California Independent
System Operator

CALIFORNIA ISO

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Subject: Valley - Rainbow Interconnection Project Feasibility Study Report – April 25, 2000

Mr. Korinek:

As follow-up to its 1999 annual five-year transmission planning assessment, San Diego Gas & Electric (SDG&E) conducted a study to assess transmission options to meet the ISO Grid Planning Criteria (Criteria) in the San Diego area in 2004. This study was conducted jointly with Southern California Edison (SCE) through an open California ISO (ISO) stakeholder process. Results of this study effort were reported to the ISO and stakeholders for review at meetings on February 25, April 17 and May 1, 2000 in San Diego. SDG&E submitted the draft report dated April 25, 2000 for ISO and stakeholder review. ISO Management's final review and comments focus on the following four areas:

Adequate Analysis: Was the reliability assessment reasonably accurate and comprehensive?
Project Effectiveness: Do the proposed projects mitigate identified criteria violations?
Alternatives Considered: Was there adequate consideration of the transmission alternatives?
Project Economics: Among viable transmission alternatives, were project costs a key factor in determining the preferred project?

Adequate Analysis: It is the ISO's judgement that the steady state, post-transient, short-circuit, and transient stability analyses performed were adequate and sufficient for the 2004 summer peak case. Using the most current and up-to-date information for the power flow models and data, the studies have attained a reasonable degree of accuracy. The study results generally reflect an accurate, comprehensive test of system performance under a multitude of single and multiple contingencies. Specifically, problems involving thermal overloads, low voltage, insufficient reactive reserve, and circuit breaker short-circuit duty were identified within the SDG&E and SCE areas.

Project Effectiveness: The ISO concurs with the findings of the SDG&E report and that the mitigation alternatives considered, if implemented, would be effective in achieving acceptable reliability.

Alternatives Considered: SDG&E identified four possible transmission-related facility additions, as alternatives to mitigate reliability problems. These 500 kV transmission alternatives were Valley-Rainbow, Mira Loma-Rainbow, Devers-Rainbow and a second

Southwest Powerlink (SWPL) from Palo Verde to Miguel. The study focussed on 500 KV facilities because, by 2004, all feasible 230 kV alternatives have been exhausted.

Project Economics: For each alternative, ISO management reviewed confidential cost information from SDG&E. This cost information demonstrates that the Valley-Rainbow 500 kV Project (Project) is the lowest cost alternative.

Project # 99123 - New Valley-Rainbow 500 kV line – Operating date – June 2004

The recommended transmission Plan of Service is as follows:

?? a 500 kV line from SCE's Valley Substation to a new SDG&E Rainbow[1] Substation (approximately 40 miles in length);

?? a loop-in of SDG&E's Talega - Escondido 230 kV Line into Rainbow to form Talega - Rainbow and Rainbow - Escondido 230 kV Lines, and bundling those two lines;

?? addition of a second bundled Talega - Rainbow and a second bundled Rainbow - Escondido 230 kV Line;

?? 500/230 kV transforming capability at Rainbow Substation (rated at least 1120 MVA);

?? one or two (depending on capability) phase-shifting transformer [or alternative Flexible AC Transmission System (FACTS) device];

?? a total of at least 350 MVAR of dynamic reactive power support and 990 MVAR of static power support; and

?? some local reinforcements in the Escondido 69 kV area and elsewhere[2], which will be addressed during SDG&E's annual transmission assessment.

?? No reinforcement needs were identified in the SCE system other than those associated with terminating the line in SCE's Valley Substation.

?? Based on the study results, the Project is capable of a "Planned Rating" (non-simultaneous maximum rating) of 1000 MW. The Project is anticipated to increase SDG&E's system import capability to about 3600 MW with all elements in service.

The studies have been done for a 1-in-5 year load forecast. If the results are extrapolated for a 1-in-10 year load forecast, this "Valley-Rainbow" 500 kV Project would serve load growth while

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[1] Wherever the Rainbow Substation is referenced, the nearby Pala site would also apply. SDG&E evaluation of the two alternative sites is pending, but the final site selection will have no significant impact on the study results.

[2] Certain upgrades identified in these studies may be needed for the future SDG&E transmission expansion, but are not directly the result of the Valley – Rainbow proposal (or alternative). Such upgrades, that may be needed with or without the proposed project include a new 392 MVA 230/138 kV TCUL transformer for Sycamore Canyon Substation, a loop-in of the Chicarita – Carlton Hills Tap 138 kV Line into Sycamore Canyon Substation, bundle both San Luis Rey – Mission 230 kV Lines with 2-1033 kCMIL ACSR, and develop a continuous emergency rating for the Encina – Peñasquitos 230 kV Line. These projects will be evaluated as a part of SDG&E's annual transmission expansion stakeholder process.

meeting the Criteria through 2006 or 2008 depending on whether or not it is acceptable to employ load shedding to meet the Criteria under the combined contingency of a single generator and a single transmission line. Based on the recent ISO Board approved "Interim California ISO Principles Toward the Application of Involuntary Planned Load Interruption," involuntary load interruptions should not be used to meet the Criteria for the combined contingency of a single generator and a single transmission line unless the ISO Board decides that the capital project alternative is not cost effective. This decision would need to be made when subsequent projects are brought before the ISO Board to serve increasing demand while meeting reliability in the 2006+ time frame.

In recognition of the long lead time (6-10 years) necessary to complete any of the anticipated 500 kV transmission alternatives needed to meet the long-term reliability needs in the 2006+ time frame, ISO Management believes a "Stage 2" 500 kV study to identify the preferred transmission project needs to be completed this year to allow sufficient time for the project to be placed in service when needed.

The ISO recognizes that the results of this "Phase 1" study is preliminary, and a more detailed facilities study will be done in Phase 2. The ISO will continue to work closely with SDG&E and SCE to ensure that the final design of the preferred alternative meets all applicable criteria.

In parallel or during the WSCC Rating Study, ISO Management requests that SDG&E pursue the following activities:

?? Demonstrate project compliance with WSCC Level A, B and C contingencies, for a 90/10 peak load level.

?? Finalize the internal SDG&E 230, 138 & 69kV facility expansion plans needed for reliability.

?? Complete assessment of Pala Substation as an alternative to the Rainbow site.

?? Identify simultaneous loading impacts, particularly the Southern California Import Transmission (SCIT) path.

?? Perform additional studies as sensitivities, including high East of River flow, "shoulder peak" case, and CFE imports at maximum.

?? Identify all significant operational procedures that need to be developed to integrate the project into the Regional grid.

?? Determine the proper mix of static and dynamic reactive power compensation additions, optimum VAR locations, choice of preferred compensation technologies (capacitors, SVCs, FACTS devices, etc.), and re-evaluate SDG&E reactive power margin criteria to ensure voltage stability.

?? Evaluate the suitability of a Unified Power Flow Controller (UPFC) as an alternative to the proposed 1400MVA phase-shifter at Rainbow/Pala, and assess the pros and cons of installing either device at 500kV versus 230kV.

?? Investigate the use of line drop compensation with Encina and South Bay plant owners as a possible way to further improve system voltage stability.

?? Conduct detailed operational studies for 2004 to determine viable interim mitigation procedures, in the event the Project is delayed beyond June 2004.

The ISO concurs with this Project; it has been demonstrated that the Project is a prudent and technically sound solution to the identified reliability criteria violations in 2004. This Project is required to increase import capability into the SDG&E Area to meet increased load with no increase in in-area generation capability. **Because this Project's estimated cost is greater than $20 million, it will be submitted for approval to the ISO Board under a separate memo.** There are three alternatives to the recommended project (1. Build a new Mira Loma – Rainbow 500 kV line; 2. Build new Devers – Rainbow 500 kV line; 3. Build new second Southwest Power Link (Palo Verde to Miguel). The Project was preferred over these alternative projects primarily based on lead-time requirements and plan of service costs.

The ISO also requests that SDG&E begin a "stage 2" 500 kV study to identify the preferred long-term transmission alternative to address reliability concerns on the ISO grid in the 2006+ time frame.

We appreciate the tremendous effort made by SDG&E, SCE and interested stakeholders in supporting the ISO stakeholder process. Please call Steve Mavis (916) 351-2112 or Catalin Micsa (916) 608-5704 if you have any questions regarding these comments.

Sincerely,

{Original signed by Armando J. Perez}

Armando J. Perez
Director of Grid Planning

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(Via email) SDG&E Study Stakeholders