Clarification to the ISO Board-Approved 2013-2014 Transmission Plan:

Locational Effectiveness Factor Calculations in the San Diego Area

California ISO
Shaping a Renewed Future

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Background

The ISO is providing in this document additional information about locational effectiveness factors within the San Diego area, to assist the resource procurement process of San Diego Gas & Electric Company currently underway. This information is being provided to assist SDG&E with the direction received from the CPUC in D.13-02-015 to take into account the locational effectiveness of resources as determined by the ISO.

This information builds upon the analysis contained in the ISO's 2013-2014 Transmission Plan as well as the "Clarification to the ISO Board-Approved 2013-2014 Transmission Plan: Locational Effectiveness Factor Calculations in the LA Basin Area" that was posted on the ISO website. This information provides further details regarding locational effectiveness factors within the sub-areas in San Diego.

The information provided in the 2013-2014 Transmission Plan was developed without taking into account further resource procurement in the San Diego area or the final recommended transmission reinforcements ultimately approved by the ISO Board of Governors on March 20, 2014. The information in the Transmission Plan was developed as an initial step in assessing independently the effectiveness of various solutions and developing a comprehensive plan, at a time when the final results of the CPUC's Track 4 process were also not known. The overall plan (including assumptions about Track 4 results for San Diego) that was developed was then tested for overall effectiveness in meeting local area needs and assessing potential residual shortfalls.

This analysis now layers analysis of locational effectiveness upon Track 4 results for San Diego and the LA Basin, as well as the approved transmission solutions in the 2013-2014 Transmission Plan.

Considerable uncertainty remains as to the exact nature and location of Track 4 procurement and the interaction between the approved transmission reinforcements. The ISO has therefore performed this additional analysis of effectiveness factors under a much broader range of sensitivities than was included in the 2013-2014 Transmission Plan. This additional analysis focuses on the range of generation effectiveness factors assuming different levels of transmission reinforcement, with and without the Imperial Valley Flow Controller approved in the 2013-2014 Transmission Plan, and also modeling improvements to the coordination between existing automated voltage control mechanisms (energizing shunt capacitor banks). The study

results for determining the locational effectiveness factors for three sub-areas within San Diego are based on the decisions regarding resources authorized the by CPUC for Tracks 1 and 4 for San Diego.

Table 1 – Generation Locational Effectiveness Factors for the San Diego Sub-Areas

		Scenario A	**Scenario B**
San Diego Sub-areas	North & Northwest	100%	100%
	South & Southwest	100%	91.7%
	Eastern*	100%	100%

Notes:

*Locational effectiveness factor (LEF) for Eastern sub-area is reported based on its performance in helping to mitigate identified post-transient instability concerns. This is also based on the premise that its delivery issues (i.e., overloading concerns on the Sycamore-Penasquitos 230kV line) are resolved in the generation interconnection process with further transmission upgrades.

- North and Northwest San Diego sub-area includes the area having major bulk 230kV substations and sub-transmission substations (138kV and lower transmission voltage) south of the SCE-SDG&E border, north of Penasquitos and Mission 230kV Substations and north of Sycamore Canyon 230kV Substation. Due to numerous subtransmission substations located in this sub-area, only major 230kV substations are listed here: Talega, San Onofre, San Luis Rey, Encina, Escondido and Palomar Energy.

- South and Southwest San Diego sub-area includes the area having major bulk 230kV substations and sub-transmission substations starting from Penasquitos to its southern area, south of Sycamore Canyon Substation, south of San Luis 230kV Substation, Miguel 230kV and its northern area. Due to numerous subtransmission substations located in this sub-area, only major 230kV substations are listed here: Penasquitos, Old Town, Mission, Miguel, Silvergate, and Otay Mesa.

- Eastern San Diego sub-area primarily includes the area from Suncrest 230kV to Sycamore Canyon 230kV Substation. It also includes the sub-transmission substations (i.e., having 138kV and lower transmission voltage) located in the eastern area of San Diego that is south of Sycamore Canyon Substation, east of Mission Substation and east of Miguel Substation.

The ISO performed two study scenarios to determine the generation effectiveness factors to mitigate post-transient voltage instability concerns based on the most critical contingency that affect the LA Basin and San Diego local capacity areas: the overlapping N-1-1 contingency of the East County – Miguel 500kV line, system readjusted, followed by the Ocotillo – Suncrest 500kV line outage.

Scenario A

For Scenario A, the ISO included transmission projects that were approved by the ISO Board for the 2013-2014 Transmission Plan with the exception of the Imperial Valley flow controller (i.e., IV flow controller). The reason for not including the IV flow controller for this scenario is due to the uncertainty whether the ISO and CFE will successful work through operational concerns regarding implementation of the I.V. Flow Controller on CFE's Imperial Valley – La Rosita 230kV line. Therefore, to account for the uncertainty of the IV Flow Controller for this analysis, the ISO only modeled the additional 2x225 MVAR synchronous condensers at San Luis Rey and the Mesa Loop-in project, but not the IV Flow Controller. In term of resources, the ISO included authorized resources for SDG&E Track 1(i.e., 45 MW for Escondido repowering and 300 MW from Pio Pico as these received approval for the Power Purchase & Tolling Agreement (PPTA) from the CPUC), as well as resources up to the total authorized LTPP Track 4 for SDG&E. For the North and Northwest San Diego sub-area, as well as for the Eastern San Diego sub-area, a maximum of 600 MW of conventional generation was modeled and 175 MW of preferred resources (i.e., installed capacity for distribution solar generation or solar DG) and 25 MW (installed capacity) for energy storage were included in the studies. These amounts were found to be needed to achieve convergence for the post-transient studies of the overlapping N-1-1 contingency in San Diego. Based on the CPUC's Assigned Commission Ruling (ACR) for R.1312010, the ISO utilized a factor of 0.47 for peak load impact to calculate the net qualifying capacity (NQC) for the distribution solar DG, and 0.50 (or 50%) of the installed capacity of new distribution-connected storage is assumed to provide capacity and flexibility as a default. To simplify the study process of determining and comparing the locational effectiveness factors in

the San Diego sub-areas, resources in the LA Basin were modeled in the southwest LA Basin sub-area and were held constant while various levels of conventional resources for were studied for the three sub-areas in San Diego. It is also noted that the resources assumed for the Southwest LA Basin are higher for Scenario A than for Scenario B due to the absence of the IV flow controller.

Scenario B

Scenario B includes full implementation of all transmission upgrades approved by the ISO Board in the ISO 2013-2014 Transmission Plan for the LA Basin / San Diego area. For this analysis, the ISO assumed the successful installation of an IV Flow Controller (a phase shifting transformer was studied in this case), as well as the Mesa Loop-in project, and the 2x225 MVAR synchronous condensers at San Luis Rey Substation. It is also noted that the resources assumed for the Southwest LA Basin are lower for Scenario B than for Scenario A due to the addition of the IV flow controller. Otherwise Scenario B is similar to Scenario A.

Under this scenario, the locational effectiveness factors for the North and Northwest San Diego sub-area, as well as the Eastern San Diego sub-area are equivalent with 100% effective for mitigating post-transient voltage instability conditions.

Conclusions

Locational effectiveness factors for the conventional resources located in San Diego local capacity area depend on these factors: full or partial transmission upgrades that were approved by the ISO Board as part of the 2013-2014 Transmission Plan, the level and locations of conventional resources in the LA Basin[1], and where these resources are located in San Diego area. The North & Northwest sub-area, as well as the Eastern San Diego sub-area have equivalent effectiveness factors. The South & Southwest sub-area has slightly lower locational effectiveness factor than the other two sub-areas in San Diego under the scenario. The ISO must also note that these results reflect weighted or aggregate levels of effectiveness within each sub-area. It is expected that there may be variations in effectiveness for individual buses within the South and Southwest sub-area. However, within the judgment of the ISO, these results are reasonably representative of the differences in effectiveness between the different sub-areas within the San Diego area.

[1] For simplicity, the ISO assumed resources in the SW LA Basin sub-area. Other potential mix of locations, as well as various levels, for resource development in the LA Basin can potentially alter the results.