, Ordering Paragraph No. 15 and pages 98-114.
[38] D.13-02-015, Ordering Paragraph No. 21.

VII.

CONTINGENT RESOURCES STRATEGY

SCE plans to pursue two forms of contingent generation development to "backstop" the Transmission and Preferred Resources strategies previously addressed in this testimony. SCE will seek option contracts with third party developers to allow GFG to be developed quickly, if needed, as described in Chapter VI. In addition, as noted in Chapter V, SCE plans to develop generation sites in the vicinity of Johanna and Santiago substations that can be used by third-party developers, if needed. The Mesa Loop-In and Preferred Resources will substantially reduce the need for conventional generation in the LA Basin. Consequently, both the Preferred Resources and the Mesa Loop-In need to be timely and successfully implemented in order to both maintain reliability in the LA Basin and ensure preservation of the OTC regulatory compliance dates. To ensure reliability is maintained given the tight timeline and other uncertainties, the Preferred Resources and the Mesa Loop-In should be backstopped with a contingent resource strategy.

A. Contingent Site Development Plans

The Pilot targets an aggressive amount of Preferred Resources development in a compact geographic area. While this focused effort has value, it also creates reliability risks if the Pilot does not achieve its objectives. For this reason, SCE will propose developing a contingency plan primarily to support implementation of the Pilot. Per this plan, SCE will prepare GFG sites near its Johanna and Santiago substations as a backstop" to preserve local reliability should the Pilot not achieve its goals. This effort will develop "construction ready" sites to reduce the lead times needed to construct GFG in the LA Basin. This will provide more time for the Pilot to operate before a decision needs to be made on whether to pursue GFG. SCE will request cost recovery assurance for funding of development of these sites.

SCE will work to obtain necessary sites and associated permits for selected sites, but will not seek to have new generation built on the sites without Commission approval. The objective is not to utilize these sites if the Pilot is successful. If SCE believes the additional resources are needed, SCE will bring an application to the Commission explaining the circumstances that have lead SCE to need to put these GFG generation sites out to bid in order to complete construction on a schedule that would support the OTC compliance dates.

SCE has not yet conducted its New LCR RFO. Thus, SCE does not know whether developers will submit projects in the vicinity of Johanna and Santiago substations. However, should SCE accept third-party bids or option contracts located in this area, there would be a reduced need for contingent site development to backstop the Pilot.

B. Contingency Plans are Necessary to Mitigate the Risk That Preferred Resources used in the Pilot program and the Mesa Loop-In Are Not Successfully Developed

The LCR need created by the simultaneous retirement of SONGS and the OTC plants is unprecedented. The Mesa Loop-In and the Pilot each face substantial and unique challenges. However, it may be some time before the success of each is established and assumed available to meet the LCR need.

1. Mesa Loop-In Uncertainties

SCE plans to submit the Mesa Loop-In into the CAISO 2013-2014 TPP for evaluation and approval. Before projects can be developed, the CAISO Board must adopt projects as part of its annual TPP process. It is uncertain whether the CAISO will adopt the Mesa Loop-In. Even after approval from the CAISO, risks remain for transmission projects.

It will take several years to complete the permitting of the Mesa Loop-In, including environmental review. Even if the CAISO approves the Mesa Loop-In in 2014, and SCE moves quickly to seek Commission approvals, permitting may be protracted,

and SCE may not ultimately receive the requested approvals in a timely manner for unforeseen reasons.

2. Preferred Resources Uncertainties

A significant amount of uncertainty exists around key elements of the implementation of SCE's Preferred Resources strategy.

a) The Preferred Resources Need To Be Available

The availability of Preferred Resources is unsure for two reasons. First, a significant amount of the additional Preferred Resources may be located at sites where customers are not willing to participate in additional Preferred Resources offerings. Many Preferred Resources that SCE can target require the consent of the implementing customer before they can be deployed. As SCE deploys more of these resources, fewer remaining customers may be willing or likely to participate.

Second, the availability of Preferred Resources typically cannot be assured until much closer to the time of resource need. There is no assurance that these Preferred Resources will ultimately be available to meet needs related to OTC closures because it is unlikely that customers will commit in 2014 that they will implement EE or DR in 2021. The Pilot is designed to provide a better understanding of these uncertainties.

b) The CAISO May Not Accept Some Preferred Resources As Valid LCR Resources

California has not used Preferred Resources to meet LCR need in the past. The effectiveness of Preferred Resources in meeting this type of need has not yet been determined, and may take some time to resolve. For some time, SCE and

the CAISO have been negotiating the appropriate attributes of Preferred Resources to meet LCR need. SCE anticipates that these issues will not be fully resolved until the CAISO completes its recently initiated DR stakeholder process. Until that time, the effectiveness of preferred resources is uncertain.

Attachment A

Table 1 from NERC Reliability Standard TPL-001-3

Table I. Transmission System Standards – Normal and Emergency Conditions

Category	Contingencies	System Limits or Impacts		
	Initiating Event(s) and Contingency Element(s)	System Stable and both Thermal and Voltage Limits within Applicable Rating [a]	Loss of Demand or Curtailed Firm Transfers	Cascading Outages
A No Contingencies	All Facilities in Service	Yes	No	No
B Event resulting in the loss of a single element.	Single Line Ground (SLG) or 3-Phase (3Ø) Fault, with Normal Clearing: 1. Generator 2. Transmission Circuit 3. Transformer Loss of an Element without a Fault	Yes Yes Yes Yes	No [b] No [b] No [b] No [b]	No No No No
	Single Pole Block, Normal Clearing[e]: 4. Single Pole (dc) Line	Yes	No[b]	No
C Event(s) resulting in the loss of two or more (multiple) elements.	SLG Fault, with Normal Clearing[e]: 1. Bus Section 2. Breaker (failure or internal Fault)	Yes Yes	Planned/ Controlled[c] Planned/ Controlled[c]	No No
	SLG or 3Ø Fault, with Normal Clearing[e], Manual System Adjustments, followed by another SLG or 3Ø Fault, with Normal Clearing[e]: 3. Category B (B1, B2, B3, or B4) contingency, manual system adjustments, followed by another Category B (B1, B2, B3, or B4) contingency	Yes	Planned/ Controlled[c]	No
	Bipolar Block, with Normal Clearing[e]: 4. Bipolar (dc) Line Fault (non 3Ø), with Normal Clearing[e]: 5. Any two circuits of a multiple circuit towerline[f]	Yes Yes	Planned/ Controlled[c] Planned/ Controlled[c]	No No
	SLG Fault, with Delayed Clearing[e] (stuck breaker or protection system failure): 6. Generator 7. Transformer 8. Transmission Circuit 9. Bus Section	Yes Yes Yes Yes	Planned/ Controlled[c] Planned/ Controlled[c] Planned/ Controlled[c] Planned/ Controlled[c]	No No No No

D [d] Extreme event resulting in two or more (multiple) elements removed or Cascading out of service.	3Ø Fault, with Delayed Clearing [e] (stuck breaker or protection system failure): 1. Generator 2. Transmission Circuit 3. Transformer 4. Bus Section 3Ø Fault, with Normal Clearing [e]: 5. Breaker (failure or internal Fault) 6. Loss of towerline with three or more circuits 7. All transmission lines on a common right-of way 8. Loss of a substation (one voltage level plus transformers) 9. Loss of a switching station (one voltage level plus transformers) 10. Loss of all generating units at a station 11. Loss of a large Load or major Load center 12. Failure of a fully redundant Special Protection System (or remedial action scheme) to operate when required 13. Operation, partial operation, or misoperation of a fully redundant Special Protection System (or Remedial Action Scheme) in response to an event or abnormal system condition for which it was not intended to operate 14. Impact of severe power swings or oscillations from Disturbances in another Regional Reliability Organization.	Evaluate for risks and consequences. ▪ May involve substantial loss of customer Demand and generation in a widespread area or areas. ▪ Portions or all of the interconnected systems may or may not achieve a new, stable operating point. ▪ Evaluation of these events may require joint studies with neighboring systems.

a) Applicable rating refers to the applicable Normal and Emergency facility thermal Rating or system voltage limit as determined and consistently applied by the system or facility owner. Applicable Ratings may include Emergency Ratings applicable for short durations as required to permit operating steps necessary to maintain system control. All Ratings must be established consistent with applicable NERC Reliability Standards addressing Facility Ratings.

b) An objective of the planning process is to minimize the likelihood and magnitude of interruption of firm transfers or Firm Demand following Contingency events. Curtailment of firm transfers is allowed when achieved through the appropriate re-dispatch of resources obligated to re-dispatch, where it can be demonstrated that Facilities, internal and external to the Transmission Planner's planning region, remain within applicable Facility Ratings and the re-dispatch does not result in the shedding of any Firm Demand. For purposes of this footnote, the following are not counted as Firm Demand: (1) Demand directly served by the Elements removed from service as a result of the Contingency, and (2) Interruptible Demand or Demand-Side Management Load. In limited circumstances, Firm Demand may be interrupted throughout the planning horizon to ensure that BES performance requirements are met. However, when interruption of Firm Demand is utilized within the Near-Term Transmission Planning Horizon to address BES performance requirements, such interruption is limited to circumstances where the use of Firm Demand interruption meets the conditions shown in Attachment 1. In no case can the planned Firm Demand interruption under footnote 'b' exceed 75 MW for US registered entities. The amount of planned Non-Consequential Load Loss for a non-US Registered Entity should be implemented in a manner that is consistent with, or under the direction of, the applicable governmental authority or its agency in the non-US jurisdiction.

c) Depending on system design and expected system impacts, the controlled interruption of electric supply to customers (load shedding), the planned removal from service of certain generators, and/or the curtailment of contracted Firm (non-recallable reserved) electric power Transfers may be necessary to maintain the overall reliability of the interconnected transmission systems.

d) A number of extreme contingencies that are listed under Category D and judged to be critical by the transmission planning entity(ies) will be selected for evaluation. It is not expected that all possible facility outages under each listed contingency of Category D will be evaluated.

Appendix B

Witness Qualifications

SOUTHERN CALIFORNIA EDISON COMPANY

QUALIFICATIONS AND PREPARED TESTIMONY

OF GARRY L. CHINN

Q. Please state your name and business address for the record.

A. My name is Garry L. Chinn, and my business address is 3 Innovation Way, Pomona, California 91768.

Q. Briefly describe your present responsibilities at the Southern California Edison Company.

A. I am a Project Manager of the Transmission & Interconnection Planning Group within Transmission and Distribution (T&D). In this position, I am responsible for leading a group of power system engineers in assessing the electric system and developing transmission facilities to ensure the performance of SCE's bulk power system is in compliance with NERC Reliability Standards.

Q. Briefly describe your educational and professional background.

A. In 1991, I received a Bachelor of Science degree in electrical & electronic engineering from California State University, Sacramento. I also earned a Master of Science degree in electrical engineering from the University of Southern California in 1994. I became a registered professional electrical engineer with the State of California in 1995. Since 1991, I have held positions related to the planning of the transmission system with the Los Angeles Department of Water & Power, Metropolitan Water District of Southern California and SCE. I have over ten years of service with SCE, all with the Transmission & Interconnection Planning Group.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony in this proceeding is to sponsor portions of Exhibit SCE-1, entitled *Track 4 Testimony Of Southern California Edison Company*, as identified in the Table of Contents thereto.

Q. Was this material prepared by you or under your supervision?

A. Yes, it was.

1 Q. Insofar as this material is factual in nature, do you believe it to be correct?

2 A. Yes, I do.

3 Q. Insofar as this material is in the nature of opinion or judgment, does it represent your best

4 judgment?

5 A. Yes, it does.

6 Q. Does this conclude your qualifications and prepared testimony?

7 A. Yes, it does.

SOUTHERN CALIFORNIA EDISON COMPANY

QUALIFICATIONS AND PREPARED TESTIMONY

OF COLIN E. CUSHNIE

Q. Please state your name and business address for the record.

A. My name is Colin E. Cushnie, and my business address is 2244 Walnut Grove Avenue, Rosemead, California 91770.

Q. Briefly describe your present responsibilities at the Southern California Edison Company.

A. I am the Director of the Portfolio Planning & Analysis Department in SCE's Power Supply Organizational Unit. My department's responsibilities include demand and price forecasting, contract and solicitation analysis and valuation, portfolio analysis and risk management, portfolio reporting, CRR portfolio management, and fundamental model analysis.

Q. Briefly describe your educational and professional background.

A. I earned a Bachelor of Arts Degree in both Economics and Business Administration from Whittier College in 1986. I was hired by SCE in January 1987 and held various positions related to the procurement of material, equipment, and services until October 1993. Since October 1993, I have held positions of increased responsibility related to SCE's natural gas and electrical energy planning, procurement, and regulatory advocacy and support. In my current position, I manage a staff of approximately 45 energy professionals. I have previously testified before the California Public Utilities Commission.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony in this proceeding is to sponsor the portions of Exhibit SCE-1, entitled *Track 4 Testimony Of Southern California Edison Company*, as identified in the Table of Contents thereto.

Q. Was this material prepared by you or under your supervision?

A. Yes, it was.

Q. Insofar as this material is factual in nature, do you believe it to be correct?

A. Yes, I do.

1 Q. Insofar as this material is in the nature of opinion or judgment, does it represent your best
2 judgment?
3 A. Yes, it does.
4 Q. Does this conclude your qualifications and prepared testimony?
5 A. Yes, it does.

SOUTHERN CALIFORNIA EDISON COMPANY

QUALIFICATIONS AND PREPARED TESTIMONY

OF MARK E. NELSON

Q. Please state your name and business address for the record.

A. My name is Mark E. Nelson, and my business address is 8631 Rush Street, Rosemead, California 91770.

Q. Briefly describe your present responsibilities at the Southern California Edison Company.

A. I am the Director of Integrated Planning in the Integrated Planning and Environmental Affairs department. My present responsibilities as the Director of Integrated Planning include the development of long-term resource plans for SCE, monitoring the electricity markets to help assure their efficient operations, supporting generation initiatives and regulatory efforts at SCE, and management of the Project Development Division.

Q. Briefly describe your educational and professional background.

A. I earned a Bachelor of Science degree in Economics from Iowa State University with emphasis work in Chemical Engineering and Systems. I earned a Master of Science degree in Econometrics from Iowa State University with thesis work in electricity demand analysis. I first joined the Southern California Edison Company as a Planning Engineer in 1991 and held various management positions through 1996, including Manager of Real Time Pricing and Customer Software Systems. In 1996 I joined Edison Source and held a number of management positions including Director of Retail Energy Operations until my departure in 1999 following the cessation of energy marketing activities. From 1999-2003, I served as Managing Consultant of Commerce Venture Group LLC, with primary responsibility for energy sector consulting and analysis. I rejoined Southern California Edison in 2003 as Integrated Planning Manager and was subsequently promoted to Director of Generation Planning & Strategy prior to promotion to my current position.

Prior to joining Southern California Edison, I served as a Consultant for Midwest Solar, Inc., a leading national supplier of large scale solar thermal systems, with responsibility for economic

and engineering analysis from 1980-83. From 1983-88, I held management and analysis positions with subsidiaries of MidAmerican Energy, with responsibility for generation and transmission projects, economic analysis, regulatory affairs and customer services. From 1988-91, I served as Vice President of Analysis for DATASSIST, where I was responsible for economic and statistical analysis of electric and gas utility projects. I am the author of a number of energy and business books and articles, including: An Econometric Study of Residential Electricity Demand (ISBN 1-56471-005-X), Fundamentals of Business Process Analysis (1-56471-009-2), and "Understanding Natural Gas Demand for Electric Utilities."

I have served as an adjunct professor or instructor at several universities, teaching economics and business courses.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony in this proceeding is to sponsor portions of Exhibit SCE-1, entitled *Track 4 Testimony Of Southern California Edison Company*, as identified in the Table of Contents thereto.

Q. Was this material prepared by you or under your supervision?

A. Yes, it was.

Q. Insofar as this material is factual in nature, do you believe it to be correct?

A. Yes, I do.

Q. Insofar as this material is in the nature of opinion or judgment, does it represent your best judgment?

A. Yes, it does.

Q. Does this conclude your qualifications and prepared testimony?

A. Yes, it does.

SOUTHERN CALIFORNIA EDISON COMPANY

QUALIFICATIONS AND PREPARED TESTIMONY

OF JONATHAN RUMBLE

Q. Please state your name and business address for the record.

A. My name is Jonathan Rumble, and my business address is 8631 Rush Street, Rosemead, California 91770.

Q. Briefly describe your present responsibilities at the Southern California Edison Company.

A. I am the current Manager for Generation Planning (previously known as the Project Development Division or PDD) within Integrated Planning & Strategy at Southern California Edison.

Q. Briefly describe your educational and professional background.

A. I hold a bachelor degree in economics and government from Skidmore College (New York) as well as a Masters in Business Administration from University of California - Los Angeles. I have been an employee of Southern California Edison and its parent Edison International for over eight years as senior manager, project manager, and senior financial analyst within the Generation and Corporate Finance Organizations. Previously, I was a senior consultant for Navigant Consulting (New York) serving as a project manager for engagements in the insurance and financial industries.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony in this proceeding is to sponsor the portions of Exhibit SCE-1, entitled *Track 4 Testimony Of Southern California Edison Company*, as identified in the Table of Contents thereto.

Q. Was this material prepared by you or under your supervision?

A. Yes, it was.

Q. Insofar as this material is factual in nature, do you believe it to be correct?

A. Yes, I do.

1 Q. Insofar as this material is in the nature of opinion or judgment, does it represent your best
2 judgment?
3 A. Yes, it does.
4 Q. Does this conclude your qualifications and prepared testimony?
5 A. Yes, it does.

SOUTHERN CALIFORNIA EDISON COMPANY

QUALIFICATIONS AND PREPARED TESTIMONY

OF CARL H. SILSBEE

Q. Please state your name and business address for the record.

A. My name is Carl H. Silsbee, and my business address is 2244 Walnut Grove Avenue, Rosemead, California 91770.

Q. Briefly describe your present responsibilities at Southern California Edison Company.

A. I am Manager of Resource Economics and Compliance in the Integrated Planning and Strategy Department. In this position, I am responsible for CPUC's Long Term Procurement Plan and the CEC's Integrated Energy Policy Report managing resource planning related studies, including those involving reserve margin standards and resource capacity value and a variety of special projects. I have held this position since April 2013.

Q. Briefly describe your prior responsibilities at Southern California Edison Company.

A. Prior to my present position, I held various positions in the Regulatory Policy and Affairs Department (and its predecessor organization) between 1981 and 2007. In these positions I was responsibility for coordinating and preparing operating and maintenance expense forecasts for CPUC general rate cases, preparing revenue requirement analyses in support of Certificate of Public Convenience and Necessity (CPCN) applications, supporting wholesale rate case applications before the Federal Energy Regulatory Commission, developing avoided cost prices and pricing policies for qualifying facilities, and incentive ratemaking. I became Manager of Resource Policy and Economics in the Market Strategy and Resource Planning Department in 2007, and was responsible for a variety of technical studies and for case management activities involving the CPUC's Long Term Procurement Plan and the CEC's Integrated Energy Policy Report proceedings. I have previously testified before this Commission.

Q. Briefly describe your educational and professional background.

A. I received a Bachelor's degree in Engineering from Harvey Mudd College in 1974 and a Master's degree in Engineering-Economic Systems from Stanford University in 1975.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony in this proceeding is to sponsor portions of Exhibit SCE-1, entitled *Track 4 Testimony Of Southern California Edison Company*, as identified in the Table of Contents thereto.

Q. Was this material prepared by you or under your supervision?

A. Yes.

Q. Insofar as this material is factual in nature, do you believe it to be correct?

A. Yes, I do.

Q. Insofar as this material is in the nature of opinion or judgment, does it represent your best judgment?

A. Yes, it does.

Q. Does this conclude your qualifications and prepared testimony?

A. Yes, it does.