

Clarification to the ISO Board-Approved 2013-2014 Transmission Plan:
**Locational Effectiveness Factor Calculations in
the LA Basin Area**



California ISO
Shaping a Renewed Future

April 23, 2014

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Background

The ISO is providing in this document additional information about locational effectiveness factors for the LA Basin area, to assist the resource procurement process of Southern California Edison currently underway. This information is being provided to assist SCE 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.

The information provided in the 2013-2014 Transmission Plan was developed without taking into account further resource procurement in the LA Basin 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 additional results also assume all Track 4 resources in San Diego are in-service.

Table 1 – Updated Generation Locational Effectiveness Factors

		Scenario A*	Scenario B	Scenario C
LA Basin Area	Northwest	0%	LEF < 13.6%	56.9%
	Western Central	not studied	34.4%	66.6%
	Southwest	50%	71.7%	100%
San Diego Area	San Diego	100%	100%	100%

* As reported in the ISO’s 2013-2014 Transmission Plan:

- Northwest LA Basin sub-area includes these substations: El Segundo, Chevmain, El Nido, La Cienega, La Fresa, Redondo, La Fresa, La Cienega, Hinson, Arcogen, Harborgen, Long Beach, Lighthipe, and Laguna Bell.
- Western Central LA Basin sub-area includes these substations: Center, Del Amo, Mesa, Rio Hondo, Walnut, Olinda.
- Southwest LA Basin sub-area includes these substations: Alamitos, Barre, Lewis, Villa Park, Ellis, Huntington Beach, Johanna, Santiago, and Viejo.
- San Diego sub-area includes the metropolitan area south of SCE-SDG&E border, west of Suncrest, 230kV load side of Miguel 500/230kV substation, and north of Otay Mesa – Tijuana 230kV line. The ISO assumes resource additions from Pio Pico (which received approved PPTA from the CPUC recently) and proxy resources in the NW San Diego (i.e., north of Penasquitos and south of San Onofre) for these analyses. This area is provided for comparison purposes only. A separate locational effectiveness factor document is posted for the San Diego area.

The ISO performed three 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

Scenario A was the initial study that the ISO performed to inform the CPUC's Long Term Procurement Plan Track 4 proceeding. This information was subsequently included in the ISO's 2013-2014 final Transmission Plan (page 104). At the time of the studies (December 2013), the ISO did not include the major recommended projects such as the Mesa Loop-In Project nor the Imperial Valley (I.V.) Flow Controller as these projects were not yet reviewed nor approved by the ISO Board. The ISO included the previously approved dynamic reactive support projects, such as the SONGS SVC and the Talega Synchronous Condensers. The ISO also included the additional dynamic reactive support at San Onofre for the analyses. In addition, the amount of resource additions in San Diego sub-area was limited to the amount within the range that SDG&E was seeking as part of its LTPP Track 4 submittal testimony (i.e., 500 - 550 MW). Without the Mesa Loop-In project or the IV Flow Controller project, the generation effectiveness factors were found to be less for the SW LA Basin and the NW LA Basin as indicated in Table 1 above.

Scenario B

For Scenario B, the ISO included transmission projects that were approved by the ISO Board for the 2013-2014 Transmission Plan, as well as updated resource information based on authorization from the CPUC for SCE and SDG&E as part of the LTPP Track 4 process. An uncertainty for this scenario is whether the ISO and CFE will successful work through operational concerns regarding 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 (i.e., 45 MW for Escondido repowering and 300 MW from Pio Pico), as well as the total authorized LTPP Track 4 resources for SDG&E (i.e., 600 MW assumptions for all source technology (assuming conventional generation) and 200 MW from preferred resources and energy storage. The addition of the transmission projects and the resources for SDG&E helped improve the locational effectiveness factors for the SW LA Basin to 71.7% (when compared to resources located in San Diego), and slight improvement to less

than 13.6% for the NW LA Basin resources. For this analysis, 14,200 MW was added to the NW LA Basin in roughly equal amounts at El Segundo, Redondo, Hinson, La Fresa, Laguna Bell, Long Beach, Lighthipe substations, along with 200 MW as well as additional 2x79 MVAR reactive supports in the SW LA Basin sub-area.

Scenario C

Scenario C is the most optimistic of the three study scenarios. 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 rest of the Group I transmission that was approved by the ISO Board (i.e., Mesa Loop-in project, 2x225 MVAR synchronous condensers at San Luis Rey), as well as completion of resource additions in San Diego per the CPUC Tracks 1 and 4 authorizations. This also assumes that SDG&E would be able to receive authorizations for its Power Purchase and Tolling Agreement (PPTA) for 600 MW of conventional resources (under all source technology) for LTPP Track 4. An amount of 200 MW of preferred resources and storage were assumed, as in Scenario B.

Under this most optimistic scenario, the locational effectiveness factor for the SW LA Basin is equivalent to the factor for San Diego sub-area (i.e., 100%) based on roughly two thirds of the generation at Alamitos and the remainder of the generation at Johanna, Santiago, and Viejo substations. The Western Central LA Basin's locational effectiveness factor is improved to about 66.6% based on modeling the generation at Center substation, and the NW LA Basin sub-area sees an improvement in its locational effectiveness factor to about 56.9% based on modeling the generation at Redondo and El Segundo substations.

Conclusions

Locational effectiveness factors for the sub-areas in the LA Basin depend on the amount and type of additional resources that are modeled in San Diego, as well as whether all or part of the transmission mitigations that were approved by the ISO Board can be installed and placed in service.

These results show that under the studied scenarios the generation outside of the southwest LA Basin area do have higher than the "no other mitigations" scenario as was set out in the Plan, as some of the mitigations that are now approved (and assuming some of the procurement is in the most effective areas) work together to allow a higher effectiveness of those other areas.

These additional sensitivity runs show a range of results, that the northern LA Basin plants like El Segundo range from 19% as effective as the Alamitos/Huntington Beach generation to 57%. Also, the central LA Basin area runs from 48% to as high as 67%. The high ends of the ranges also reflect the optimal development of the Imperial Valley Flow Controller, and the optimal operation of the flow controller regardless of potential impact on CFE.

The ISO must also note that these results reflect weighted or aggregate levels of effectiveness within each area. It is expected that there will be variations in effectiveness for individual buses within each area. Also, the distribution of resources to different buses within each area can also affect the composite effectiveness for each area. However, within the judgment of the ISO, these results are reasonably representative of the differences in effectiveness between the different areas within the LA Basin.

The overall conclusions remain the same; that the northern LA Basin area is much less effective than the southwest LA Basin and Orange County (Alamitos/Huntington Beach) area.

As mentioned in the discussion for Scenario B studies, it is still considered to be uncertain whether the IV Flow Controller can be successfully implemented and achieve the theoretical maximum benefit. Until further logistics related to the IV Flow Controller are resolved by the ISO and CFE, there is still a risk that this transmission project may not proceed, or that its effectiveness will not be as significant as demonstrated in these results. In addition, SDG&E is still seeking authorization from the CPUC regarding its plan of procurement for the Carlsbad Energy Center. Until a PPTA is approved by the CPUC on this potential conventional resource to fill part of its LTPP Track 4 authorizations, it is still considered another uncertainty for the locational effectiveness factors for resources in the sub-areas in the LA Basin / San Diego area.