

**SDG&E Request for
Economic Planning Study of the
Renewable Energy Express Transmission Project
as part of CAISO's
2017-2018 Transmission Planning Process (TPP)**

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Requested Study

The CAISO's *Transmission Planning Process* allows for Economic Planning Studies. In particular, CAISO Tariff Section 24.3.4.1 Assessments of Requests for Economic Planning Studies (c) allows for explicit consideration of the effects of a proposed project on Local Capacity Area Resource requirements.

SDG&E hereby submits for consideration its AC to DC conversion project, colloquially known as the Renewable Energy Express ("REX") transmission project. This project consists of converting a portion of the existing AC Southwest Powerlink (SWPL) to a DC system with terminals at North Gila substation, Imperial Valley substation, and Miguel substation. All elements are within, or adjacent to, existing rights of way and land holdings. Accordingly, SDG&E believes the environmental impacts will be minimal and any required permits relatively easy to secure. A schematic of the existing transmission system and the transmission system after the addition of the REX transmission project is provided at the end of this document.¹

SDG&E recommends that the CAISO's economic planning study estimate the life-cycle (60 year) benefits of the REX transmission project in comparison to a reference scenario that reflects California's 50% Renewable Portfolio Standard (RPS) requirements. SDG&E believes a logical starting point for this reference scenario would be the "In-state FCDS" portfolio as referenced on Page 5 of the CAISO's February 28, 2017 presentation of the "*50% RPS Special Study – Out-of-state Portfolio Assessment Results and Next Steps*" for the 2016-2017 Transmission Planning Process Stakeholder Meeting. This starting point would be updated with data and assumptions developed through the 2017-2018 TPP. The reference scenario would include all transmission upgrades approved by the CAISO through the 2016-2017 TPP. It would also include sufficient dependable capacity within (i) the San Diego Local Capacity Requirement (LCR) sub-area, (ii) Greater Imperial Valley-San Diego LCR area, and (iii) the LA Basin LCR area to meet estimated LCRs for each area. Where yet-to-be-approved new sources of dependable capacity are needed within each of the LCR areas to meet the estimated LCRs, gas turbine additions should be assumed.

¹ For purposes of the REX scenario, SDG&E will provide the CAISO with whatever level of technical detail the CAISO requires to model the REX transmission project.

The REX transmission project will provide economic value compared to the reference scenario in terms of (i) reduced production costs, and (ii) lower LCRs within the three LCR areas. Accordingly, SDG&E recommends that the CAISO set up two production cost cases for year 2026, one representing the reference scenario and the other representing the REX transmission project scenario. The Transmission Economic Assessment Methodology (TEAM) would be used to project net CAISO consumer production cost benefits over the 60 year life of the project. These benefits reflect the differences -- between the reference scenario and the REX transmission project scenario -- in (i) gross consumer costs (Locational Marginal Prices (LMPs) times load at each CAISO load bus) paid by CAISO consumers, (ii) producer surplus (LMPs times generation at each CAISO generation bus) that accrues to the benefit of CAISO consumers,² (iii) congestion rents that accrue to the benefit of CAISO consumers, and (iv) surplus loss revenues that accrue to the benefit of CAISO consumers.

Based on its own studies, SDG&E believes that compared to the reference scenario, the addition of the REX transmission project will significantly reduce LCRs. With the REX transmission project in service, the contingency condition which establishes LCRs will be different and will bind at a lower amount of LCRs.³ SDG&E recommends the CAISO employ its traditional power flow analysis to estimate LCRs with the REX transmission project in service. The reduction in LCRs means that load serving entities (LSEs) within these areas are able to reduce their purchases of relatively costly local Resource Adequacy (RA) capacity, with a corresponding increase in the amount of relatively less costly system RA capacity that must be purchased. SDG&E believes this category of benefits is substantial and may, on its own, substantially offset the capital costs of the REX transmission project.

To estimate the net reduction in RA procurement costs that will occur over the 60 year life-cycle of the REX transmission project, long-term projections of local and system RA prices for the reference scenario and for the REX transmission project scenario will be needed. These prices will vary by year depending on (i) the extent to which existing dependable local and system RA capacity exceeds the minimum amount required, and (ii) the year in which the amount of existing dependable local and system RA capacity (accounting for expected retirements) drops below the respective requirement.

When the amount of existing dependable local and system RA capacity drops below the respective requirement, new gas turbine capacity should assumed to be added as a proxy for closing the deficiency. It is challenging to estimate local and system capacity prices during years of surplus. One approach that could be used is to estimate current local and system dependable capacity prices based on public information and use linear interpolation to escalate these prices

² SDG&E believes that the producer surplus from the renewable resources assumed to satisfy California's 50% RPS requirement will accrue to the benefit of CAISO consumers. This is because most of the purchased power agreements (PPAs) under which these resources are developed are likely to be structured in a manner which, for the energy produced by these facilities, transfers the difference between LMPs and actual variable operating costs (if any) to CAISO consumers.

³ The overlapping outages of the TDM combined cycle plant (G-1) and the North Gila – Imperial Valley 500 kV line (N-1) are currently the binding contingency condition. When the existing North Gila – Imperial Valley - Miguel 500 kV line is converted to HVDC, an outage of one pole of the bi-pole HVDC line becomes the N-1 contingency. This leaves the other pole in-service.

between the current year and the year in which the surplus is forecast to end, at which point the dependable capacity price becomes the cost of a gas turbine adjusted downward for expected market revenues. Note that the cost of the proxy gas turbine likely varies based on the location in which the gas turbine is assumed to be built. It would likely be most expensive in the LCR areas, least expensive at the system level where it could be built anywhere within the WECC.

Possible Sensitivity

There are potential synergies between the REX transmission project and New Mexico wind. SDG&E understands that another entity will be submitting an economic planning study request to evaluate additional wind resources in New Mexico delivered into the metro-Phoenix area. It may be instructive for the CAISO to develop a scenario that combines the REX transmission project with New Mexico wind delivered into the metro-Phoenix area via the SunZia transmission project.⁴

In this scenario, new New Mexico wind resources would replace, on an energy basis, an equivalent amount of planned California solar PV. It will be necessary to account for the difference in capital costs between California solar PV and New Mexico wind, as well as the difference in economic lives between (i) the 60 year REX and SunZia transmission projects, and (ii) the 20 year lives of rooftop solar PV and wind. New Mexico wind will provide a significant capital cost savings because it takes much less installed New Mexico wind capacity to provide the same amount of energy as California solar PV. This benefit compounds across the two renewable replacement cycles that are needed to equalize life-time assumptions: once at year 21 and again at year 41.⁵ Also, renewable resources can be built at lower cost out-of-state than within California.

Using the TEAM, the CAISO can estimate the extent to which this sensitivity scenario, as compared to the reference scenario, provides further benefits in terms of reduced net CAISO

⁴ As reported by the CAISO in its “50% RPS Special Study – Out-of-state Portfolio Assessment Results and Next Steps” presentation, 1500 MW of New Mexico wind was studied. SDG&E understands that the study did not identify the need for major new transmission to access this wind. However, SDG&E does not believe any party has yet demonstrated that will be sufficient long-term firm contract-path transfer capability available on existing transmission to deliver 1500 MW of new New Mexico wind to the edge of the CAISO Balancing Authority. Additionally, the physical transfer capability of the existing transmission system in the desert southwest could be affected by the retirement of significant amounts of generation that, historically, has provided large and predictable amounts of inertia. For these reasons, the CAISO should consider a sensitivity scenario that includes the SunZia transmission project.

⁵ SDG&E recommends that the CAISO use the latest update of the WECC Transmission Expansion Planning Policy Committee’s (TEPPC’s) generation capital costs. These updates include projections of expected capital cost reductions over time based on “learning curves,” fixed O&M and adjustment factors for construction in different locations. Currently, the latest update is dated January 31, 2017 and is available at https://www.wecc.biz/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/2017-01-31%20E3%20WECC%20Capital%20Costs%20v1.pdf&action=default&DefaultItemOpen=1

consumer costs.⁶ SDG&E's own analysis suggests that the output profile of New Mexico wind is better correlated with periods of relatively higher LMPs than California solar PV.

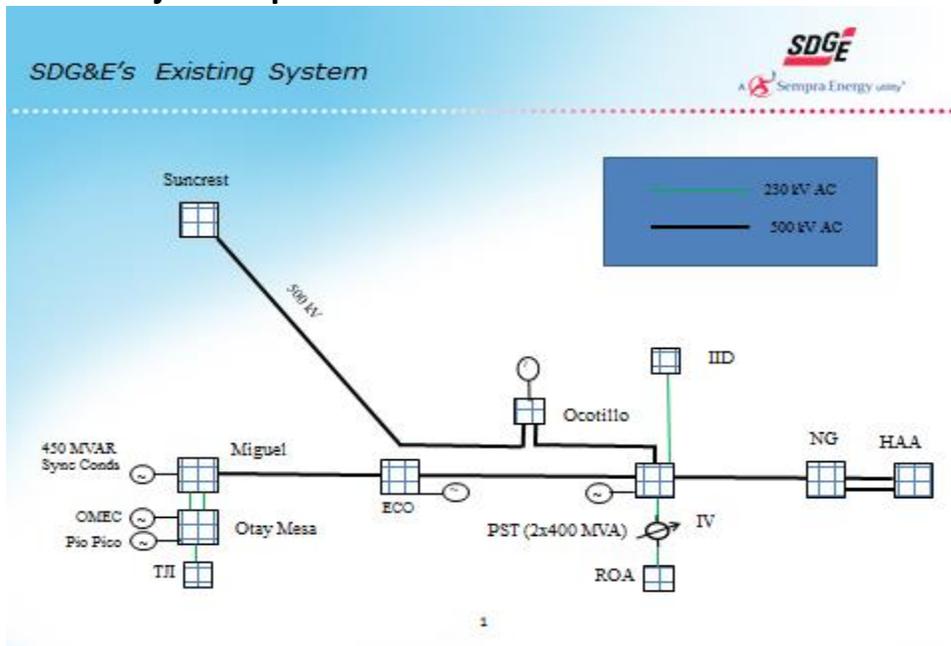
This sensitivity scenario would need to account for the differences in dependable capacity value (solar PV generally has a higher dependable capacity value than wind, although this difference is rapidly eroding, and may even reverse, as the most critical peak load period shifts into the early evening as the result of increasing levels of rooftop solar PV generation). It will also need to account for the costs of replacing renewable resource curtailments as a result of physical over-supply in certain hours of the year (replacing planned California solar PV sources with New Mexico wind will reduce the amount of physical curtailment which is required because the output profile of New Mexico wind is not highly correlated with the output profile for California solar PV resources).

Commitment of Support

The economic planning study described in this request outlines some of the methodology and assumptions that SDG&E recommends the CAISO use. Further detail will no doubt be necessary and SDG&E looks forward to working with the CAISO and other stakeholders to refine the study in ways that will provide information of greatest value.

Thank you for consideration of SDG&E's request. Please contact Jan Strack (jstrack@semprautilities.com) or Huang Lin (hlin@semprautilities.com) to discuss this economic planning study request.

Project Maps



⁶ For purposes of this sensitivity scenario, SDG&E expects the SouthWestern Power Group will provide the CAISO with whatever level of technical detail the CAISO requires to model the SunZia transmission project.

A one-line diagram showing all major proposed elements (e.g. substation, line, circuit breaker, transformer, and interconnection points).

