SUNRISE POWERLINK

TRANSMISSION PROJECT

PURPOSE AND NEED

Volume 2

Application No. 05-12-____

December 14, 2005

SAN DIEGO GAS & ELECTRIC COMPANY

DESCRIPTION

The following demonstrates the purpose and need for the Sunrise Powerlink Transmission Project and serves as the prepared direct testimony of San Diego Gas & Electric Company ("SDG&E") in support of its application to the California Public Utilities Commission for a Certificate of Public Convenience and Necessity for the project.

CHAPTER I – EXECUTIVE SUMMARY

This chapter provides an overview of the proposed Sunrise Powerlink project, the benefits it provides to the San Diego transmission area and the State of California, and the reasons the Commission should determine that the project is necessary and in the public interest. The witness for this chapter is James P. Avery.

CHAPTER II – SCOPE AND COST

This chapter describes the potential scope and cost of the facilities SDG&E is considering as part of the Sunrise Powerlink. The witness sponsoring this chapter is Jan Strack.

CHAPTER III – RELIABILITY

This chapter indicates how the project enhances the ability of the San Diego transmission areas to provide reliable service, consistent with the reliability requirements of the CAISO. This witness sponsoring this chapter is Jan Strack.

CHAPTER IV – RENWABLE ENERGY

This chapter describes how the Sunrise Powerlink will substantially increase California's access to renewable energy resources thereby promoting the further development of these resources and supporting California's efforts to meet established renewable resource goals. The witness sponsoring this chapter is Vincent D. Bartolomucci.

CHAPTER V – ECONOMIC BENEFITS

This chapter documents how the project will provide significant economic benefits to the San Diego transmission area and customers of the CAISO. The witnesses sponsoring this chapter are Victor Kruger for the RMR cost savings analysis and Jan Strack with regard to all other material.

CHAPTER VI – ALTERNATIVES

This chapter discusses the various transmission and non-transmission alternatives to the Sunrise Powerlink and explains why these alternatives are infeasible and/or inferior to the proposed project. The witness sponsoring this chapter is Jan Strack.

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SUNRISE POWERLINK

CHAPTER I

EXECUTIVE SUMMARY

SDGE
A Sempra Energy utility

Application No.: A.05-12-

Exhibit No.: ___________________

Date: December 14, 2005

Witness: James P. Avery

I.

EXECUTIVE SUMMARY

San Diego Gas and Electric Company ("SDG&E") presents to the Commission this report demonstrating the purpose and need for a 500 kilovolt ("kV") transmission line between the Imperial Valley and the SDG&E service area. This proposed project, known as the "Sunrise Powerlink", is the best and most comprehensive solution to meet the following three vital objectives:[1]

- Maintain Reliability: The project will enable the San Diego transmission system to satisfy the grid reliability requirements of the California Independent System Operator ("CAISO") starting in 2010, thereby allowing SDG&E and other Load Serving Entities ("LSEs") within the San Diego service area to reliably serve their customers during periods of unusually high energy demand.
- Promote Renewable Energy: The project will provide California consumers more economical access to remote areas with significant renewable resource potential and will encourage the development of such resources thereby diversifying the State's resource mix and reducing its reliance on fossil-fueled generation, consistent with Senate Bill ("SB") 1078 and the Energy Action Plan ("EAP").
- Reduce Energy Costs: This cost-effective project will pay for itself and could potentially provide up to $57 million per year in *net* energy savings for California electricity customers. These savings will come in the form of reduced energy costs resulting from increased access to lower cost sources of power in the desert Southwest and reduced reliance on older, less-efficient in-area generation.

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[1] SDG&E's analyses and resulting benefits are viewed from the perspective of electricity consumers within the CAISO control area, unless otherwise expressly stated.

SDG&E submits that each of these benefits, on its own, is sufficient to support the need for the Sunrise Powerlink and, taken as a whole, overwhelmingly demonstrate that the proposed project is necessary and in the best interest of the public.

SDG&E has not yet completed route selection for the Sunrise Powerlink and is currently in the process of determining the best route and design for the project. This process includes an extensive outreach effort to gather input from potentially affected communities, elected officials, and other interested parties. As noted in this application, SDG&E proposes that the Commission consider the Sunrise Powerlink in two separate but overlapping phases (i.e., project need and route) in order to accommodate this public participation process without jeopardizing the needed in-service date for the project.

A. Public Involvement

For Sunrise, SDG&E has departed from the traditional practice used to site major transmission projects, whereby public comment from local communities and regional stakeholders is gathered *after* the applicant has selected the preferred and alternate route, and has completed preliminary engineering and environmental studies. Instead, SDG&E has initiated a comprehensive public outreach program designed to involve the public and project stakeholders, including residential and commercial customers, community and business leaders, environmental groups, and elected officials, early in the route selection process. This outreach effort has three primary objectives:

1) Engage a broad array of stakeholders in the route selection process to ensure that all interested parties have an opportunity to provide input on the project;
2) Identify key issues and possible community impacts associated with the project prior to making routing decisions; and

3) Maximize public awareness of the project.

SDG&E began its public education program for the Sunrise Powerlink in 2004 by meeting with customers and community leaders to hear their suggestions regarding how SDG&E should plan to meet expected load growth in the San Diego region, including the development of additional transmission infrastructure. In 2005, SDG&E initiated an education and outreach program to create public awareness of the project and provide local communities and customers with multiple forums to provide input and feedback on key issues and potential routing options for the project. Two types of public forums gather input for the project: "Community Working Groups" and "Open Houses".

The Community Working Group is designed to bring together a diverse group of community leaders and regional decision-makers for a series of open meetings to discuss issues related to the Sunrise Powerlink and give interested parities the opportunity to become involved in the route selection process.[2]

To date, SDG&E has hosted two phases of Community Working Group meetings in the City of San Diego and the community of Ramona. The first-phase meetings focused on an overview of energy infrastructure issues facing Southern California and a detailed description of the Sunrise Powerlink. Participants were also asked to provide input and rank the various environmental constraints that will be used as part of the route selection criteria. Ranking environmental constraints is just one example of how Community Working Groups participants actually shape the decision-making process for the route.

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[2] It should be noted that the Community Working Groups are not intended to build regional consensus on any particular route. It is unrealistic to believe that such a diverse group of individuals, each with their own specific issues, would agree on a single route. In fact, some may disagree with the final preferred route and alternate route for the project.

During the second-phase meetings held in these same areas, SDG&E unveiled transmission "macro-corridors" for the Sunrise Powerlink that will be further studied. Community Working Group participants were asked to comment on these possible routes. These comments are being used as part of the route selection process.

All of the Community Working Group meetings are open to the general public and additional meetings will be held in early 2006 to review and discuss the final preferred and alternate alignment for the Sunrise Powerlink.

SDG&E has also hosted nine project Open Houses in the communities of Scripps Ranch, Valley Center, Ramona, Julian and Borrego Springs and four additional Open Houses will be hosted in early 2006. These Open Houses provide the public with an opportunity to discuss the project with SDG&E officials and provide input on key issues such as possible routes. All comments received are tracked in a project database and will be considered prior to making any determination on a preferred route and alternate route.

To maximize public awareness of the Open Houses, SDG&E: 1) advertised the meetings in 21 local newspapers; 2) sent invitations to over 75,000 property owners; 3) directly notified elected officials, local community groups and other interested parties; 4) posted meeting announcements in highly public areas such as community centers, libraries and post offices; and 5) notified the broadcast media. In addition to these public meetings, interested parties may provide input via phone, email,[3] or the project website, www.sdge.com/sunrisepowerlink, where they can download fact sheets, frequently asked questions, maps and other project information. A section of the website provides the public an opportunity to submit comments that will be used in the route selection process.

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[3] By calling the project hotline number (877)-775-6818 or sending an email to sunrisepowerlink@sdge.com.

This route selection and public involvement process will culminate in the Proponent's Environmental Assessment ("PEA") to be submitted by mid-2006. In the instant application, SDG&E proposes a recommended scope for the project and also provides an estimate of the range of costs associated with this scope in order to inform the Commission's determination of need for the Sunrise Powerlink. This scope was the result of another public stakeholder process performed as part of the regional planning meetings of the Southwest Transmission Expansion Plan ("STEP")[4] and the collaborative work done as part of the Imperial Valley Study Group ("IVSG").[5]

B. Project Description

The Sunrise Powerlink is a proposed 500 kV alternating current transmission line that would be constructed and placed in service by the year 2010. The project will connect the existing Imperial Valley substation near El Centro, California to a new "Central" substation to be located somewhere in central San Diego County. SDG&E will also build two new 230 kV lines connecting the Central substation to the existing Sycamore Canyon substation and one new 230 kV line between the Sycamore Canyon substation and the Peñasquitos substation.[6]

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[4] STEP was formed in November 2002. It is an ad hoc voluntary organization whose membership is open to all interested stakeholders. STEP provides a forum for participating in the planning, coordination, and implementation of transmission systems between the Arizona, Nevada, Mexico and southern California areas. Its goal is to facilitate the development of transmission capable of supporting a competitive, efficient, and seamless wholesale electricity market while meeting established reliability standards.

[5] See, Report of the Imperial Valley Study Group (September 30, 2005), filed by SDG&E with the Commission on October 4, 2005. The IVSG was formed in response to D.04-06-010 (2004). It adopted the mission of specifying a phased development plan for the construction of transmission upgrades capable of exporting 2,200 MW of renewable power from the Imperial Valley. The IVSG is a voluntary planning collaborative made up of regional stakeholders. Participants include the Commission, all regional Transmission Owners, the CAISO, CEC, generation developers, local, state and federal agencies, environmental and consumer groups and other interested parties. Its work has been led by IID, SDG&E and SCE, and is fully supported by LADWP.

[6] The proposed scope of the Sunrise Powerlink is discussed more fully in Chapter II, Scope and Cost.

Although the specific route of the Sunrise Powerlink is not known at this time, the total length of the 500 kV portion of the project is estimated to be between 75 and 105 miles. The cost of constructing the project, including the new 230 kV lines west of the Central substation and other project elements described herein is estimated to be between $1.015 billion on the low side and $1.437 billion on the high side.[7] These estimated costs are provided for the Commission's information in order to support its determination that the Sunrise Powerlink is needed and in the public's interest. As noted above, SDG&E will provide refined engineering cost estimates based on a specific project route as detailed in the PEA to be submitted in 2006.[8]

C. Background

SDG&E currently provides electric utility service to approximately 1.3 million customers in a service area that includes all of San Diego County and the southern part of Orange County. Demand in this area is served by a combination of internal capacity and imported power delivered through only two points of interconnection—a 500 kV line at SDG&E's Miguel substation[9] that accesses power from the east and south, and a series of 230 kV lines connecting through the San Onofre Nuclear Generating Station ("SONGS") switchyard to the north.[10] Neither of these paths is capable of serving the full peak-load requirements of the SDG&E local reliability area if the other is out of service.

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[7] Nominal dollars including Allowance for Funds Used During Construction ("AFUDC").

[8] These estimated costs may change due to such factors as: permitting and environmental requirements; final design criteria; changes in project schedule; inflation and deflation factors; and unforeseen events.

[9] The SDG&E electric transmission system is also interconnected with Comision Federal de Electricidad ("CFE") in Mexico through two 230 kV transmission lines (Path 45), one at the Imperial Valley substation and the other at the Miguel substation. However, this interconnection provides no net import capability to the San Diego transmission area.

[10] SONGS, while geographically located within SDG&E's service area, is connected to SCE from a system perspective and, from an electric reliability perspective, is outside the San Diego local reliability area.

San Diego is the nation's seventh largest city and the nation's sixth largest county with an economy in excess of $70 billion of goods and services per year.[11] Yet the San Diego service area lies within an electrical cul-de-sac, relying on only a single 500 kV line and a small set of 230 kV lines tied to the larger transmission network (or "grid") outside the region to obtain the electricity imports needed to support its economy. Among the large electric service areas in the State, only San Diego is so underserved.

SDG&E's sole 500 kV interconnection to the grid is the Southwest Powerlink ("SWPL"), a 500 kV transmission line connecting the Palo Verde Nuclear Generating Station ("PVNGS") in Arizona and SDG&E's Miguel substation in California.[12] The SWPL was constructed primarily to import cost-effective energy from the desert Southwest into California. As a result of growing loads in Southern California and the addition of new generation in the desert Southwest, including new generation located in Mexico that is connected directly to the existing Imperial Valley substation, the import capability into the San Diego area is often fully utilized. The SWPL is owned jointly by SDG&E, Arizona Public Service Company ("APS"), and the Imperial Irrigation District ("IID").[13] Of the co-owners, only SDG&E has turned over its share of the SWPL to the operational control of the CAISO, and thus only SDG&E's share of the line is subject to the comparability and non-discrimination requirements of the CAISO tariff on file with the Federal Energy Regulatory Commission ("FERC").

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[11] This figure does not that part of southern Orange County where SDG&E provides electricity service.

[12] See, *In re Application of SDG&E for Certificate to Construct and Operate a 500 kV Transmission Line*, D.93785, 7 CPUC 2d 301 (1981).

[13] Pursuant to contracts executed in 1981 and 1983, SDG&E transferred specified undivided interests in portions of SWPL to APS and IID, respectively. As a result, SWPL is owned jointly by SDG&E, APS, and IID in ownership shares that vary among the segments of the line. The Palo Verde to North Gila segment is owned by SDG&E, APS and IID in shares of 76.22%, 11%, and 12.78%, respectively. The North Gila to Imperial Valley segment is owned by SDG&E and IID in shares of 85.64% and 14.36%, respectively. The Imperial Valley to Miguel segment is wholly owned by SDG&E.

As a participating transmission owner ("PTO") under the CAISO FERC tariff, SDG&E must comply with CAISO's statewide grid planning standards which consist of:

- Western Electricity Coordinating Council ("WECC") Reliability Criteria for Transmission System Planning;
- North American Electric Reliability Council ("NERC") Planning Standards;
- Criteria pertaining to the Diablo Canyon and SONGS nuclear plants; and
- CAISO requirements that utilities plan their systems so that, for a single transmission circuit outage with the largest generator already out of service, there will be no interruption of customer load in the event of a *subsequent* outage during adverse weather conditions.

This last item is referred to as the CAISO's "G-1/N-1" reliability criterion. For purposes of capacity planning for the San Diego area, this criterion requires that there be sufficient in-area resources and transmission import capability to serve the full adverse peak demand forecast during the worst G-1/N-1 event. Specifically, the ability to import power from SONGS and other off-system generation is defined by two import constraints: (1) the application of the CAISO's G-1/N-1 reliability criteria; and (2) the application of the WECC/NERC N-0 reliability criteria, as applied to the San Diego transmission system. These import capabilities are a critical factor in analyzing and determining grid reliability, siting future generation resources, and/or expanding the transmission system to provide for the economic import of electricity from renewable and conventional generation resources.

D. <u>Resource Procurement Policy</u>

The overarching goal of the EAP is for California's energy to be adequate, affordable, technologically advanced and environmentally sound. The State is taking important steps to achieve this objective. California has established the most aggressive, long-term energy efficiency goals in the nation and has adopted specific programs to begin achieving these goals. Additionally, the State is increasing its emphasis on demand response and developing various programs that will effectively reduce electric demand during peak load conditions. California has also established a goal of procuring 20% of its electricity requirements from renewable resources by the year 2010 and is considering a goal of 33% by the year 2020.[14] The CPUC is also reviewing a number of transmission projects that will meet the goals articulated in the EAP.[15]

As recognized by California's loading order and the EAP, all of these resource elements are essential to achieving a properly balanced portfolio of energy resources and infrastructure. The EAP emphasizes the critical need for transmission as follows:

> Significant capital investments are needed to augment existing facilities, replace aging infrastructure, and ensure that California's electrical supplies will meet current and future needs at reasonable prices and without over-reliance on a single fuel source….
>
> An expanded, robust electric transmission system is required to access cleaner and more competitively priced energy, mitigate grid congestion, increase grid reliability, permit the retirement of aging plants, and bring new renewable and conventional power plants on line. Streamlined, open and fair transmission planning and permitting processes must move projects through planning and into construction in a timely manner. The state agencies must work closely with the CAISO to achieve objectives and to benefit from its expertise in grid operation and planning….[16]

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14 The EAP, adopted by the Commission and the CEC in May 2003, accelerated the completion date for increasing the share of renewable energy in energy sales from 20% of sales by 2017 to 20% by 2010. On June 1, 2005 the Governor signed Executive Order S-3-05 accelerating the renewable energy goals to 33% of energy sales by 2020. See *Strategies Underway in California That Reduce Greenhouse Gas Emissions* at http://www.climatechange.ca.gov/climate_action_team/factsheets/2005-06_GHG_STRATEGIES_FS.PDF

15 See I.05-06-041, I.05-09-005, A.04-12-007, A.04-12-008, and A.05-04-015.

16 Section II.4 of the October, 2005 *Energy Action Plan II* an "implementation roadmap for energy policies", as adopted by the Commission and the CEC.

The importance of transmission was also addressed by the CEC in its recently adopted Strategic Transmission Investment Plan,[17] which clearly identified the need for certain major transmission projects, and specifically found that the Sunrise Powerlink would provide significant benefits to the State:

> **Sunrise Powerlink 500 kV Project** - The proposed 500 kV Sunrise Powerlink Project would provide significant near-term system reliability benefits to California, reduce system congestion and its resultant costs, and provide an interconnection to both renewable resources located in the Imperial Valley and lower-cost out-of-state generation. Without this proposed project, it is unlikely that SDG&E will be able to meet the state's RPS goals, ensure system reliability, or reduce RMR and congestion costs. The Energy Commission therefore believes that the proposed project offers significant benefits and recommends that it move forward expeditiously so that the residents of San Diego and all of California can begin to realize these benefits by 2010 (Report at 6).
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> *** * * ***
>
> In summary, the proposed 500 kV Sunrise Powerlink Project would provide significant near-term system reliability benefits to California, reduce system congestion and resultant congestion costs, and provide an interconnection to renewable resources located in the Imperial Valley and lower-cost out-of-state generation. Without the proposed project, it is unlikely that SDG&E will be able to meet the state's RPS goals, ensure system reliability, or reduce RMR and congestion costs. Therefore, the Energy Commission believes the proposed project offers significant benefits and recommends that the project be moved forward expeditiously so that the residents of San Diego and all of California can begin realizing these benefits by 2010 (Report at 65).

E. <u>Resource Planning</u>

Energy demand in the SDG&E service area is steadily increasing as a result of the area's growth. The electric load served by the SDG&E transmission system is expected to grow by over 750 megawatts ("MW") over the next ten years (2006 through 2015). This is an increase of 19% and includes an expected reduction of 595 MW due to rather

[17] Strategic Transmission Investment Plan, Prepared in Support of the 2005 Integrated Energy Policy Report Proceeding (04-IEP-1K), Final Committee Report, adopted November 21, 2005.

significant incremental energy efficiency savings and other demand-side measures that are assumed to occur over this period.[18]

SDG&E carefully plans and implements measures to meet these increasing energy needs in the long-term. SDG&E accomplishes this for its bundled service customers, in part, through its long-term resource plan ("LTRP"). SDG&E's LTRP is a balanced resource strategy that emphasizes the need for a diverse portfolio of supply- and demand-side options. Consistent with the EAP and loading order, the LTRP includes energy efficiency, demand response, renewable resources, distributed and conventional generation and new transmission. As a necessary part of its portfolio, SDG&E determined that a new 500 kV interconnection would be needed to address a grid reliability shortfall by 2010. This was addressed by the Commission in its Electric Resource Planning OIR, R.04-04-003 as follows:

> While we do not approve SDG&E's 500 kV transmission line here, we do acknowledge the lengthy process needed to plan, license and construct transmission, and thus encourage SDG&E to continue its planning efforts and move forward with evaluating these transmission alternatives for meeting a local resource deficiency by 2010.[19]

F. Project Criteria and Benefits

Consistent with the State's EAP, the CEC's Strategic Transmission Investment Plan, and the Commission's direction in D.04-12-048, SDG&E has evaluated the need for new transmission using the following three key criteria:

- *How to best maintain reliable service;*

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[18] This compares SDG&E's peak demand of 4,058 MW recorded in 2005 to its expected peak demand of 4,813 MW in 2015, based on SDG&E's "50/50" peak demand forecast which has a 50% probability of being exceeded in any given year. It should be noted that 342 MW of energy efficiency demand reductions represent *future* savings and do not reflect the significant contribution of past energy efficiency achievements which are essentially embedded in the forecast.

[19] D. 04-12-048 at p.228, Finding of Fact 9; see also *id.* at p.45.

- *How to effectively access more renewable energy; and*
- *How to mitigate high energy costs.*

These three objectives best define the purpose of the Sunrise Powerlink. As detailed in this testimony, SDG&E believes that the Sunrise Powerlink best meets these three key objectives and is the next logical step to be taken by SDG&E in its efforts to meet the State's energy goals. The benefits in these three areas are as follows.

1. **Reliability**

The Sunrise Powerlink will enable the San Diego transmission system to satisfy the CAISO's G-1/N-1 adverse weather reliability requirement which, absent the needed grid upgrade, will most likely be violated beginning in 2010. The proposed project will allow SDG&E and LSEs within the San Diego area to reliably serve their customers during periods of unusually high energy demand. The project will also allow increased flexibility in operating California's transmission grid and provide additional import capability that may be urgently needed during a major outage or emergency event.

Since the SWPL was built over 20 years ago, loads in the SDG&E service area have continued to grow.[20] SDG&E now projects that beginning as early as 2010, there could be overlapping transmission and generation contingencies, as defined by the CAISO, under which the sum of available in-area generation and existing import capability could not meet load in the SDG&E service area during adverse weather conditions. Increasing the ability to import power from the desert Southwest will ensure that, if these overlapping contingencies occur during nearly any plausible adverse weather condition, all loads in the SDG&E service area could still be served. The

[20] In 1983, when the SWPL was built, the peak demand in the SDG&E service area was about 2070 MW. In 2004, the SDG&E service area recorded a peak demand of 4,065 MW.

Sunrise Powerlink will also allow for the future retirement of older, less-efficient gas-fired generating units located in the San Diego area. If just the South Bay generating station retires as expected in late-2009, SDG&E will not be able to satisfy the CAISO's G-1/N-1 reliability requirement beginning in 2010, even with the needed addition of significant new in-basin generating capacity to be provided by the Palomar and Otay Mesa generating plants.

2. Renewable Energy

The Sunrise Powerlink will provide more economical access to remote areas with the potential for significant development of renewable energy sources and will encourage the development of new renewable generation thereby diversifying the state's resource mix and reducing California's reliance on fossil fuels.

SB1078 requires California's investor owned utilities to procure 20% of their electric retail sales from eligible renewable resources by the year 2017. SB1078 also requires retail sellers of electricity, including SDG&E, to increase their procurement of renewable energy by 1% per year. The EAP strives to attain the 20% goal by 2010 rather than 2017. The Commission has adopted this accelerated goal and is considering the feasibility of achieving a goal of 33% by 2020.[21] The Commission is also requiring LSEs to supply 20% of their energy needs from renewable energy resources by 2010.[22]

SDG&E is moving aggressively to meet the 2010 goal of supplying 20% of SDG&E's bundled customer energy requirements with renewable energy sources. While some economically viable renewable resource potential appears to exist within the San Diego basin, principally wind generation on the eastern edge of SDG&E's service area

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21 See I.05-09-005 (2005).

22 See D.05-11-025, Ordering Paragraph 1, at p.27.

and concentrating solar power in the Borrego Springs area, far greater quantities have been identified outside of the SDG&E service area. As clearly documented in both the IVSG report[23] and the San Diego Regional Renewable Energy Study Group Report,[24] the Imperial Valley and eastern San Diego County areas hove significant geothermal, solar, and wind resource potential. Increasing the ability to import power from the Imperial Valley will allow SDG&E to meet the renewable resource goals at a cost that will not be burdened by high levels of congestion.

SDG&E has been negotiating with a number of developers to procure renewable energy resources in the Imperial Valley. The Sunrise Powerlink will ultimately be essential to delivering this renewable power to the San Diego area.[25]

Through its negotiations, SDG&E has already taken significant steps to meet its renewable energy goals in 2010. SDG&E has signed a contract with Stirling Energy, a solar thermal developer, to purchase the output of a 300 MW facility to be located in the Imperial Valley. Commercial operation of this facility must begin no later than 2010. Two subsequent phases of the project could add another 600 MW of solar thermal power capability. Commission approval of the contract for its first two phases is expected to be issued in December 2005. The contract delivery point for all three phases of the project is dependent on the timing of SDG&E's construction of the Sunrise Powerlink.

Should the in-service date of the Sunrise Powerlink be delayed past June 2010, Stirling Energy would make contract deliveries to SDG&E at the existing Imperial Valley

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[23] See *Development Plan for the Phased Expansion of Transmission to Access Renewable Resources in the Imperial Valley,* September 30, 2005, at http://www.energy.ca.gov/ivsg/documents/2005-09-30_IVSG_REPORT.PDF ; and *Potential for Renewable Energy in the San Diego Region,* August 2005, at: http://www.renewablesg.org/docs/Web/Ch1_ExSummary.pdf

[24] Potential for Renewable Energy in the San Diego Region, dated August 2005 (http://renewablesg.org).

[25] Additional information regarding the outcome of these may be available at a later date.

substation. If the Sunrise Powerlink is placed in-service by the end of June 2010, the contract delivery point will be that established by the interconnection agreement between Stirling, SDG&E and the CAISO. SDG&E anticipates that the point of interconnection between the Stirling project and the CAISO grid will be at either the Imperial Valley substation; or at a new 500/230 kV substation that may be built along the Sunrise Powerlink at a point that is on the edge of the Imperial Valley, due west of the southern tip of the Salton Sea. Either way, the Sunrise Powerlink, along with other existing transmission connections between the Imperial Valley and the San Diego basin, will deliver a significant portion of the output of the Stirling project to the San Diego area.

3. <u>Economics</u>

Through the analysis presented in this application, SDG&E concludes that the Sunrise Powerlink is cost effective for California electricity customers and will produce net energy savings of up to $57 million per year over the life of the project. These savings will result from reduced congestion and Reliability-Must-Run ("RMR")[26] costs and increased access to lower-cost sources of power in the desert Southwest. SDG&E projects that the total energy savings provided by project to all CAISO consumers, before accounting for the project's fixed costs, are $210 million per year on a levelized basis. This includes $96 million per year in savings as a result of reduced congestion and higher grid dispatch efficiency throughout the CAISO control area and $114 million per year from reduced RMR contract costs in the San Diego service area.[27]

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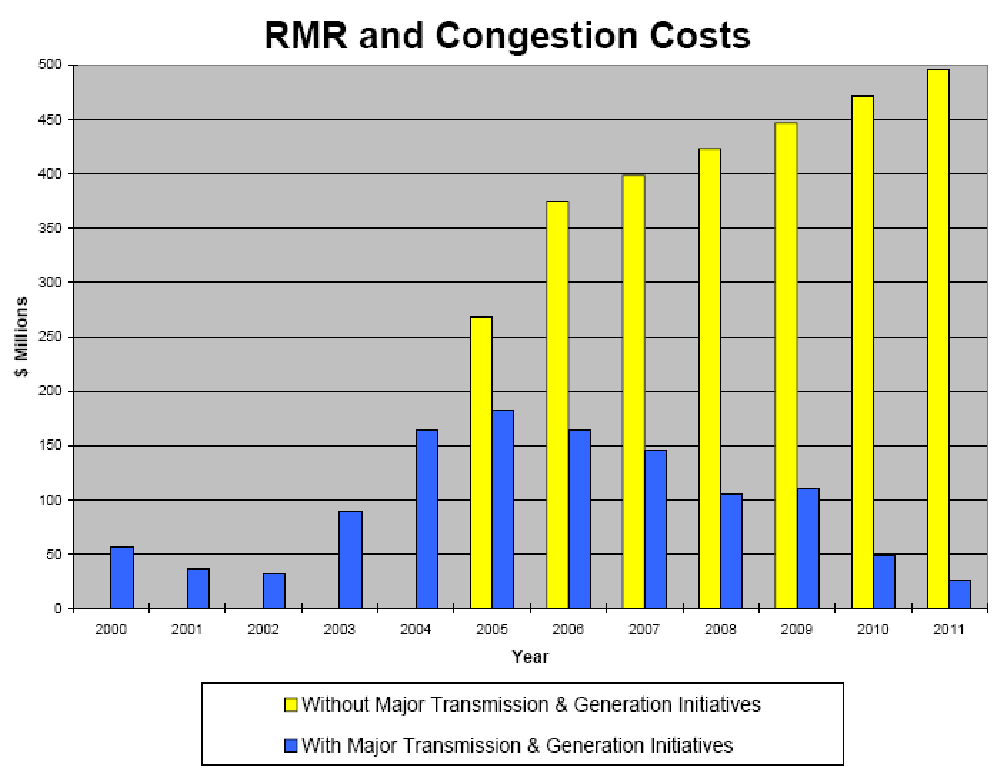
[26] RMR describes contracts between the CAISO and generators in certain constrained areas that require such generators to be available and run at the CAISO's direction. The costs of RMR contracts are borne by the customers within the constrained area. This is addressed more thoroughly in Chapter V, Economic Benefits.

[27] The project will also provide about $1 million per year savings as a result of reduced line losses.

Increasing RMR costs have been a significant issue for San Diego are customers. The following chart illustrates the projected in increase in these costs over the next few years. This chart also shows the significant savings that will be provided by the major transmission and generation initiative being aggressively pursued in the San Diego area.[28] The Sunrise Powerlink will further reduce RMR costs and secure greater energy savings for San Diego customers, particularly if the project is expeditiously completed and not unnecessarily delayed.



28 The chart reflects the combined effect of such measures as the Mission-Miguel transmission upgrade, and the future addition of major generation assets, most notably the Palomar plant (541 MW in 2006) and the Otay Mesa plant (561 MW in 2008). RMR as currently structured may not continue in the long-term. However, the fundamental nature of local reliability demands and the cost of meeting such demand must continue in one form or another.

The Sunrise Powerlink will also augment existing transfer capability between the desert Southwest and California load centers and accommodate the retirement of aging and inefficient, gas-fired generation in the San Diego area by providing an increased ability to access capacity sources. By reducing congestion costs and losses, CAISO consumers[29] will be able to access low cost sources of power in the desert Southwest at reasonable prices and, at the same time, the improved access offers developers of conventional power plants an incentive to build new, efficient, generating capacity. The project will also enhance competition among the generating companies that supply power to California, putting downward pressure on energy costs.

G. **Conclusion**

For all of these reasons, SDG&E believes that construction and operation of the Sunrise Powerlink is in the best interest of California and electricity customers. These significant and diverse benefits—maintaining reliability, promoting renewable energy, and reducing energy costs—are best achieved through this proposed transmission project. Accordingly, SDG&E requests that the Commission approve the proposed scope of facilities and find that the Sunrise Powerlink is necessary and in the public interest given its intended purpose and resulting benefits. SDG&E fully documents and supports this purpose and need in the following testimony, which is organized as follows:

- Chapter II – Describes the potential scope and cost of the facilities that SDG&E is considering as part of the Sunrise Powerlink;
- Chapter III – Indicates how the project will enhance SDG&E's ability to reliably serve its customers, consistent with the reliability requirements of the CAISO;

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29 As noted previously, these benefits will accrue to ratepayers who receive transmission service from facilities that are under the operational control of the CAISO.

- Chapter IV – Describes how the Sunrise Powerlink will substantially increase SDG&E's and California's access to renewable energy;
- Chapter V – Details how the project will provide significant economic benefits to all CAISO ratepayers;
- Chapter VI – Addresses the various transmission and non-transmission alternatives to the Sunrise Powerlink and explains why these alternatives are not feasible and/or are inferior to the proposed project.

This concludes this chapter.

SUNRISE POWERLINK

CHAPTER II

SCOPE AND COST

SDGE

A Sempra Energy utility

Application No.: A.05-12-______

Exhibit No.: ____________________

Date: December 14, 2005

Witness: Jan Strack

II.

SCOPE AND COST

This Chapter addresses the proposed scope and estimated cost of the Sunrise Powerlink transmission project. It sets forth the technical requirements that determine the minimum performance requirements for the new line and describes the general process SDG&E used to identify the project elements. SDG&E will provide a detailed description of the proposed project in its PEA which SDG&E expects to file with the Commission by the middle of 2006.[1] The major elements of the scope and estimated cost are described below.

The general path of the Sunrise Powerlink will be between the Imperial Valley substation and the central portion of San Diego County as illustrated in Figures II-1 and II-2 in Appendix II. At this time, SDG&E has not selected a specific route for the Sunrise Powerlink and is currently in the process of determining the best route and design for the project which is being informed by an extensive community outreach effort initiated by SDG&E.

Because specific route selection will be done through a routing study and public involvement process, SDG&E is providing herein a "low-end" and a "high-end" cost estimate of $1.015 billion and $1.437 billion, respectively, as discussed in Section C below. These costs are provided for the Commission's information in order to support its determination that the Sunrise Powerlink is needed and in the public interest. In its forthcoming PEA filing, SDG&E will provide detailed engineering cost estimates based on a specific project route as determined through the public route selection process.

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[1] At the time of this filing, SDG&E expects to complete the PEA sometime during the 2nd quarter of 2006 and to file its CPCN application shortly thereafter.

A. **Proposed Scope**

The proposed project scope evolved out of work performed in an outreach effort aimed at interested stakeholders and led by a Technical Working Group in coordination with the Statewide Transmission Expansion Plan ("STEP").

The STEP was formed in November 2002 as an ad hoc voluntary organization to provide a forum for participating in the planning, coordination, and implementation of transmission systems between the Arizona, Nevada, Mexico and southern California areas. Membership in STEP is open to all interested stakeholders and the organization's goal is to facilitate the development of transmission infrastructure capable of supporting a competitive, efficient, and seamless wholesale electricity market while meeting established reliability standards.

The Technical Working Group was formed in October 2004 and included representatives of the CAISO, CEC, SDG&E, SCE, IID, CFE, APS, LEAPS, Intergen, Coral Energy, and Sempra Energy Resources. The Technical Working Group forum was managed as an open process and reported to the regional planning meetings of the STEP. Its goal was to review the technical merits of a high voltage transmission line that would serve San Diego.

The Technical Working Group completed a comprehensive screening study which reviewed *eighteen* transmission alternatives. Each alternative was evaluated based on its various merits and a "short list" of the best four was developed. These four alternatives were subjected to matrix analysis, focusing on three main criteria:

- Grid reliability and technical performance;
- Access to renewable energy; and
- Economics.

As described in SDG&E's October 4, 2005 *Report for SDG&E's Transmission Comparison Study*,[2] the matrix analysis weighed the performance of the four alternatives to obtain the ranking shown below.[3]

1. Imperial Valley-Central-Serrano/Valley 500 kV project (or "Full Loop")
2. Imperial Valley-Central 500 kV project (or "Sunrise Powerlink")
3. Imperial Valley-Miguel 500 kV project
4. Serrano/Valley-North 500 kV project

The Technical Working Group determined that the Full Loop[4] option and the Sunrise Powerlink were the best performing transmission alternatives with respect to grid reliability and technical performance, accessing areas of high renewable resource potential, and providing economic benefits. Based on more refined project analysis, cost estimates, and a second round of economic analysis, which is described more fully in Chapter V, Economic Benefits, the Sunrise Powerlink emerged as the preferred project.

1. Imperial Valley-Central Transmission Line Facilities

In general terms the 500 kV transmission line portion of the Sunrise Powerlink will traverse the geographic area between the existing Imperial Valley substation and a new 500/230 kV substation (known as "Central") located in central San Diego County. As such, the line is likely to cross desert terrain, mountains, foothills and inland plains. The "low-end" cost estimate for the 500 kV transmission line portion of the project is based on a length of approximately 75 miles while the "high-end" cost estimate is based on a length of approximately 105 miles.

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[2] This report was prepared by SDG&E in cooperation with the CAISO and STEP participants.

[3] A discussion of the general merits of these four alternatives is provided in Chapter VI, Alternatives.

[4] The Imperial Valley-Central-Serrano/Valley 500 kV project is sometimes referred to as the "Full Loop" project because it completes the 500 kV path through the Southern California load centers. Today, there is no 500 kV connection between the Los Angeles and San Diego areas.

The proposed 500 kV transmission line is assumed to use a combination of single circuit, self supporting tubular steel poles and lattice steel towers. The 500 kV line will be designed for thermal powerflow capability greater than 2,000 MW in anticipation of future needs. A combination of new rights-of-way and construction of access roads in conjunction with the expansion of some existing rights-of-way will also be required for the proposed transmission line. Since the route selection process has not been completed at the time of this filing, the engineering details such as conductor type and structure heights have not been finalized and thus, are not included in this filing.

2. Substation Facilities

The future Central substation will be located somewhere in central San Diego County. It is anticipated that this new substation will require approximately 80 fenced acres, reached via an access road. The proposed substation acreage will accommodate future expansion. Additional land may be required outside of the fenced area to provide for a transition area between the substation and surrounding properties, depending on the location.

Transformation capability at the Central substation will be comprised of two 500/230 kV transformer banks, each rated at 1120 MVA. Initially, one 500 kV line with series compensation, two 230 kV lines, and the required supporting protection, metering and communication facilities will be installed. The substation fenced area will have room for additional 500 kV and 230 kV transmission lines and supporting equipment; to accommodate potential growth.

The Sunrise Powerlink will also require modifications to existing substations to increase transformation capability and accommodate the termination of new lines.

3. West of Central Upgrades

The new Central substation will be connected to the San Diego load center via two new 230 kV lines that connect to SDG&E's existing Sycamore Canyon substation. Each of these lines will be rated at approximately 1,000 MW. In addition, a new 230 kV transmission line will be connected between SDG&E's existing Sycamore Canyon and Peñasquitos substations. The estimated length of the 230 kV transmission lines ranges from approximately 35 miles to 51 miles.

The proposed 230 kV transmission lines are assumed to use self supporting tubular steel poles. Some new rights-of-way and construction of access roads may also be required for these lines. Since the route selection process has not been completed at the time of this filing, the engineering details such as conductor type and structure specifications and heights have not been finalized and thus are not included in this filing.

In addition to the new 230 kV lines discussed above, SDG&E will undertake several upgrades to the existing transmission system including installation of capacitors at several locations.

B. Technical Basis of Proposed Scope

The project scope presented in this petition allows at least 4,000 MW to be imported into the San Diego area under all-lines-in-service conditions ("N-0") and is designed to ensure that, at this import level the unexpected outage ("N-1") of the most critical element of the grid, either the Imperial Valley-Miguel segment of the Southwest Power Link ("SWPL") or the North Gila-to-Imperial Valley segment of the SWPL, will not result in any violations of the applicable requirements of the Western Electricity Coordinating Council's ("WECC") reliability criteria. The project scope is also designed to satisfy the CAISO's G-1/N-1 reliability criteria[5] for the SDG&E transmission system. Pursuant to this criteria, if the largest generating unit within the San Diego area is unavailable, and there is an over-lapping outage, commonly known as a "G-1/N-1" outage condition, of the most critical element of the transmission grid, there will be no loss of load for any subsequent transmission outage.

For purposes of this filing, power flows into the San Diego basin are defined as the sum of: (a) flows into Miguel substation on the SWPL; (b) flows into the northern part of SDG&E's system on the five 230 kV lines connecting to SONGS; (c) flows into the San Diego area on the 230 kV line that connects SDG&E's local system to CFE's Tijuana substation; and (d) flows into the Central substation on the Sunrise Powerlink.

To establish the technical performance of the Sunrise Powerlink, SDG&E studied "heavy summer," "heavy winter" and "light autumn" conditions. These studies ensure that the project scope satisfies applicable reliability criteria across a range of system conditions. SDG&E believes the project scope identified above will satisfy applicable reliability criteria across a wide-range of possible system conditions.[6]

The WECC reliability criteria require SDG&E to demonstrate under the conditions tested, that with all facilities in service ("N-0"[7] or "Category A") there is no

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[5] The CAISO's reliability criteria are set forth in section II.3 of the February 7, 2002 *California ISO Planning Standards*. The requirement to apply the G-1/N-1 reliability criteria under adverse weather conditions is described under "Projected Customer Demands" in section IV of the document.

[6] This does not mean that construction of the Sunrise Powerlink will completely eliminate the possibility of loss of load or congestion. There are an infinite number of possible system conditions and it is impossible to anticipate and study them all. Moreover, there are very low probability events, such as the simultaneous loss of many transmission lines, or extreme weather conditions which are well beyond common industry planning practices and financially impractical to mitigate.

[7] For purpose of this discussion "N-0" indicates that all individual transmission line segments, individual transformers, and individual generators are either in-service or available to operate. "N-1" indicates at least one of these elements is forced out or unavailable to operate. "N-1-1" and "N-2" indicates at least two of these elements are forced out or unavailable to operate.

loss of load and thermal overloads or unacceptable voltages anywhere on the grid. SDG&E is also required to demonstrate that with all lines in service, the subsequent outage of a single transmission line, generator or transformer ("N-1" or "Category B") will not result in loss of load, thermal overloads, unacceptable voltages, or electrical instability anywhere on the grid.

Generally speaking, a Plan of Service for the Sunrise Powerlink and Full Loop were developed through a detailed analysis involving several iterative steps. First, potential elements of the Plan of Service, including associated projects and incidental project details, were developed to address initial overloads. Then, these potential elements were evaluated to determine whether any additional downstream elements were overloaded as a result of the first set of fixes. If overloaded, these additional downstream elements were fixed in the engineering analysis model, which led to a modification of the plan of service. The process was then repeated until ultimately a Plan of Service was developed. Finally, each element was rechecked to confirm its need in a final Plan of Service. This entire iterative process was done in close coordination with the annual grid assessment process, which studied the years prior to the Sunrise Powerlink in detail. In identifying the Plan of Service for the Sunrise Powerlink, SDG&E accounted for the effects of the system modifications identified through the grid assessment process.

The project scope was not modified to mitigate overloads resulting from double outages ("N-2"), common corridor contingencies, bus outages or breaker failure ("Category C" and "Category D"). The WECC reliability criteria allows the use of controlled load-shedding and operating procedures to address these more extreme, but improbable, outage conditions.

The project scope was next reviewed for any additions or modification that might be necessary to maintain stability and ensure proper dynamic performance of the system. This was done by performing transient stability and post-transient stability studies. Transient stability studies are designed to ensure that the system can ride through selected critical faults while maintaining good voltage, frequency, synchronization among the system parts or elements, and electrical equilibrium between load and generation (i.e., no undamped oscillations). The NERC/WECC Reliability Criteria and Planning Standards were used to make this determination.[8] Post-Transient stability studies are designed to ensure that an electrical system can maintain acceptable voltage levels, retain voltage stability and avoid voltage collapse following selected critical faults on the system. These post-transient stability studies were performed using the Reactive Power Margin Requirement criteria[9] under the WECC Guidelines (NERC/WECC Planning Standards, I.D. WECC-G2) as a proxy for the WECC Standards I.D. WECC-S1, S2 and S3.

C. <u>Estimated Cost</u>

SDG&E sought to develop conservative (i.e., realistic, but not likely to exceed) cost estimates for the Sunrise Powerlink that would reflect the range of terrain and siting challenges in the project study area. The goal of this analysis was to develop a cost range sufficiently reliable to support the Commission's finding of need for the project. Because route and site selection are not complete and are subject to an extensive routing study and public involvement process, the cost estimates are based on the scope of the project described herein, rather than route- and site-specific, detailed design and engineering.

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8 See Table W-1, "WECC Disturbance Performance Table of Allowable Effects on Other Systems."

9 The Reactive Power Margin Requirement is also known as the V-Q Methodology and was developed by the Technical Studies Subcommittee of the WECC.

For purposes of estimating the potential cost of the Sunrise Powerlink, representative “transects”, or study corridors, were identified. To accomplish this, SDG&E isolated three general areas where the conceptual Central substation could potentially be located. Next, within the broad geographic area between: (1) the Imperial Valley substation; (2) the three representative Central substation locations; and (3) the Sycamore Canyon and Peñasquitos substations; a total of thirty-five transects were identified.

These transects were identified based on existing linear features, in some instances having associated existing rights-of-way, providing a feasible opportunity for locating a new transmission line immediately adjacent or parallel to the existing feature. The identified transects covered a variety of mileages, terrain types, geology, and rights-of-way opportunities that may be encountered between Imperial Valley, Central and Peñasquitos substations.

For each transect, cost estimates were developed based on assumptions made for project details including structures type (i.e., lattice or tubular steel poles), structure quantities, conductor, hardware, foundations, access roads, rights-of-way acquisition and environmental mitigation. Using these assumptions, conceptual cost estimates were developed for each transect using recent cost information for land rights, labor, equipment and materials. For some transects, two estimates were developed, one using steel pole for the transmission structures, and one using lattice towers.

After the estimates for all transects were developed, corridors for the “high-end” and “low-end” estimates were selected. The “low-end” estimate corridor was comprised of those transects reflecting the shortest distance between the Imperial Valley and the nearest area identified for the Central substation. The "high-end" estimate corridor was comprised of those transects reflecting the longest distance to reach the Central substation areas. For this latter estimate, we used the conservative assumption of all-steel pole construction for the 500 kV portion of the route. It was assumed that all of the 230 kV lines would be on steel poles for both the high-end and low-end estimates.

For the estimates related to substation facilities, the initial step was to determine the configuration of the proposed Central substation and the upgrades to existing substations. This included the development of preliminary one-line diagrams, general arrangement drawings and equipment lists. For the Central substation, costs for property acquisition and site development were estimated based on several potential sites in the study area with varying terrain, geology, and property costs.

Based on these estimates, SDG&E believes the cost of constructing the Sunrise Powerlink will be $1.015 billion on the "low-end" and $1.437 billion on the "high-end." These estimates include: (1) the costs of all work on the project, including necessary substation upgrades, upgrades west of the Central Substation and upgrades elsewhere on the SDG&E system; (2) engineering, environmental, construction management, and other support services; (3) accounting overheads including Allowance for Funds Used During Construction ("AFUDC"); (4) escalation; and (5) appropriate contingencies. Assuming a 40-year project life and Operating & Maintenance ("O&M") costs of $10 million per year (in 2010 dollars), the levelized annual costs of the project are estimated at $153 million on the "low-end" and $212 million on the "high-end."

Table II-1 shows the projected annual revenue requirements necessary to recover the costs of building and operating the Sunrise Powerlink. This information is also used in the analyses presented in Chapter V, Economic Benefits and Chapter VI, Alternatives.

It should be emphasized that while these cost estimates are based on the study corridors described above, the identification of such corridors for estimating purposes in no way reflects a preferred route for the Sunrise Powerlink or pre-judges the routing study and public involvement process now underway. It is possible that the final route selected could vary substantially from the representative study corridors used in this cost assessment. In that event, SDG&E still believes the process used to identify these estimates adequately reflects the range of costs and challenges that will be encountered by the Sunrise Powerlink project.

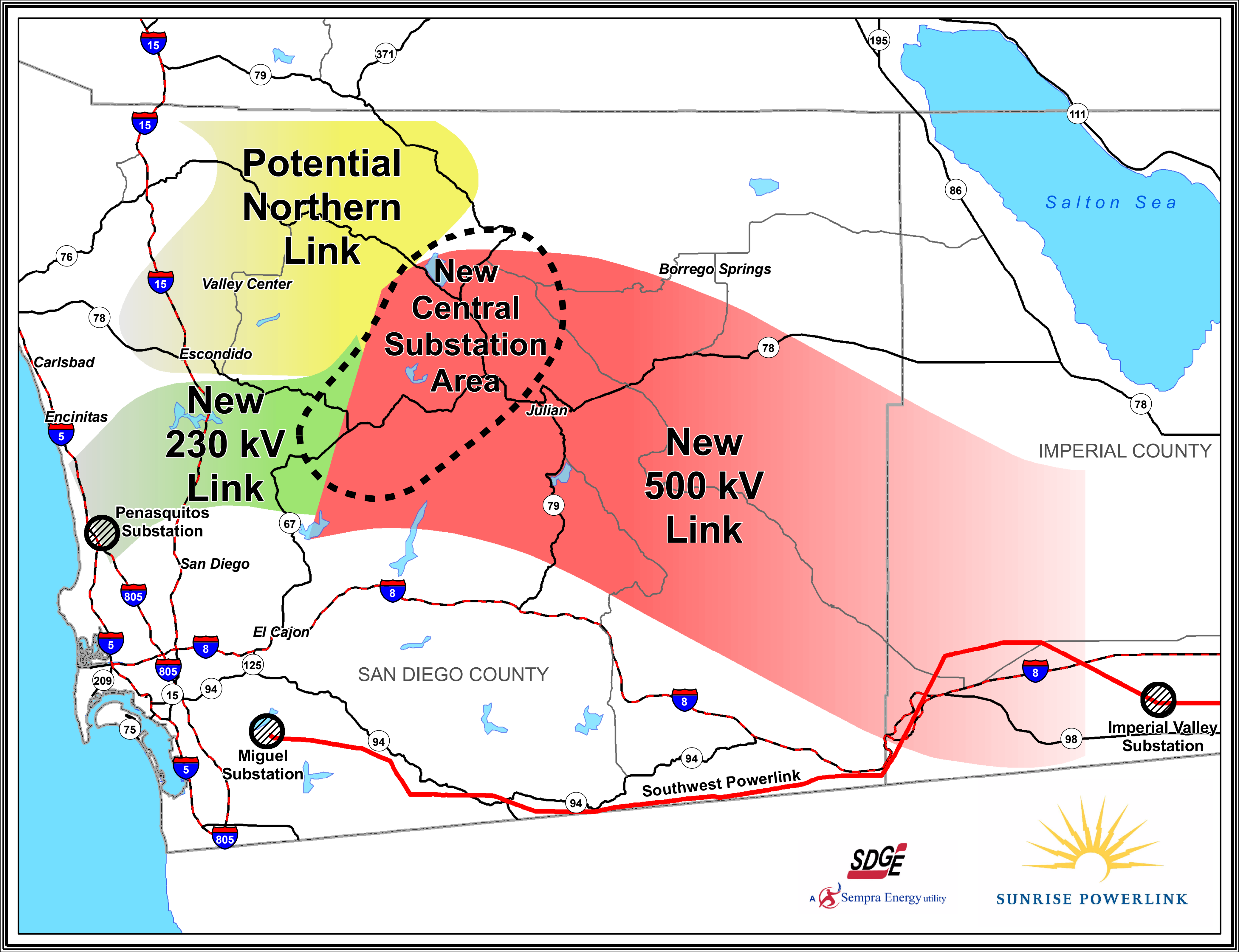
This concludes this chapter.

APPENDIX II

Table II-1 ($millions)

$Millions	Capital Recovery Revenue Requirement [1]		**SUNRISE POWERLINK**	Total Revenue Requirement	
Year	"Low" Cost Estimate	"High" Cost Estimate	O&M	"Low" Cost Estimate	"High" Cost Estimate
2008[2]	21	33	-	21	34
2009	23	35	-	23	36
2010	183	258	10	196	272
2011	169	238	10	182	252
2012	163	230	11	176	243
2013	156	221	11	169	235
2014	150	212	11	163	226
2015	144	204	11	158	218
2016	138	196	12	152	211
2017	133	188	12	147	203
2018	127	180	12	141	195
2019	121	172	13	136	188
2020	116	165	13	130	180
2021	110	157	13	125	172
2022	104	149	14	119	165
2023	98	141	14	114	157
2024	93	133	14	108	149
2025	88	126	15	104	142
2026	84	121	15	100	138
2027	81	116	15	97	133
2028	77	112	16	94	129
2029	74	107	16	91	125
2030	71	103	16	88	121
2031	68	99	16	85	117
2032	65	94	17	82	112
2033	61	90	17	80	108
2034	58	85	17	77	104
2035	55	81	18	74	100
2036	52	77	18	71	96
2037	49	73	18	68	92
2038	46	68	19	65	88
2039	43	64	19	62	84
2040	40	61	19	60	81
2041	38	57	20	58	78
2042	35	53	20	55	74
2043	31	48	20	52	69
2044	25	38	20	46	60
2045	22	35	21	43	57
2046	20	32	21	41	53
2047	12	21	21	34	43
2048	23	36	22	45	58
2049	21	33	22	44	56
Total	**3,285**	**4,741**	**639**	**3,978**	**5,453**

[1] Includes working cash component derived from O&M expenses.
[2] Land acquisition. Current accounting practice is that land be booked as plant-in-service when purchased if construction is started within twelve months of the purchase.

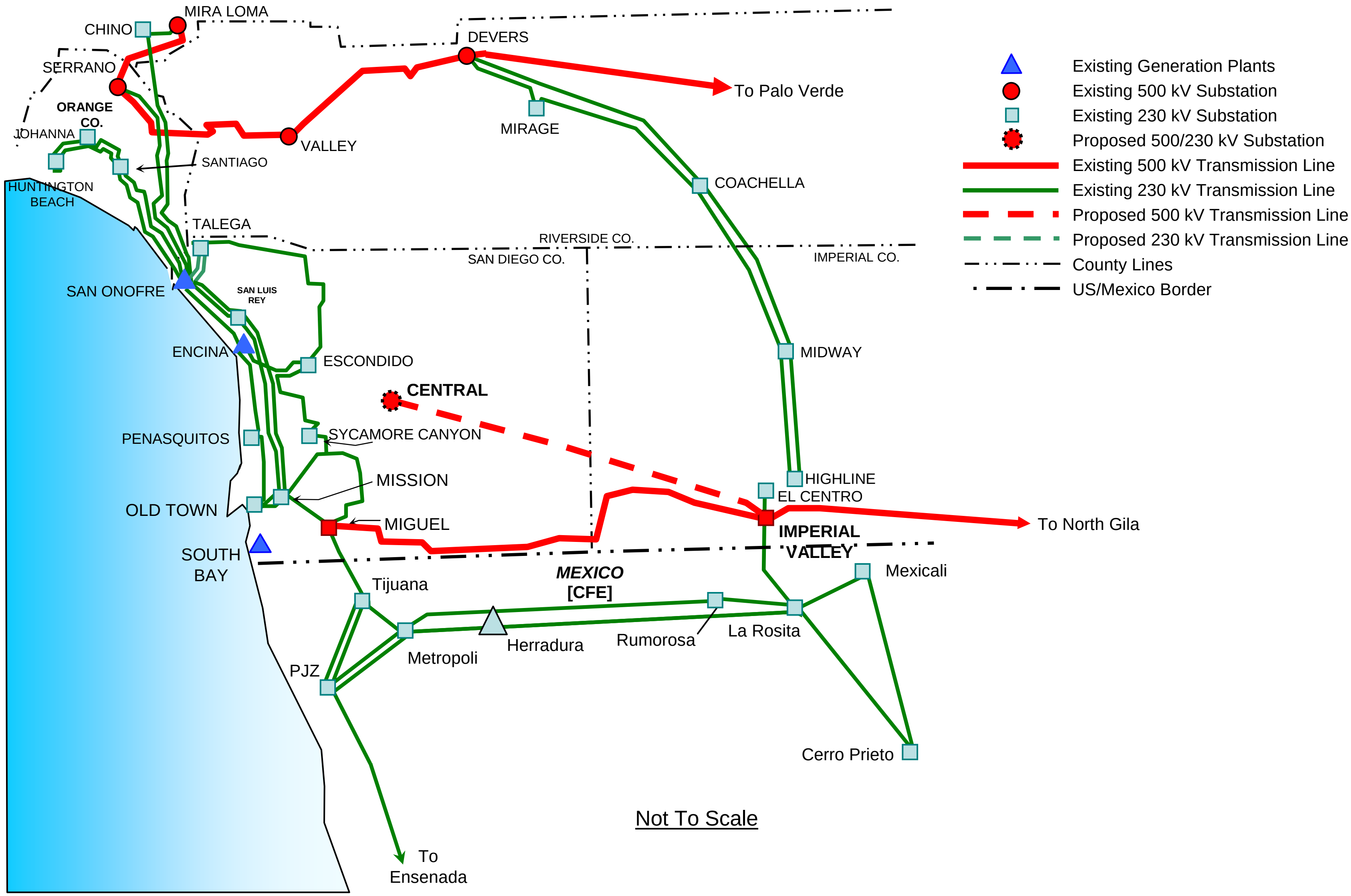


Potential Northern Link
New Central Substation Area
New 230 kV Link
New 500 kV Link
Salton Sea
IMPERIAL COUNTY
SAN DIEGO COUNTY
Borrego Springs
Valley Center
Escondido
Carlsbad
Encinitas
Julian
San Diego
El Cajon
Penasquitos Substation
Miguel Substation
Imperial Valley Substation
Southwest Powerlink
15
79
371
195
111
86
76
78
5
67
805
8
125
94
209
75
98
SDGE
A Sempra Energy utility
SUNRISE POWERLINK

Figure II-2

Imperial Valley – Central

(Sunrise Powerlink)



SUNRISE POWERLINK

CHAPTER III

RELIABILITY

SDGE
A Sempra Energy utility

Application No.: A.05-12-

Exhibit No.: ___

Date: December 14, 2005

Witness: Jan Strack

III.

RELIABILITY

This Chapter addresses the reliability benefits the Sunrise Powerlink will provide. SDG&E's service territory has experienced a significant increase in electric demand since the last major transmission line, the Southwest Powerlink ("SWPL"), was built in 1983.[1] Based on SDG&E's current forecast of peak demand over the next ten years (2006 through 2015), the SDG&E service area will face a significant resource deficiency, particularly if there are critical generation and transmission outages during adverse summer weather conditions, absent major infrastructure to mitigate the deficiency.

SDG&E has an obligation to ensure: (1) that it has—in accordance with the requirements of the Commission—arranged sufficient generating capacity to serve its bundled customer energy needs, and (2) that—in partnership with the CAISO—energy can be transmitted to meet the electric needs of all consumers in the SDG&E service area in accordance with applicable reliability criteria. SDG&E meets this service obligation through a mix of energy efficiency programs, demand reduction, new in-area generation, and transmission infrastructure. However, absent greater transmission import capability it will not be possible to meet the CAISO's G-1/N-1 reliability requirements, as applied to the San Diego area transmission system, during a ten-year planning horizon.

The Sunrise Powerlink will enable the San Diego transmission system to meet the CAISO's reliability requirements with adequate margins for the years 2010 through 2015. These margins are the result of the 1,000 MW of increased import capability the project will provide under the CAISO's G-1/N-1 reliability criteria.

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[1] When the SWPL was built in 1983, the peak demand in the SDG&E service area was 2,069 MW. In 2005, the SDG&E service area recorded a peak demand of 4,058 MW.

A. Background

Reliability benefits encompass the ability to meet load under any reasonably plausible system condition as well as a range of system conditions that may fall outside of conventional planning standards. The CAISO's G-1/N-1 reliability requirement for the San Diego area transmission system dictates that the sum of (a) available in-area generation less the largest single in-area generator[2], and (b) the maximum imports into the SDG&E service area assuming certain transmission contingencies, equals or exceeds the load within the service area under adverse weather peak load conditions. In particular, the CAISO's G-1/N-1 reliability criteria requires that there be no loss of load, thermal overloads, or unacceptable voltages in the event that (a) the largest generator in the local area and the most critical transmission element are already out of service, and (b) there is a subsequent outage of another transmission element.[3]

B. Load Conditions

The use of adverse weather peak load conditions is required by the CAISO's interpretation of NERC/WECC's planning standards governing the level of projected customer demands that are to be used in addressing local load serving concerns.[4] The CAISO's interpretation states that "for studies that are addressing local load serving

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2 The CAISO's planning standards do not specifically indicate which generator should be considered the "G-1" outage for purposes of applying the CAISO's G-1/N-1 reliability criteria. However, in practice the CAISO has used the "largest" generator within a local area.

3 The CAISO's G-1/N-1 criteria is more stringent than the NERC/WECC reliability criteria in that the CAISO does not permit load to be dropped in the event of a subsequent outage. The NERC/WECC Category C reliability criteria permits controlled load drop in the event of an overlapping G-1/N-1 event followed by the outage of another transmission element. (Refer to the WECC's April 2005 *Reliability Criteria*, Table I, Category C: "Event(s) resulting in the loss of two or more (multiple) elements.")

4 The NERC/WECC planning standards provide that interconnected transmission systems shall be designed to accommodate "all demand levels over the range of forecast system demands" (see section I, page 9 of WECC's April, 2005 *Reliability Criteria*). The WECC's *Reliability Criteria* specifies that "regions, subregions, power pools, and their members" are to "develop planning criteria and guides that are applicable to their respective areas and which are in compliance with NERC Planning Standards" (refer to the Introduction, page 5).

concerns, the studies should assume a 1 in 10-year extreme weather load level."[5]

Because SDG&E is addressing options to satisfy local service area loads in year 2010 and beyond, SDG&E is obligated to study service area peak load levels in each year that have a 10% probability of occurrence (i.e., one year in ten).

C. Reliability With and Without the Sunrise Powerlink

Table III-1 below summarizes the results of the grid reliability analysis performed by SDG&E and illustrates the fact that given the present G-1/N-1 import limitation into the San Diego area of 2,500 MW, and absent significantly greater in-area generation, it will not be possible to meet all loads under adverse weather conditions, for a wide range of resource scenarios within a ten year planning horizon (2006 through 2015).

Table III-1

Without the Sunrise Powerlink
Surplus/(Deficiency) Outcomes (MW)

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
No Retirements (with Otay Mesa)	261	155	629	531	440	349	255	162	65	**(35)**
Encina 4 Retired (with Otay Mesa)	261	155	330	232	141	50	**(44)**	**(137)**	**(234)**	**(334)**
No Retirements and No Otay Mesa	261	155	88	**(10)**	**(101)**	**(192)**	**(286)**	**(379)**	**(476)**	**(576)**
South Bay Retired [6] (with Otay Mesa)	261	155	629	531	**(262)**	**(353)**	**(447)**	**(540)**	**(637)**	**(737)**
Encina All Retired (with Otay Mesa)	261	155	629	531	440	**(611)**	**(705)**	**(798)**	**(895)**	**(995)**
South Bay and Encina All Retired (with Otay Mesa)	261	155	629	531	**(262)**	**(1313)**	**(1407)**	**(1500)**	**(1597)**	**(1697)**

[5] "*California ISO Planning Standards*" dated February 7, 2002. Appendix III provides SDG&E's adverse weather demand forecast.

[6] Baseline Planning Scenario.

This analysis clearly shows that new transmission is needed to increase the import capability into the San Diego area in order to meet the CAISO's G-1/N-1 reliability requirement. The timing of the need for new transmission line varies from 2009 to 2015 depending on variations in resource assumptions.[7] Under SDG&E's "baseline" planning scenario,[8] a deficiency of 262 MW will occur in 2010 and grow to 739 MW in 2015.

Table III-2 indicates the impact the Sunrise Powerlink will have on the ability to maintain reliable service within the San Diego area. With the Sunrise Powerlink in service by 2010, the San Diego area transmission system will be able to satisfy the CAISO's G-1/N-1 reliability requirement with appropriate margins in the years 2010 through 2015. This analysis assumes that with the Sunrise Powerlink, 3,500 MW can be imported into the San Diego area without violating the CAISO's G-1/N-1 reliability requirement.

Table III-2

With the Sunrise Powerlink

Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
90/10 Load Forecast	4636	4742	4849	4947	5038	5129	5223	5316	5413	5,513
Available Generation	2938	2938	3539	3539	2837	2837	2837	2837	2837	2837
less "G-1"	541	541	561	561	561	561	561	561	561	561
Generation (less G-1)	2397	2397	2978	2978	2276	2276	2276	2276	2276	2,276
"G-1/N-1-1" Import Level	2500	2500	2500	2500	3500	3500	3500	3500	3500	3,500
Generation + Imports	4897	4897	5478	5478	5776	5776	5776	5776	5776	5776
Surplus/(Deficiency)	261	155	629	531	**738**	**647**	**553**	**460**	**363**	**263**

G-1 Assumptions:
2006 – Palomar Plant (541 MW)
2008 – Otay Mesa Plant (561 MW)

Other Assumptions:
2008 – Lake Hodges (40 MW)
By 2010 – South Bay Retired (702 MW)
By 2010 – Sunrise Powerlink

[7] The assumptions used in this assessment for peak demand, energy efficiency, demand response and generation resources are discussed in Appendix III.

[8] The baseline scenario assumes Palomar (541 MW) in 2006, Otay Mesa (561 MW) in 2008, and the retirement of South Bay (702 MW) by 2010.

D. Import Capability

With the Sunrise Powerlink, the CAISO's G-1/N-1 reliability requirement will be met because there will be a significant increase in the amount of power that can be imported into the San Diego area under the applicable transmission line contingencies. SDG&E has performed studies with the Sunrise Powerlink in-service indicating that with 3,500 MW of imports into the San Diego area, it will be possible to readjust the system without loss of load following an outage of the Imperial Valley-Miguel 500 kV line and in anticipation of the possible subsequent outage of the North Gila-Imperial Valley 500 kV line. In other words, at a combined import of 3,500 MW,[9] the outage of the Imperial Valley-Miguel 500 kV line, system readjusted, followed by the outage of the North Gila-Imperial Valley 500 kV line, would result in flows that are at or below 100% of the emergency rating of all remaining in-service transmission elements.[10] In addition, under these contingency conditions, and at the indicated import level, all voltages are within permissible limits.

Absent new import capability, the maximum level of imports that can be achieved with the Imperial Valley-Miguel 500 kV line out of service—anticipating the subsequent outage of one of the SONGS-Talega 230 kV lines—is constrained by thermal limitations on SCE's Barre-Ellis 230 kV line. In other words, at a combined import of 2,500 MW[11] the outage of the Imperial Valley-Miguel 500 kV line—assuming the existing Remedial Action Scheme cross-trips the Imperial Valley-La Rosita line 230 kV line, followed by the outage of one of the SONGS-Talega 230 kV lines—would result in power flows at or

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[9] This assumes a net *scheduled* interchange of zero between CFE and the CAISO grid.

[10] The NERC/WECC *Reliability Criteria* allow the use of emergency ratings "as required to permit operating steps necessary to maintain system control". See "a)" under the "Footnotes to Table I",

[11] The 2,500 MW simultaneous import capability for the SDG&E service area assumes a net scheduled interchange of zero between CFE and the CAISO grid.

below 100% of the emergency rating of all remaining in-service transmission elements. In addition, under these outage conditions, and at the indicated import level all voltages will be at or within permissible limits.

It is important to note that the addition of a second 500 kV interconnection will improve the delivery of power into the San Diego transmission system by providing an alternate delivery point to the Miguel substation. The SDG&E transmission system has several critical corridors where transmission lines are on common towers or rights-of-way. These corridors face vulnerabilities such as fires, landslides, inclement weather, human error and intentional acts. This loss of one of these key transmission corridors within could have a large impact on the SDG&E system. While the CAISO reliability criteria does allow load dropping due to loss of a transmission corridor, the amount of load that could be required to be shed could be quite significant. In addition to meeting the need to serve San Diego area customers, the Sunrise Powerlink will dramatically reduce the risk of exposure to customers due to a catastrophic event such as the loss of a key transmission corridor.

This concludes this chapter.

APPENDIX III

ASSUMPTIONS

This Appendix discusses the various assumptions underlying the RMR and energy dispatch analysis presented in this chapter. Sections A through E below address the areas of electricity demand, energy efficiency, demand response, self-served load and larger generation. The assumptions used in this analysis are consistent with SDG&E's Long-Term Resource Plan ("LTRP"), as adopted by the Commission in D.04-12-048.[1]

A. Electricity Demand

A critical input to the reliability analysis is the long-term forecast of electricity demand. Two load conditions are used for the analysis. For this reliability analysis, SDG&E forecasts the system peak load in each year that has a 10% probability of occurrence (i.e., once in ten years). This is also referred to as the "90/10" peak load condition or forecast and is required by the CAISO's interpretation of NERC/WECC's planning standards that are to be used in addressing local load serving concerns.

SDG&E uses econometric and statistical techniques to develop forecasts for system energy requirements and system peak load. In general, the forecasting models integrate input assumptions regarding demographics, economic indicators and activity, weather, energy prices, building and appliance standards, energy efficiency, self-served load, and other measurable factors that affect electricity consumption. Resources were added according to the Commission's preferred loading order as follows:

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[1] Tables III-2 through III-8 incorporate the demand forecast and resources shown in Tables III-9 and III-10 for the "without" and "with" Sunrise Powerlink cases. These tables do not explicitly include possible re-powering or replacement of existing in-area generation resources. From the standpoint of applying the CAISO's G-1/N-1 reliability criteria, a megawatt-for-megawatt re-powering or replacement of existing in-area generation offers no incremental contribution towards meeting the CAISO's requirements. To satisfy the CAISO's criteria, the San Diego area needs a net *increase* in megawatt generating capacity, not just the replacement of *existing* capacity.

- First, forecasted load is reduced by expected future levels of energy efficiency.
- Second, demand reduction programs are incorporated to further reduce the resource need.
- Third, renewable power is added to meet an accelerated Renewable Portfolio Standard ("RPS") target of 20% of energy needs by 2010.
- Finally, conventional resources are added to meet the remaining need. SDG&E tailors resource additions so that in combination with the existing resources, the resource mix includes a combination of base loaded, intermediate and peaking resources to meet the overall load shape for the San Diego service area.

The 90/10 peak demand forecast reflects the embedded impact of historical energy efficiency achievements and self-served load. The forecast also includes reductions due to future incremental energy efficiency savings and self-served load, as shown below. The 90/10 peak demand forecast is not further adjusted to reflect the impact of demand response programs, as discussed in Section C below.

90/10 Peak Load Condition

(MW)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Peak Forecast (90/10)	**4,642**	**4,750**	**4,859**	**4,989**	**5,138**	**5,282**	**5,424**	**5,559**	**5,715**	**5,879**	**6,034**
Less:											
Uncommitted Energy Efficiency	0	0	0	30	86	137	182	223	280	342	405
Self-Served Load (DG)	6	8	10	12	14	16	18	20	22	24	26
Peak Load (90/10)	**4,636**	**4,742**	**4,849**	**4,947**	**5,038**	**5,129**	**5,223**	**5,316**	**5,413**	**5,513**	**5,604**
Less DRP:											
BIP											
Clean Backup											
DLC											
RBRP											
Smart Thermostat											
DRP Subtotal:	0	0	0	0	0	0	0	0	0	0	0
Uncommitted – Price Sensitive (2)											
DRP Total:	0	0	0	0	0	0	0	0	0	0	0
Net Demand (90/10)	**4,636**	**4,742**	**4,849**	**4,947**	**5,038**	**5,129**	**5,223**	**5,316**	**5,413**	**5,513**	**5,604**

B. Energy Efficiency

In D.04-09-060 the CPUC established goals for electricity and natural gas energy efficiency savings for the four largest IOUs, including SDG&E. This decision adopted annual and cumulative goals for energy savings and demand reductions for 2006 through 2013, as shown below. For projecting beyond 2013, SDG&E has estimated future energy efficiency savings based on the trend reflected by past energy efficiency activities.

D.04-09-060 requires the California IOUs to reflect in their resource acquisition and procurement plans full recognition of the aggressive energy savings goals that were adopted (see D.04-09-060 at Ordering Paragraph 6). Accordingly, SDG&E's demand forecast includes the projected energy savings and demand reduction impacts as follows:

SDG&E Electricity Savings Goals for Energy Efficiency

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total Annual Savings Goal (GWh/yr)	268.4	268.4	280.5	285.1	284.4	282.3	273.6	262.5	221.7	214.9
Total Cumulative Savings Goal (GWh/yr)	268.0	536.8	817.3	1102.4	1386.8	1669.1	1942.7	2205.2	2426.9	2641.8
Annual Peak Savings Goal (MW/yr)	50.4	50.3	54.6	54.2	54.0	53.6	52.0	49.9	42.1	40.8
Cumulative Peak Savings Goal (MW)	50.4	100.7	155.3	209.5	263.5	317.1	369.1	419.0	461.1	501.9
Annual Uncommitted Energy Efficiency (2009-2013)—(3), (4)	0.0	0.0	0.0	0.0	0.0	30.0	56.0	51.0	45.0	41.0
Cumulative Uncommitted Energy Efficiency (2009-2013)—(3), (4)	0.0	0.0	0.0	0.0	0.0	30.0	86.0	137.0	182.0	223.0

(1) Total savings = all savings from energy efficiency programs funded by public goods charge and procurement funding. This total includes savings from energy efficiency programs already in the CEC's demand forecast.

(2) MW savings derived by multiplying GWh Savings by 0.19, the average value GWh to peak savings for 2004/2005 applications. This is an estimate of average peak savings during all the peak hours; = GWh savings in peak period/560 hours in period.

(3) The CPUC's goals are annual goals that SDG&E assumed will be installed by the end of each program year. However, for resource planning purposes, SDG&E assumed that only a portion of the expected annual MW will be installed in time to impact each year's summer demand.

(4) Program years with CPUC-approved budgets are considered "committed". Program years 2006-2008 are currently part of the committed energy efficiency resources as the budgets were approved in D.05-09-043. Future program years, 2009 onwards are considered uncommitted.

The energy efficiency goals adopted specifically for SDG&E are very aggressive. This was articulated by the Commission as follows:

> "[W]e adopt a cumulative GWh savings goal for SDG&E that is somewhat higher than the maximum achievable potential presented in the disaggregated study for SDG&E's service territory, but that does not increase the numbers above the maximum achievable potential for all three electric IOUs combined. As a result, our adjustments result in an adopted trajectory of GWh savings goals for SDG&E that is 118% of the cumulative maximum achievable potential presented in the disaggregated Secret Energy Surplus Study, whereas the adopted GWh savings goals for PG&E and SCE are more on the order of 88% the cumulative maximum achievable potential presented in that study." (D.04-09-060, at p.27)

Clearly, achieving this level of energy efficiency savings will be quite challenging but SDG&E is fully committed to this essential effort. Given the level of these assumed future savings, however, SDG&E does not believe it is wise to plan on the assumption that significantly more energy efficiency savings could be realistically achieved as an alternative to the Sunrise Powerlink transmission project. Moreover, it is quite likely that when the CPUC updates its energy savings goals for the next program cycle (2009-2011), it will moderate its expectations and reduce SDG&E's goals to be more consistent with future energy efficiency potential study estimates for the SDG&E service area. These studies will be conducted jointly by the CPUC and CEC within the next two years.

C. <u>Demand Response</u>

Demand response effects are not considered by the CAISO when applying its G-1/N-1 reliability criteria under extreme peak load conditions (i.e., the 90/10 peak load forecast). The CAISO has expressed uncertainty over whether these programs would be triggered during the period of time covered by the G-1/N-1 contingencies that forms the basis for application of its reliability criteria. Moreover, it should be noted that although demand response can make an important contribution to system reliability, demand response programs generally have operational characteristics that limit their availability both in terms of number of days and hours per year. As a result, demand response programs are not reflected in the reliability analysis.

D. <u>Self-Served Load</u>

Self-served load and distributed generation ("DG") include certain renewable generation resources, such as wind and solar photovoltaic systems, and non-renewable generation resources, such as fossil-fueled combined heat and power ("CHP") and microturbine systems. DG systems range in size and type and typically include residential applications that are less than 5 kW and commercial and smaller industrial applications from 30 kW to 5 MW. DG installation is supported through a number of programs including the CPUC's Self-Generation Incentive Program ("SGIP") and the CEC's Emerging Renewables Program ("ERP")

Self-generation and DG resources reduce the peak demand that would otherwise have to be served by generation delivered over the SDG&E transmission system. As a result, projected impacts are incorporated as a reduction to the demand forecast.

SDG&E developed a forecast of new self-served load and DG as part of its July 2004 Long-Term Resource Plan.[2] This forecast was based on historical information collected from existing installations and includes reasonable assumptions concerning the likely expansion of the various self-generation and DG technologies across the SDG&E system over time. The input used in the forecast is as follows:

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[2] R.04-04-003, See Direct Testimony of Thomas O. Bialek, July 9, 2004.

(MW)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Self-Served Load – DG	6	8	10	12	14	16	18	20	22	24	26

It is clear that the State is increasing its efforts to advance the further deployment of DG resources in California. Several significant programs exist to provide incentives or otherwise encourage the installation of DG technology and more programs are currently being proposed. Senate Bill 1 ("SB1"), known as the "Million Solar Homes Bill", would establish an ambitious goal of achieving 3,000 MW of solar generation within a ten-year period. While SB1 did not get passed by the Legislature in 2005, it will be considered again in 2006. In the interim, the CPUC is currently pursuing the development of the California Solar Initiative ("CSI") which will likely expand the State's financial support of solar DG technologies and thereby increase renewable DG deployment, although perhaps not as aggressively as SB1 proposes.

While it would be highly speculative to assume that 3,000 MW of additional solar DG resources would be installed and operating by the year 2016 as a result of SB1 or any other State effort to support further deployment, it is useful to understand what this might mean with regard to the need for the Sunrise Powerlink project and the assumptions used in SDG&E's supporting analysis.

Loads in the San Diego area represent about 10% of the electricity consumption in California. Accordingly, the San Diego area's portion of the 3,000 MW SB1 goal would be about 300 MW or 30 MW per year, assuming the potential installations are spread uniformly throughout the State and over time. In its testimony in the CPUC's DG OIR, R.04-03-017, SDG&E showed that the expected capacity of a solar photovoltaic

("PV") system at the 3 pm August system peak averages 50% of its nameplate capacity.[3] Therefore, if a significantly expanded solar program is implemented sometime in 2006, it would likely produce no more than 15 MW of added DG resources per year within the San Diego area, beginning in 2007. As a result, there would be no more than a 60 MW reduction in SDG&E's peak demand requirements by the year 2010. Clearly, even using this hypothetical scenario, the resulting impact would not defer the need for the Sunrise Powerlink.

E. Larger Generation

The reliability analysis presented in this chapter uses as input, with certain exceptions, the in-area resources the CAISO has historically relied upon during the G-1/N-1 event that is the precursor to the subsequent outage condition the CAISO uses to evaluate the San Diego area transmission system performance under adverse weather conditions**.** To determine the quantity of *existing* in-area resources that can be relied upon for meeting the CAISO's reliability criteria, SDG&E has typically used the CAISO's determination of available capacity within the San Diego area for purposes of establishing RMR contract requirements. The available capacity is generally based on the amount of energy which was actually generated by each resource during historical peak load periods. Existing in-area resources include all existing resources regardless of ownership or contractual arrangements.

For *future* in-area resource additions, SDG&E has included only those resources for which there are firm commitments to build the new capacity. The one exception to this is the capacity of the 50 MW Kumeyaay Wind Project, whose construction in eastern

[3] Amended Response of SDG&E & SoCal Gas to Assigned Commissioner and Administrative Law Judge's Ruling and Scoping Memo, R.04-03-017, pg. 14.

San Diego County is now nearing completion. This project is not included because the CAISO has been not been willing to count wind capacity for purposes of satisfying its G-1/N-1 reliability requirement absent historical evidence that some portion of wind capability can be relied upon during peak periods.

In summary, the major generation resource assumptions are shown below.

- Palomar provides 541 MW beginning in 2006 and each year thereafter.
- Otay Mesa provides 561 MW beginning in 2008 and each year thereafter.
- Miramar provides 46 MW each year.
- SDG&E area QFs and renewable resources provide 174 MW in total each year.
- Total San Diego area DWR contracts provide a total of 126 MW through 2010 and these facilities continue at this level as merchant units thereafter.
- Encina provides a total of 960 MW each year.
- South Bay provides a total of 702 MW through 2009 but retires by 2010.
- San Diego area generation is projected to increase from 2,273 MW in 2005 to 2,837 MW in 2016, an increase of 564 MW or 25%.

This concludes this discussion.

Table III-3

Without the Sunrise Powerlink
Load and Resources: South Bay Retired – with Otay Mesa

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
90/10 Load Forecast	4636	4742	4849	4947	5038	5129	5223	5316	5413	5513
Available Generation	2938	2938	3539	3539	2837	2837	2837	2837	2837	2837
less G-1	541	541	561	561	561	561	561	561	561	561
Generation (less G-1)	2397	2397	2978	2978	2276	2276	2276	2276	2276	2276
"G-1/N-1" Import Level	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Generation + Imports	4897	4897	5478	5478	4776	4776	4776	4776	4776	4776
Surplus/(Deficiency)	261	155	629	531	(262)	(353)	(447)	(540)	(637)	(737)

G-1 Assumptions:
2006 – Palomar Plant (541 MW)
2008 – Otay Mesa Plant (561 MW)

Other Assumptions:
2008 – Lake Hodges (40 MW)
By 2010 – South Bay Retired (702 MW)

Table III-4

Without the Sunrise Powerlink
Load and Resources: No Plant Retirements – with Otay Mesa

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
90/10 Load Forecast	4636	4742	4849	4947	5038	5129	5223	5316	5413	5,513
Available Generation	2938	2938	3539	3539	3539	3539	3539	3539	3539	3539
less "G-1"	541	541	561	561	561	561	561	561	561	561
Generation (less G-1)	2397	2397	2978	2978	2978	2978	2978	2978	2978	2,978
"G-1/N-1" Import Level	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Generation + Imports	4897	4897	5478	5478	5478	5478	5478	5478	5478	5478
Surplus/(Deficiency)	261	155	629	531	440	349	255	162	65	(35)

G-1 Assumptions:
2006 – Palomar Plant (541 MW)
2008 – Otay Mesa Plant (561 MW)

Other Assumptions:
2008 – Lake Hodges (40 MW)
No Plant Retirements

Table III-5

Without the Sunrise Powerlink
Load and Resources: No Plant Retirements – without Otay Mesa

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
90/10 Load Forecast	4636	4742	4849	4947	5038	5129	5223	5316	5413	5513
Available Generation	2938	2938	2978	2978	2978	2978	2978	2978	2978	2978
less "G-1"	541	541	541	541	541	541	541	541	541	541
Generation (less G-1)	2397	2397	2437	2437	2437	2437	2437	2437	2437	2437
"G-1/N-1" Import Level	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Generation + Imports	4897	4897	4937	4937	4937	4937	4937	4937	4937	4937
Surplus/(Deficiency)	261	155	88	**(10)**	**(101)**	**(192)**	**(286)**	**(379)**	**(476)**	**(576)**

G-1 Assumptions:
2006 – Palomar Plant (541 MW)

Other Assumptions:
2008 – Lake Hodges (40 MW)
No Otay Mesa
No Plant Retirements

Table III-6

Without Sunrise Powerlink
Load and Resources: Encina Unit 4 Retired – with Otay Mesa

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
90/10 Load Forecast	4636	4742	4849	4947	5038	5129	5223	5316	5413	5,513
Available Generation	2938	2938	3230	3230	3230	3230	3230	3230	3230	3230
less "G-1"	541	541	561	561	561	561	561	561	561	561
Generation (less G-1)	2397	2397	2679	2679	2679	2679	2679	2679	2679	2679
"G-1/N-1" Import Level	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Generation + Imports	4897	4897	5179	5179	5179	5179	5179	5179	5179	5179
Surplus/(Deficiency)	261	155	330	232	141	50	**(44)**	**(137)**	**(234)**	**(334)**

G-1 Assumptions:
2006 – Palomar Plant (541 MW)
2008 – Otay Mesa Plant (561 MW)

Other Assumptions:
2008 – Encina Unit 4 Retired (299 MW)
2008 – Lake Hodges (40 MW)

Table III-7

Without Sunrise Powerlink
Load and Resources: All Encina Units Retired – Otay Mesa

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
90/10 Load Forecast	4636	4742	4849	4947	5038	5129	5223	5316	5413	5,513
Available Generation	2938	2938	3539	3539	3539	2579	2579	2579	2579	2579
less "G-1"	541	541	561	561	561	561	561	561	561	561
Generation (less G-1)	2397	2397	2,978	2,978	2,978	2,018	2,018	2,018	2,018	2,018
"G-1/N-1" Import Level	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Generation + Imports	4897	4897	5478	5478	5478	4518	4518	4518	4518	4518
Surplus/(Deficiency)	261	155	629	531	440	**(611)**	**(705)**	**(798)**	**(895)**	**(995)**

G-1 Assumptions:
2006 – Palomar Plant (541 MW)
2008 – Otay Mesa Plant (561 MW)

Other Assumptions:
By 2011 – Encina Retired (960 MW)
2008 – Lake Hodges (40 MW)

Table III-8

Without Sunrise Powerlink
Load and Resources: SouthBay and Encina Retired – with Otay Mesa

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
90/10 Load Forecast	4636	4742	4849	4947	5038	5129	5223	5316	5413	5,513
Available Generation	2938	2938	3539	3539	2837	1877	1877	1877	1877	1877
less "G-1"	541	541	561	561	561	561	561	561	561	561
Generation (less G-1)	2,397	2,397	2,978	2,978	2,276	1,316	1,316	1,316	1,316	1,316
"G-1/N-1" Import Level	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Generation + Imports	4897	4897	5478	5478	4776	3816	3816	3816	3816	3816
Surplus/(Deficiency)	261	155	629	531	**(262)**	**(1313)**	**(1407)**	**(1500)**	**(1597)**	**(1697)**

G-1 Assumptions:
2006 – Palomar Plant (541 MW)
2008 – Otay Mesa Plant (561 MW)

Other Assumptions:
2008 – Lake Hodges (40 MW)
By 2010 – South Bay Retired (702 MW)
By 2011 – Encina Retired (960 MW)

Table III-9

Application of CAISO's "G-1/N-1" Reliability Criteria to San Diego Area Transmission System – *Without Sunrise Powerlink*

BASELINE SCENARIO

For the Month of August	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Palomar CC	0.0	541.0	541.0	541.0	541.0	541.0	541.0	541.0	541.0	541.0	541.0	541.0
Miramar GT	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0
Area QFs and Renewables	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0
Envirepel	0.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Otay Mesa CC	0.0	0.0	0.0	561.0	561.0	561.0	561.0	561.0	561.0	561.0	561.0	561.0
Lake Hodges Pump Storage Hydro Plant	0.0	0.0	0.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Calpeak Border	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Calpeak El Cajon	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Calpeak Escondido	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Electrovest (Otay)	0.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Elctrovest (Escondido)	0.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
El Cajon GT	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Encina 1	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0
Encina 2	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0
Encina 3	109.0	109.0	109.0	109.0	109.0	109.0	109.0	109.0	109.0	109.0	109.0	109.0
Encina 4	299.0	299.0	299.0	299.0	299.0	299.0	299.0	299.0	299.0	299.0	299.0	299.0
Encina 5	329.0	329.0	329.0	329.0	329.0	329.0	329.0	329.0	329.0	329.0	329.0	329.0
Encina GT	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Kearny GT 1	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Kearny 2A	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Kearny 2B	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Kearny 2C	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Kearny 2D	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Kearny 3A	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Kearny 3B	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Kearny 3C	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Kearny 3D	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Larkspur Border 1	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0
Larkspur Border 2	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0
Miramar GT 1	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
Miramar GT 2	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
South Bay 1	145.0	145.0	145.0	145.0	145.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Bay 2	149.0	149.0	149.0	149.0	149.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Bay 3	174.0	174.0	174.0	174.0	174.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Bay 4	221.0	221.0	221.0	221.0	221.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Bay GT	13.0	13.0	13.0	13.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total San Diego Area Capacity	**2273.0**	**2938.0**	**2938.0**	**3539.0**	**3539.0**	**2837.0**	**2837.0**	**2837.0**	**2837.0**	**2837.0**	**2837.0**	**2837.0**
Less:												
"G-1" Generation	329.0	541.0	541.0	561.0	561.0	561.0	561.0	561.0	561.0	561.0	561.0	561.0
Total San Diego Area Capacity after G-1	**1944.0**	**2397.0**	**2397.0**	**2978.0**	**2978.0**	**2276.0**	**2276.0**	**2276.0**	**2276.0**	**2276.0**	**2276.0**	**2276.0**

For the Month of August	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
"N-1" Import Capability	**2500**	**2500**	**2500**	**2500**	**2500**	**2500**	**2500**	**2500**	**2500**	**2500**	**2500**	**2500**
Combined In-Area Generation Capability + "N-1" Import Capability	**4444.0**	**4897.0**	**4897.0**	**5478.0**	**5478.0**	**4776.0**	**4776.0**	**4776.0**	**4776.0**	**4776.0**	**4776.0**	**4776.0**
San Diego Area Peak Demand												
Forecast Total Peak Demand (90/10)		**4642**	**4750**	**4859**	**4989**	**5138**	**5282**	**5424**	**5559**	**5715**	**5879**	**6034**
Less:												
Uncommitted Energy Efficiency (2009-2016)		0	0	0	30	86	137	182	223	280	342	405
Distributed Generation		6	8	10	12	14	16	18	20	22	24	26
Peak Load (90/10) net of EE and DG		**4636**	**4742**	**4849**	**4947**	**5038**	**5129**	**5223**	**5316**	**5413**	**5513**	**5604**
Less:												
Demand Reduction Programs												
Day Ahead												
Dispatchable												
Day Of												
Total of Demand Reduction Items		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Net Peak Demand (90/10)	**4058**	**4636.0**	**4742.0**	**4849.0**	**4947.0**	**5038.0**	**5129.0**	**5223.0**	**5316.0**	**5413.0**	**5513.0**	**5604.0**
Surplus Capability Over Net Peak Demand (90/10)	**386**	**261**	**155**	**629**	**531**	**(262)**	**(353)**	**(447)**	**(540)**	**(637)**	**(737)**	**(828)**

(1) "LTRP 2005_Compliance Case.xls" ("System Peak")
(2) Assumes impacts are limited to SDG&E's bundled customers
(3) "Supply Form S-1 Compliance Case.xls"
(4) Uncommitted Energy Efficiency represents established CPUC savings goals for programs (and program periods) not yet approved

Table III-10

Application of CAISO's "G-1/N-1" Reliability Criteria to San Diego Area Transmission System – *With Sunrise Powerlink*

BASELINE SCENARIO

For the Month of August	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Palomar CC	0.0	541.0	541.0	541.0	541.0	541.0	541.0	541.0	541.0	541.0	541.0	541.0
Miramar GT	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0
Area QFs and Renewables	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0	174.0
Envirepel	0.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Otay Mesa CC	0.0	0.0	0.0	561.0	561.0	561.0	561.0	561.0	561.0	561.0	561.0	561.0
Lake Hodges Pump Storage Hydro Plant	0.0	0.0	0.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Calpeak Border	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Calpeak El Cajon	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Calpeak Escondido	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Electrovest (Otay)	0.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Elctrovest (Escondido)	0.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
El Cajon GT	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Encina 1	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0
Encina 2	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0	103.0
Encina 3	109.0	109.0	109.0	109.0	109.0	109.0	109.0	109.0	109.0	109.0	109.0	109.0
Encina 4	299.0	299.0	299.0	299.0	299.0	299.0	299.0	299.0	299.0	299.0	299.0	299.0
Encina 5	329.0	329.0	329.0	329.0	329.0	329.0	329.0	329.0	329.0	329.0	329.0	329.0
Encina GT	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Kearny GT 1	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Kearny 2A	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Kearny 2B	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Kearny 2C	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Kearny 2D	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Kearny 3A	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Kearny 3B	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Kearny 3C	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Kearny 3D	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Larkspur Border 1	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0
Larkspur Border 2	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0
Miramar GT 1	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
Miramar GT 2	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
South Bay 1	145.0	145.0	145.0	145.0	145.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Bay 2	149.0	149.0	149.0	149.0	149.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Bay 3	174.0	174.0	174.0	174.0	174.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Bay 4	221.0	221.0	221.0	221.0	221.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Bay GT	13.0	13.0	13.0	13.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total San Diego Area Capacity	**2273.0**	**2938.0**	**2938.0**	**3539.0**	**3539.0**	**2837.0**	**2837.0**	**2837.0**	**2837.0**	**2837.0**	**2837.0**	**2837.0**
Less:												
"G-1" Generation	329.0	541.0	541.0	561.0	561.0	561.0	561.0	561.0	561.0	561.0	561.0	561.0
Total San Diego Area Capacity after G-1	**1944.0**	**2397.0**	**2397.0**	**2978.0**	**2978.0**	**2276.0**	**2276.0**	**2276.0**	**2276.0**	**2276.0**	**2276.0**	**2276.0**

For the Month of August	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
"N-1" Import Capability	**2500**	**2500**	**2500**	**2500**	**2500**	**3500**	**3500**	**3500**	**3500**	**3500**	**3500**	**3500**
Combined In-Area Generation Capability + "N-1" Import Capability	**4444.0**	**4897.0**	**4897.0**	**5478.0**	**5478.0**	**5776.0**	**5776.0**	**5776.0**	**5776.0**	**5776.0**	**5776.0**	**5776.0**
San Diego Area Peak Demand												
Forecast Total Peak Demand (90/10)		4642	4750	4859	4989	5138	5282	5424	5559	5715	5879	6034
Less:												
Uncommitted Energy Efficiency (2009-2016)		0	0	0	30	86	137	182	223	280	342	405
Distributed Generation		6	8	10	12	14	16	18	20	22	24	26
Peak Load (90/10) net of EE and DG		**4636**	**4742**	**4849**	**4947**	**5038**	**5129**	**5223**	**5316**	**5413**	**5513**	**5604**
Less:												
Demand Reduction Programs												
Day Ahead												
Dispatchable												
Day Of												
Total of Demand Reduction Items		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Net Peak Demand (90/10)	**4058**	**4636.0**	**4742.0**	**4849.0**	**4947.0**	**5038.0**	**5129.0**	**5223.0**	**5316.0**	**5413.0**	**5513.0**	**5604.0**
Surplus Capability over Net Peak Demand (90/10)	**386**	**261**	**155**	**629**	**531**	**738**	**647**	**553**	**460**	**363**	**263**	**172**

Notes: Area QF includes the total amount of capacity that the ISO recognizes as being available at time of peak and can be counted for grid reliability purposes. It includes the following units: [Name them if you want]

SUNRISE POWERLINK

CHAPTER IV

RENEWABLE ENERGY

SDGE
A Sempra Energy utility

Application No.: A.05-12-______

Exhibit No.: ____________________

Date: December 14, 2005

Witness: Vincent D. Bartolomucci

IV.

RENEWABLE ENERGY

This Chapter demonstrates the role of the Sunrise Powerlink in facilitating SDG&E meeting the Commission-mandated renewable energy goals for 2010. This chapter also shows how the Sunrise Powerlink "is necessary to facilitate achievement of the renewable power goals" established by the legislature and this Commission, and how the Sunrise Powerlink will encourage renewable energy development in the Imperial Valley.[1] Section A below discusses SDG&E's efforts to procure renewable energy resources and to meet the state's goals. The information that has been redacted has been highlighted for reference (or blacked out in the public version of this chapter [redacted]).

A. SDG&E's Efforts to Procure Renewable Energy Resources

SDG&E is moving aggressively to meet renewable resource goals for year 2010 and beyond. SDG&E has embraced the goal that by 2010, 20% of SDG&E's bundled customer load will be served by renewable energy sources.

1. Background of the Renewable Portfolio Standard ("RPS").

SDG&E's efforts to procure renewable energy arise in the context of the state's efforts to promote renewable resource development. On September 12, 2002, SB 1078 was signed into law requiring California to procure 20% of its electric retail sales from eligible renewable resources by December 31, 2017. The law requires a retail seller of electricity to increase its procurement of renewable energy by 1% per year. SB 1078 also requires the Commission to establish a process to determine market prices of electricity,

[1] SB 1078, as codified in Cal. Pub. Util. Code § 399.25, provides that an application of an electrical corporation for a certificate authorizing the construction of new transmission facilities shall be deemed to be necessary to the provision of electric service for purposes . . . if the commission finds that the new facility is necessary to facilitate achievement of the renewable power goals established in Article 16 (commencing with Section 399.11).

create a process for rank ordering and selection of least-cost and best-fit resources to fulfill program obligations, develop flexible rules for compliance and standard terms and conditions to be used by electrical corporations in contracting with renewable generators. The CEC is required to certify eligible renewable energy resources, to design and implement an accounting system to verify retail sellers' compliance with the RPS and to allocate and award supplemental energy payments to cover any above-market cost of renewable energy.

The governor's Energy Action Plan strives to attain the 20% goal by 2010 rather than 2017; and, the Commission has endorsed the accelerated goal.[2] The Commission has issued certain decisions establishing rules to govern implementation of the RPS in R.04-04-026, R.01-10-024 and I.00-11-001.[3] R.04-04-026 is addressing ongoing RPS implementation issues.

The Commission has established parameters for the procurement of renewable resources by investor owned utilities.[4] Utilities may procure renewable resources either through a "Request for Offers" ("RFO") competitive solicitation or through bilateral negotiations. The utility is required to brief its Procurement Review Group ("PRG") during all phases of its procurement process, including bid evaluation, short-listing and negotiations. The PRG is charged with overseeing the utility's procurement methods, reviewing procedural fairness, examining overall procurement prudence and providing

[2] R.04-04-026

[3] R.01-10-024 is the predecessor proceeding addressing all-source utility procurement.

[4] D.03-06-071.

feedback during all stages.[5] Final executed contracts, after PRG review, are submitted for Commission approval.

2. SDG&E's Renewable Resource Goals and Long Term Procurement Plan

SDG&E filed its Long-Term Renewable Resource Plan ("LTRP") with the Commission on April 15, 2005, as part of its overall resource plan filing in R.04-04-003. D.05-07-039 (July 27, 2005) approved SDG&E's LTRP. SDG&E filed a supplement to its 2005 LTRP on December 6, 2005. SDG&E's goal is to achieve not only a 20% renewable resource mix by 2010, but to increase its renewable portfolio beyond 20%, provided that it can access and acquire additional cost-effective renewable resources.

SDG&E projects that it will procure approximately 5.54% of its overall bundled customer retail sales from renewable resources in 2005 assuming all current resources deliver as contracted. In order to achieve a 20% renewable generation mix by 2010 based on a 2009[6] forecast bundled customer retail sales benchmark of 17,418 gWh, SDG&E must obtain a total of approximately 3,484 gWh of renewable energy. Currently, SDG&E has 977 gWh of renewable energy under Commission-approved contracts through 2010, which equates to a 5.6% baseline retail energy supply. SDG&E must procure an additional 2,507 gWh in order to achieve the procurement goal by 2010.

The Company's plan presumes that, post-2010, SDG&E will continue to increase its renewable portfolio subject to its ability to acquire cost-effective renewable resources. SDG&E's goal is to contract for up to 24% for delivery in 2010 as a contingency in the event some projects cannot achieve commercial operation. SDG&E projects that it will

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[5] SDG&E's PRG includes representatives of the Commission, the CEC, Natural Resource Defense Council, Office of Ratepayer Advocates, The Utility Reform Network, ("TURN"), Utility Consumers Action Network ("UCAN"), California Department of Water Resources, and California Farm Bureau Federation.

[6] In accordance with the methodology established by D.04-06-014.

procure 24% of its overall retail sales from renewable generation by 2014. SDG&E currently has 857 GWh of renewable energy under contract in 2014, which equals approximately 4.6% in 2014. The percentage drops in 2014 because several existing contracts are due to expire between 2010 and 2014. SDG&E's plan therefore anticipates that SDG&E will replace this lost energy as well as continue to increase its overall renewable percentage by year 2014.

3. Recent Efforts to Accomplish SDG&E's Renewable Goals

SDG&E continues to actively and aggressively solicit new renewable resources in order to attain its 20% goal and to diversify its renewable portfolio.

a. 2004 RFO and Lessons Learned

SDG&E issued a renewable RFO on July 1, 2004 ("2004 RFO"). The results substantiated the concern expressed in SDG&E's LTRP Proceeding testimony (R.04-04-003) filed July 9, 2004,[7] that availability of transmission will have a significant impact on SDG&E's ability to achieve the goal of 20% by 2010. Of the projects contained in SDG&E's 2004 RFO short-list, greater than 80% of the associated projected annual energy purchases are dependent in some way on new transmission being approved and built to import the energy from Imperial Valley.

On September 22, 2005, SDG&E filed Advice Letter 1727-E seeking Commission approval of three agreements resulting from the 2004 RFO. SDG&E filed a second Advice Letter 1734-E on October 27, 2005 seeking approval for a fourth such agreement. Of these four projects, one, Stirling Energy Systems ("SES"), will be located in the Imperial Valley area of California. This Agreement contemplates the purchase by SDG&E of up to 900 MW of new solar related energy from SES in three phases. Phase 1 consists of 300 MW

[7] Prepared Direct Testimony of Vincent D. Bartolomucci at. pp. 6, 12, 15.

scheduled for delivery in the [redacted] timeframe.[8] Phase 2 project consists of an additional 300 MW in the [redacted] timeframe.[9] SDG&E also has a right of first refusal for a third phase for another 300 MW phase. The third phase would commence deliveries in the [redacted] timeframe. If approved and successfully developed, Phase 1 of the Stirling Solar Project will, by itself, constitute approximately 3.7% of SDG&E's 20% renewable resource goal for 2010. Phase 2 would add another [redacted]

All phases of this project are contingent upon the construction of new transmission facilities. At a minimum, "gen-tie" facilities must be built to reach the transmission grid at any one of the Imperial Irrigation District's (IID's) system, the Southwest Powerlink, or the Sunrise Powerlink. These four contracts, if approved, would increase the level of *committed* resources in SDG&E's overall renewable portfolio to approximately 13.3% in 2010 and to approximately 15% in 2014.

Bids submitted in response to the 2004 RFO showed that SDG&E could access another [redacted] economically-attractive renewable resources if the Sunrise Powerlink is built. SDG&E's 2004 short-list contained bids from a number of other resources located in the Imperial Valley region. SDG&E is currently in negotiations with [redacted] Negotiations are continuing and if an agreement for the purchase of the output is

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[8] While the first phase will provide 300 MW when all construction is completed, the capacity will be added in increments over the 2008 through 2010 period.

[9] SDG&E has the sole option for this phase of the project. The capacity could be added in increments over the 2011 through 2012 period.

reached, SDG&E would file an advice letter for Commission approval of this agreement in the coming months. Another bid, from [redacted] If ongoing negotiations with [redacted] are successful, SDG&E will submit a contract for Commission approval later this year. To address congestion cost concerns, deliveries under [redacted] are contingent upon SDG&E's ability to construct a new 500kV line to access resources in the Imperial Valley area. However, even if negotiations do not progress to a contract in this RFO, SDG&E believes that these developers [redacted]

b. What SDG&E's 2005 RFOs May Reveal.

On September 30, 2005, SDG&E issued two new RFOs ("2005 RFOs"). The first RFO solicits bids from developers to install solar photovoltaics ("PV") and stand-alone wind units on selected SDG&E facilities. The second RFO solicits bids from renewable projects for all other renewable resources that can deliver anywhere on the CAISO grid.

The second RFO solicits capacity and energy services from re-powered, upgraded or new facilities. Products may be for unit firm or as-available deliveries starting in 2006, 2007 or 2008. SDG&E does not have a preference for a particular product or technology type. SDG&E's goal has been to develop and maintain a diversified and balanced renewable portfolio. The RFOs support SDG&E's goal by promoting additional renewable development, enhancing SDG&E's ability to develop a renewable mix that is wide-ranging in technology types and allows SDG&E to pursue a combination of both power purchase and ownership options.

Bids in response to SDG&E's 2005 RFOs were due November 16, 2005. The evaluation criteria SDG&E will use is consistent with the directives from D.03-06-071, D.04-06-013 and D.04-07-029. SDG&E will evaluate all bids received taking into account not only the capacity and energy price but also forecast losses and congestion costs (or benefits),[10] resource deliverability, integration and the cost of any associated transmission upgrades or additions. All factors are included in the overall "least-cost, best-fit" evaluation process. If a project located in a congested area of the CAISO grid is still, overall, an economical resource when congestion is factored in, and "fits" into SDG&E's overall portfolio, that resource will be included in SDG&E's short-list.

4. SDG&E's Renewable Resource Commitments

The following summarizes the current status of SDG&E's renewable resource commitments.

Table IV-1 shows SDG&E's projected renewable purchases by year and technology type presuming the Sunrise Powerlink is constructed and operational by 2010. Table IV-1 is divided into several sections. The first section shows renewable resources contracted and approved by the CPUC to date. The second section shows renewable resources contracted for through SDG&E's 2004 RFO process, but still pending CPUC approval. The third section shows the combined totals of the two previous sections. The

[10] It is possible, though unlikely, that a renewable resource could be developed in a location that would actually provide *benefits* in terms of reducing congestion or losses that would otherwise be present.

fourth section shows SDG&E's LTRP assumptions.[11] The final section shows SDG&E's net short differential between these assumptions and projected annual renewable energy resource production from the contracts signed to date. That is, it shows what SDG&E would likely procure subtracting projected contracted for deliveries compared to the assumptions made in SDG&E's LTRP assumptions, in order to achieve a 20% goal in 2010.

SDG&E's ability to meet a 20% renewable goal by 2010 is challenged by the anticipated *cost* of transmission access.[12] While SDG&E may be able to procure resources in other parts of California without new transmission being built, the cost of delivering that energy to SDG&E's customers will rise as congestion and other related factors are included. SDG&E hopes to learn from offers submitted in response to the 2005 RFOs. Offers from historically congested, or likely to be congested, areas will be evaluated for impacts of congestion and transmission upgrade costs. SDG&E is concerned that congestion and transmission upgrade costs will adversely affect the relative cost-effectiveness of some renewable resource projects. Without substantial new transmission, SDG&E may be challenged to meet its 2010 RPS goals in the most cost-effective manner. More will be known once evaluation and analysis of the 2005 offers is completed.

In sum, based on experiences in renewable procurement to date, it appears that the vast bulk of economic new renewable resource opportunities lie on the eastern edge of

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[11] See SDG&E's Short-Term and Long-Term Renewable Procurement Plans filed with the Commission on April 15, 2005 in R.04-04-003.

[12] *Physical access* to transmission is <u>not</u> an issue under the CAISO's non-discriminatory competitively-based open-access transmission rules. Physical access is always possible provided transmission users are willing to pay the marginal cost of obtaining such access. Hence, it is the *cost* of such access that is the relevant concern, and whether the cost will render either access or renewable development uneconomic.

SDG&E's service territory and in Imperial County. We show below how the Sunrise Powerlink will be necessary to access these opportunities.

B. The Sunrise Powerlink Will Enable SDG&E to Access Least-Cost-Best Fit Renewables.

Based on SDG&E's 2004 Renewable RFO results, SDG&E estimates that, at a minimum, 30 to 40% of its overall renewable resource mix could come from renewable resources located within the Imperial Valley area.[13] Additionally, 6 to 7% could come from wind resources located in both the Imperial Valley and eastern San Diego County areas.

Given that SDG&E's most feasible new renewable procurement opportunities lie east of its load center, this section of the testimony considers the potential for such opportunities, and how such resources would access the grid. It discusses SDG&E's renewable outlook based on (1) SDG&E's projection of potential resources in the Imperial Valley and San Diego regions and (2) SDG&E's recently filed Transmission Ranking Cost Report ("TRCR") and how the TRCR results relate to expected resources in the Imperial Valley area.

1. Renewable Potential in the SDG&E Service Area.

Within the SDG&E service area existing renewable generation includes landfill gas recovery systems, sewage treatment, limited biomass applications, and miscellaneous small hydro applications (pipeline facilities, water treatment facilities, etc.). SDG&E has signed agreements to purchase the output of a 40 MW biomass facility and a 50 MW wind project. The wind project is currently scheduled to achieve commercial operation by the end of 2005.

[13] Based on the bids received to date from renewable resources, as much as 70% of SDG&E's renewable portfolio could be supplied from resources located in the Imperial Valley area.

There is additional wind generation potential along the eastern edge of the SDG&E service area but nearly all of this potential will require new transmission infrastructure. Based upon a combination of discussion with developers, offers received in response to SDG&E's 2004 RFO and studies done to date on resource potential in San Diego County, SDG&E has assumed that as much as 500 MW of wind resources could be developed and integrated with the SDG&E system.

2. Renewable Resource Outlook for the Imperial Valley

a. Future Resource Assumptions

With the exception of wind and solar, the potential to develop new renewable resources within SDG&E's service area is limited. However, if one looks to Imperial Valley and to a lesser extent, the La Rumorosa area of Baja Mexico, there is an abundant potential for renewable resources. Whether SDG&E is able to cost-effectively transmit renewable resources sufficient for the Company to achieve a cost-effective 20% renewable mix by 2010 will still depend upon the ability of SDG&E and other entities to build additional transmission to access areas of renewable development potential.

Current estimates are that geothermal potential in the Imperial Valley area could reach 2300 MW or more.[14] Today only approximately 450 MW of geothermal resources are developed and on line with another 215 MW facility (Cal Energy's Unit 6) proposed. The development of these resources will depend in large part upon the ability of the developers to cost-effectively access other markets outside the Imperial Valley area, to sell the output of future projects. In addition, to the solar and geothermal potential other resources such as wind and biomass also have development potential in the Imperial Valley area. The majority of these resources will likely require new transmission if they

[14] See, CEC Final 2005 Integrated Energy Policy Report (November 21, 2005), p. 103.

are to be able to cost-effectively supply energy markets outside of the Imperial Valley area.

SDG&E's 2004 Renewable RFO results showed that another [redacted] of new projects were offered. These projects were located in the Crestwood/Boulevard area which is located in the eastern portion of San Diego County. Results of SDG&E's "least-cost, best-fit" analysis showed that [redacted] that bid in that area all proposed to develop for costs that were economically attractive. However it was determined that a new 138 kV transmission line would need to be built to accommodate the delivery from the four proposed bidders at a cost of $344 million. The cost of building the new 138 kV line for these four projects, when added to the projects' bid prices, rendered the projects uneconomical. In addition, further development of this area appears problematic since the 138 kV line would only have accommodated the projects currently bid, with the next project requiring additional upgrades or construction of another transmission line in the area. In any event, when the cost of the new 138 kV transmission line was added to the overall cost of the four bids, all four projects were eliminated from further consideration in this RFO.

SDG&E's Electric & Gas Procurement Department is of the understanding, based upon publicly available information, that SDG&E's Transmission Planning group is in the process of pursuing alternative means of accessing the wind resources in the Eastern portion of San Diego County and further, that the development of transmission to interconnect potential wind generation areas in San Diego County is economically practical only if the Sunrise Powerlink is built.[15] Additionally, the potential exists for

[15] The Electric & Gas Procurement Department is considered a marketing entity under FERC 2004 Transmission rules and therefore is restricted from access to any non-pubic transmission data. This section was drafted independent of other sections of the "Purpose and Need" statement which—prior to its filing with the Commission—may have contained non-public transmission information.

development of large scale solar resources in the Borrego area of San Diego County as well as wind resources in the La Rumorosa area of Baja, Mexico. As with development of resources in the Crestwood/Boulevard area, development of the resource potential in Borrego and La Rumorosa will depend upon SDG&E's ability to find a cost-effective way to access these resources and deliver the energy to its load center.[16]

As the Company's projections make clear, a substantial portion of SDG&E's planned additions will depend upon development of new potential resources. SDG&E's 2004 RFO indicates that [redacted] of future renewable potential as related to retail sales, may be contingent upon SDG&E's ability to economically access the resources located in the Imperial Valley area and the eastern region of San Diego County.

b. Transmission Assumptions from SDG&E's TRCR

As described above, SDG&E anticipates that transmission system upgrades will be required to accommodate the substantial quantities of renewable resources whether they are in or out of SDG&E's service territory. As part of the overall evaluation process performed in conjunction with SDG&E's 2004 Renewable RFO process, SDG&E determined that the ability to transmit energy from renewable wind resources located in SDG&E's eastern service area is limited by the existing 69kV system. The existing 69kV subtransmission system will likely require significant upgrades to support the delivery of power from identified generation projects as well as future generation projects. The high transmission upgrade costs could be prohibitive for any one individual developer. SDG&E's Transmission Ranking Cost Report issued on August 22, 2005 ("TRCR") further substantiates this conclusion. The 2005 TRCR gives a good indication of the

[16] SDG&E's ability to purchase from resources in Mexico will also be dependent upon approvals from both the Commission and CEC as to whether such resources will count towards RPS compliance.

locations and amounts of renewable resources that are being considered by developers for submittal into SDG&E's 2005 RFO. The TRCR shows a potential for approximately 2000 MW of bids from wind, biomass, geothermal and solar bids in the San Diego and Imperial Valley regions between now and 2010. Of this, 937 MW of wind is proposed in the southeastern portion of SDG&E's transmission system with an additional 1045 MW proposed from various technologies proposed in the Imperial Valley area. The TRCR assumes that the Sunrise Powerlink will be in place in 2010 and that a 500kV tap will be constructed somewhere along the existing Southwest Powerlink line to accommodate renewable resource potential in the eastern portion of San Diego County.

C. Independent Studies Find the Sunrise Powerlink is Needed to Support Renewables.

There are two recent reports on studies evaluating the need for transmission to support renewable acquisition and development. Both reports support the notion that the Sunrise Powerlink is necessary for SDG&E to meet its RPS goals.

1. The Imperial Valley Study Group Supports the Need for the Sunrise Powerlink.

The Imperial Valley Study Group ("IVSG") was formed to develop a phased development of transmission facilities required to ensure delivery from the Imperial Valley of approximately 2200 MW of geothermal or other renewable generation. The group is comprised of stakeholders interested in the development of the Imperial Valley's renewable resource potential, representing transmission owners, generation developers, the CAISO, the CEC, various state and federal agencies, and environmental groups, and this

Commission.[17] Recently, the IVSG published its transmission plan,[18] which proposes three-phases of development. Most significantly, Phase 1 identifies the need for a 500 kV interconnection between the Imperial Valley and San Diego load centers.

Specifically, Phase 1 would accommodate the future development of three new geothermal plants (or equivalent resources), 645 MW total, capable of being in service by the end of 2010. The size and timing of Phase 1 is based on CalEnergy's estimate of its work to conclude Power Purchase Agreements for three such plants. These generating units at the southern end of the Salton Sea geothermal resource area would connect to the existing IID system at IID's Midway substation, which would be expanded to accommodate the additional lines from the new resources. Delivery of these geothermal resources require upgrades of the IID transmission system from its Highline substation to El Centro substation (approximately 20 miles), and from El Centro to the Imperial Valley substation (approximately 18 miles), where the power would be delivered to the CAISO grid. These upgrades to existing facilities would be constructed to accommodate the ultimate generating capacity anticipated by IID. The upgrades would take advantage of existing facilities to minimize cost and environmental impact. They would be constructed, owned and operated by IID.

[17] The IVSG was formed in response to D.04-06-010 (2004). It adopted the mission of specifying a phased development plan for the construction of transmission upgrades capable of exporting 2,200 MW of renewable power from the Imperial Valley. The IVSG is a voluntary planning collaborative made up of regional and governmental stakeholders. Participants include the Commission, all regional Transmission Owners, the CAISO, CEC, generation developers, local, state and federal agencies, environmental and consumer groups and other interested parties. Its work has been led by IID, SDG&E and SCE, and is fully supported by LADWP. The genesis and composition of the IVSG is detailed in its report at pp. 1, 8-9.

[18] Development Plan for the Phased Expansion of Transmission to Access Renewable Resources in the Imperial Valley (September 30, 2005) ("IVSG Report"). The CEC website has a link to the report at: http://www.energy.ca.gov/ivsg/documents/2005-09-30_IVSG_REPORT.PDF

The other major component of Phase 1 is a new 500 kV line from the Imperial Valley substation to San Diego County, with 230kV connections to SDG&E's load center.[19] The Sunrise Powerlink is SDG&E's project to facilitate delivery of generation in the Imperial Valley and other areas of the desert Southwest to the California load centers.

Phase 2 depends in part on the availability of a 500 kV link between IV and San Diego. This phase would accommodate an additional three geothermal plants (or equivalent), or 645 MW of incremental generation, bringing the cumulative new export capacity total to 1,290 MW. Based on CalEnergy's development schedule, Phase 2 upgrades should be timed to be available by the end of 2016. These upgrades would also provide market access for Concentrating Solar Power ("CSP") generation projects, and/or other renewable generation projects developed in that timeframe, in place of or in addition to new geothermal units. Phase 2 would upgrade IID's existing El Centro-Avenue 58 transmission line, from its El Centro substation to its planned Bannister substation west of the Salton Sea geothermal field. The El Centro-Bannister upgrade to 230 kV, approximately 25 miles, would utilize existing Right Of Way. IID would also construct a new 230 kV line from the Bannister substation to a new San Felipe 500/230 kV substation to interconnect to the Imperial Valley to San Diego 500 kV line (*i.e.,* the Sunrise Powerlink). The San Felipe substation could potentially provide an additional interconnection between the IID and CAISO systems, and thus another point for the delivery of renewable resources to California load centers. Phase 2 assumes that IID would build and own these upgrades.

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[19] SDG&E has proposed building and owning this line and is in the process of planning this project, which was studied as part of the IVSG effort. Alternatively, portions of that line or another 500 kV line in Imperial County could be built and owned by IID and/or a third party.

Phase 3 upgrades would make an additional 910 MW of Imperial Valley generation deliverable to the CAISO grid, bringing cumulative incremental export capacity to 2,200 MW. As with Phases 1 and 2, most of the new Imperial Valley generation was assumed to be scheduled to SDG&E and facilitated by a new 500 kV interconnection. Additional upgrades of the IID transmission system would support delivery of renewable resources to the Mirage/Devers 230 kV system, and/or accommodate unintended flow across Path 42.[20]

2. The CEC Specifically Found that SDG&E Needs the Sunrise Powerlink to Meet its RPS Goals.

The CEC's recently adopted Strategic Transmission Investment Plan identified the need for certain major transmission projects, and specifically found that SDG&E needs the Sunrise Powerlink to meet its RPS goals (emphasis added):[21]

> **Sunrise Powerlink 500 kV Project** - The proposed 500 kV Sunrise Powerlink Project would provide significant near-term system reliability benefits to California, reduce system congestion and its resultant costs, and provide an interconnection to both renewable resources located in the Imperial Valley and lower-cost out-of-state generation. *Without this proposed project, it is unlikely that SDG&E will be able to meet the state's RPS goals,* ensure system reliability, or reduce RMR and congestion costs. The Energy Commission therefore believes that the proposed project offers significant benefits and recommends that it move forward expeditiously so that the residents of San Diego and all of California can begin to realize these benefits by 2010 (Report at 6).
>
> * * * *
>
> In summary, the proposed 500 kV Sunrise Powerlink Project would provide significant near-term system reliability benefits to California, reduce system congestion and resultant congestion costs, and provide an interconnection to renewable resources located in the Imperial Valley and lower-cost out-of-state generation. *Without the proposed project, it is unlikely that SDG&E*

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[20] Path 42 encompasses the transmission facilities that tie SCE's transmission system in the Devers substation area to IID's transmission system.

[21] Strategic Transmission Investment Plan, Prepared in Support of the 2005 Integrated Energy Policy Report Proceeding (04-IEP-1K), Final Committee Report, adopted November 21, 2005.

> *will be able to meet the state's RPS goals*, ensure system reliability, or reduce RMR and congestion costs. Therefore, the Energy Commission believes the proposed project offers significant benefits and recommends that the project be moved forward expeditiously so that the residents of San Diego and all of California can begin realizing these benefits by 2010 (Report at 65).

In sum, the CEC has specifically made findings with respect to the Sunrise Powerlink congruent with those required by this Commission under SB 1078 - that the Sunrise Powerlink "is necessary to facilitate achievement of the renewable power goals" established by the legislature.

D. Conclusion – SDG&E Needs the Sunrise Powerlink to Meet RPS Goals

Hypothetically, given the CAISO's open access regime, it is possible for SDG&E to meet its 2010 RPS goals without the Sunrise Powerlink. But the state's renewables mandate does not call for meeting the RPS goals at all costs. Given the high likelihood of prohibitively costly congestion, and the accompanying chill on renewable development without the Sunrise Powerlink, the Sunrise Powerlink is truly "necessary" for SDG&E to meet its RPS goals in a cost effective manner. Further, should the state adopt future goals that increase the renewable target beyond 20% (to as much as 33%), the Sunrise Powerlink would most play a critical role in allowing SDG&E to expand plan to meet these expanded goals.

This concludes this chapter.

Table IV – 1

CONFIDENTIAL

(Not Included in this Redacted Public Version)

SUNRISE POWERLINK

CHAPTER V

ECONOMIC BENEFITS

SDGE
A Sempra Energy utility

Application No.: A.05-12-______

Exhibit No.: ___________________

Date: December 14, 2005

Witness: Jan Strack

Victor Kruger

V.

ECONOMIC BENEFITS

SDG&E demonstrates in this Chapter that the Sunrise Powerlink is cost-effective and will pay for itself and potentially provide estimated net savings of up to $57million per year by way of reduced energy costs. These savings will benefit CAISO ratepayers[1] through (1) reduced Reliability-Must-Run ("RMR") contract costs, and (2) improved dispatch efficiency as a result of reduced grid congestion and the associated increase in access to lower-cost sources of power in the desert Southwest. SDG&E estimates that the total levelized RMR savings over the life of the project will reduce electric costs for customers in the San Diego area by about $114 million per year. The levelized savings from improved grid dispatch efficiency will be about $96 million per year. The project will also provide about $1 million per year in reduced line losses. Given the "high" and "low" construction cost estimates discussed in Chapter II, these cost savings represent a benefit-to-cost ratio for the Sunrise Powerlink of 1.0/1 and 1.37/1, respectively.

The project will augment existing transfer capability between the desert Southwest and California load centers and accommodate the retirement of aging and inefficient, gas-fired generation in the San Diego area by providing an increased ability to access capacity sources. By reducing congestion and losses, CAISO consumers will be able to access low cost sources of power in the desert Southwest and, at the same time, the improved access will offer developers of conventional power plants viable alternative locations to build new, efficient, generating capacity. The project will also enhance competition among the generators that supply power to California, putting downward pressure on energy costs.

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[1] SDG&E's economic analysis focuses on consumers within the CAISO control area because nearly all of the costs of the Sunrise Powerlink project will be socialized across all CAISO consumers in accordance with the CAISO's Transmission Access Charge (TAC) methodology.

Section A of this Chapter addresses the method for determining reductions in RMR costs. Section B presents a comprehensive analysis of the economic benefits of the Sunrise Powerlink for all three areas – RMR, congestion, and line loss savings.

A. Reductions in RMR Contract Costs

The CAISO's existing congestion management tools do not allow it to identify or resolve intra-zonal congestion in the day-ahead scheduling market. Historically, there have been high levels of intra-zonal congestion in the Miguel substation area. This has required the CAISO to issue real-time decremental dispatch instructions based on supplemental bids submitted by generators located east of Miguel substation, and real-time incremental dispatch instructions based on supplemental energy bids submitted by generators located west of the Miguel substation. The CAISO's dispatch instructions were generally out-of-merit order (e.g., not based on least-cost dispatch), thereby necessitating uplift payments to the affected generators. The CAISO recovered the cost of these uplift payments from all loads within the South of Path 15 ("SP 15") zone.

However, because most of the generation west of Miguel substation that is effective in mitigating intra-zonal congestion in the Miguel substation area is under RMR contracts,[2] most of the out-of-merit order costs incurred by the CAISO to obtain the necessary quantity of incremental energy west of Miguel substation was recovered from customers pursuant to the CAISO's RMR cost recovery rules. These rules specify that RMR costs—which include both the costs of out-of-merit order dispatch and the fixed costs necessary to maintain the RMR units' financial viability—are to be recovered only from those

[2] RMR contracts are required when the CAISO and the FERC determine that there is insufficient generator competition in an area constrained by transmission limitations to discipline prices to competitive levels. The CAISO and FERC have determined that based on existing import capability into the San Diego basin, generators in the San Diego area have the ability to exercise local market power. The RMR contracts mitigate the ability of generators within the local area to exercise local market power.

customers in the service area where the RMR units are located, i.e., from loads within the SDG&E service area.

Because customers within the SDG&E service area pay a share of the CAISO's intra-zonal uplift costs and 100% of associated RMR contract costs, San Diego area loads have borne a comparatively heavy cost burden for the CAISO's management of intra-zonal congestion. The planned implementation of LMP in February, 2007 will eliminate the existing zonal approach for managing congestion. It will allow the CAISO to manage all grid identifiable congestion in the day-ahead time frame and will end the need for intra-zonal uplift payments. But absent new import capability or significant quantities of new in-area generation, LMP will not eliminate the need to maintain RMR contracts, or similar arrangements, to mitigate the ability of local generators to exercise market power when they are required to operate to maintain local reliability.

On an annual basis the CAISO establishes the local areas that, absent mitigating measures, may be subject to the exercise of local market power. For those local areas that are determined to be subject to the exercise of local market power, the CAISO performs an evaluation to identify the quantity of local generation that will need to be placed under an RMR contract in order to ensure that loads will be met during specific system conditions and to protect those loads from the potential exercise of local market power. For the San Diego area these conditions are a G-1/N-1 contingency event, followed by the possible outage another transmission element, during an adverse peak load weather condition that has a one year in five probability of occurrence, i.e., during an 80/20 peak load condition.[3]

[3] The approach used by the CAISO to identify RMR requirements is set forth in the CAISO Grid Planning document *Reliability Must-Run (RMR) Study Methodology*. It should be noted that this is a different demand condition from the 90/10 peak load condition used in assessing reliability requirements in Chapter III of this filing.

In determining the quantity of local generation that will need to be placed under an RMR contract, the CAISO takes into account: (1) the impact of demand response programs that are expected to be available during the assumed system conditions, (2) the amount of import capability that is available to deliver power into the San Diego area, (3) the likely availability of local generation based on demonstrated capability during periods of peak load, and (4) the known bilateral contract status of the various local generators. Table V-1 in Appendix V lists the demand response and generating capacity that are assumed to be available for purposes of determining RMR requirements in the San Diego area. Table V-1 also shows the demand forecast and resource assumptions used in this determination. The forecasts of demand, energy efficiency, demand response and distributed generation ("DG") resources are discussed further in Appendix V.

1. Resources Eligible to Satisfy the CAISO's RMR Requirement

In determining the quantity of local generation that needs to be placed under an RMR contract, the CAISO generally assumes that a generator whose output is committed to a buyer at a fixed price, does not have the ability or incentive to exercise local market power.[4] Thus Qualifying Facilities ("QFs") and renewable resources within the San Diego area whose output is purchased by SDG&E under fixed price bilateral contracts, act to reduce the quantity of local capacity that the CAISO will subject to RMR contracts. The amount of capacity from these QFs and renewable resources that the CAISO uses to

[4] This is because the generator owner's revenue stream is determined by the bilateral contract terms and is unaffected by the local price for power. In theory the only way such a generator could profitably exercise local market power is if the generator owner owned other uncontracted generation in the local area. In such event, the generator could restrict the output of its contracted generation in order to increase local market prices. If the resulting increase in local market prices increased profits for the uncontracted generation by an amount which more than offset the loss of profits for the contracted generation (which would occur as a result of the contracted generator's restricted output) the generator owner might have the incentive to exercise local market power. SDG&E does not believe there are any local generators from whom SDG&E buys power who are so-situated. If there were, the CAISO would presumably subject the uncontracted generation to an RMR contract. This would mitigate any ability to exercise local market power.

reduce local RMR requirements is based on the units' historical average output during peak load periods. The aggregate amount of such capacity is shown on Table V-1 (see "subtotal SDG&E Area QFs").

It should be noted that the 50 MW Kumeyaay Wind project in eastern San Diego County is not assumed to be available during the system conditions used by the CAISO to identify RMR requirements. This is because this facility is still under construction and has no historical operating experience to demonstrate its likely availability during the system conditions used by the CAISO to identify RMR requirements. Similarly, the planned 40 MW Envirepel biomass facility in northern San Diego County is not assumed to be available since it has yet to begin construction. If these resources were included, they would likely have a small impact on the economic benefits in the early years.

2. Import Capability Used in Identifying RMR Contract Requirements

Because the CAISO applies its G-1/N-1 reliability criteria to the San Diego area transmission system for purposes of establishing the quantity of capacity that will be subject to an RMR contract, the applicable import levels are those described in Chapter III, Reliability: 2,500 MW without the Sunrise Powerlink and 3,500 MW with the Sunrise Powerlink.

3. Projecting RMR Contract Requirements

Once the CAISO has determined the quantity of generation in a local area that will be subjected to RMR contracts, it solicits bids from eligible generators to supply the identified RMR requirements. Some generators may be deemed ineligible for an RMR contract because their ability to exercise local market power is already mitigated by an existing bilateral contract (e.g., QFs), or because the generator owner does not own or control enough generation in the local area to make an attempt to exercise local market power profitable. Other generators may be *required* to sign an RMR contract if (1) the output of the unit is needed to meet load during the system conditions assumed by the CAISO for purposes of identifying RMR contract requirements, and/or (2) it is assumed the subject generation would, absent an RMR contract, not be financially viable and would be removed from service. Based on the bids it receives, the CAISO awards RMR contracts to local generators in order to minimize expected RMR contract costs. This means that the CAISO would tend to award RMR contracts to the more efficient generators that are willing to accept a relatively lower level of payments towards the generator's fixed costs (known as the "fixed option payment").

Tables V-2 and V-3 in Appendix V provide SDG&E's assessment of the RMR requirements with and without the Sunrise Powerlink for the San Diego area using the CAISO's G-1/N-1 outage condition during 80/20 peak load conditions. The local generating units that SDG&E believes would likely be subjected to an RMR contract are highlighted. SDG&E believes these highlighted units are those that would minimize RMR costs with and without the Sunrise Powerlink. This determination was based on SDG&E's knowledge of the historical RMR costs associated with each of the subject generating units.

The RMR cost savings analysis recognizes that several initiatives are underway that will likely lead to the replacement of the current RMR contracts, notably through the introduction of some form of capacity market. It is assumed that by 2010 a viable capacity market will exist in California and all capacity needed to assure local area transmission reliability will be purchased through that market. Accordingly, the analysis presented here is not tied directly to the current form of RMR contracts. Instead, it attempts to simply capture the relative costs of ensuring local area reliability under the preferred Sunrise Powerlink transmission alternative and the in-area combined cycle generation alternative.

Many of the RMR costs are the same under both the Sunrise Powerlink and the alternative generation case so they cancel out. For example, the RMR costs associated with SDG&E-controlled generation (i.e., the new Miramar combustion turbine, the Palomar combined cycle plant, and the Otay Mesa combined cycle generating facility) are the same regardless of which of the two alternatives is pursued. Hence these RMR costs do not influence the benefit/cost analysis and the allocation of these plants costs is not relevant to this proceeding.

The source of RMR cost savings associated with the Sunrise Powerlink are summarized in Table V-4A below. The source of RMR cost savings associated with the in-area combined cycle generation alternative are summarized on Table V-4B below.

<u>Table V-4A</u>

Estimated RMR Contract Costs (millions)									
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**		
Without Sunrise Powerlink ("No Project" reference case)	$130	$135	$142	$148	$158	$170	$185		
With Sunrise Powerlink	$77	$52	$54	$63	$72	$82	$94		
									Levelized (2010 – 2049)
Savings	$53	$83	$87	$86	$86	$88	$91		$114

<u>Table V-4B</u>

Estimated RMR Contract Costs (millions)									
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**		
Without Sunrise Powerlink ("No Project" reference case)	$130	$135	$142	$148	$158	$170	$185		
With In-Area Combined Cycle	$119	$128	$129	$135	$142	$150	$159		
									Levelized (2010 – 2049)
Savings	$11	$4	$6	$1	($1)	($2)	($1)		$0

SDG&E is evaluating the cost-effectiveness of the Sunrise Powerlink, and the other indicated transmission and in-area generation alternatives against, a "no project" reference case. As noted elsewhere in the filing, the "no project" reference case is fictional in the sense that it does not satisfy the CAISO's G-1/N-1 reliability criteria; i.e., the "no project" reference case does not contain enough import capability and in-area generating capacity to meet all San Diego area loads under the CAISO's indicated contingencies and assumed peak load conditions. With respect to the evaluation of RMR savings, it is not surprising that the in-area generation alternative provides little in the way of benefits *as compared to* the no-project reference case. This is because there is less in-area generating capacity, and therefore less capacity payments (proxy RMR costs) in the no-project reference case. Note, however, that because the Sunrise Powerlink, and the other transmission and in-area generation alternatives, are compared against the <u>same</u> no-project reference case; the economic affects of the fictional case wash out.

The RMR benefits associated with the Sunrise Powerlink arise because the project expands the quantity of out-of-area generating capacity that can reach loads in the San Diego area during critical G-1/N-1 outage conditions. Because the size of the generation market outside of the San Diego area is very large, comprised of many different owners, and linked through a relatively robust high voltage transmission network, the ability of these generation owners to exercise market power is not a significant concern. The increased import capability during G-1/N-1 outage conditions (1,000 MW) will mean that fewer existing in-area generators will be required in order to meet the minimum local transmission reliability standards.

It is assumed that a local capacity market will provide the in-area capacity needed to reliably supply local loads. The assumed retirement of the South Bay plant by 2010 creates the need for new capacity in, or into, the San Diego area. The Sunrise Powerlink will reduce the amount of local capacity that is otherwise needed by 1,000 MW.

An alternative is to assume that 1,000 MW of local capacity is purchased through the local capacity market.[5] For purposes of this analysis presented, it is assumed that 1,000 MW of new generating capacity is added within the San Diego area and that this generating capacity receives a $69/kW-year (2010$) capacity payment to ensure its economic viability.[6] In the short-term, the price could be lower because of existing old generation that has been significantly depreciated and may be viable at a lower capacity payment. Also, in the longer-term combined cycle plants may make enough profit on energy sales to be viable below this capacity price. However, continued load growth and retirements coupled with the need for peaking capacity and reserves will eventually push capacity costs above this level because there is no other significant revenue source to support the construction of new peaking generating capacity. In this sense the $69/kW-year long-term average capacity cost is conservative. The actual cost of replacement capacity could be much higher which would increase the comparative benefit of the Sunrise Powerlink

Note that in comparison to the "no project" reference case, the alternative of adding 1,000 MW of in-area generation and providing this generation with a $69/kW-year capacity payment to ensure its economic viability, offers virtually no net economic benefit. While the 1,000 MW of new in-area generation reduces the need to maintain older, less efficient, local generation, therefore reducing RMR contract costs, the cost of ensuring the economic viability of the new in-area generation largely offsets this benefit.

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[5] Note that the analysis assumes that the 1000 MW of new generation is configured so as to avoid creating a larger G-1 than the planned Otay Mesa combined cycle facility.

[6] The future local capacity market price should be set to assure the economic viability of the last needed capacity resource to clear the market. This will normally be a new simple cycle peaking unit that has some ancillary services revenue and very little profit from marginal energy sales.

There are differences in the amount of energy needed for local reliability between the Sunrise Powerlink and the alternative. Most of the energy benefits stem from the higher availability of a transmission line compared to a power plant. During the expected five percent total outage rate of the alternative power plants additional old high cost plants must be run to maintain reliability. The additional 1,000 MW of import with the Sunrise Powerlink maintains reliability with little extra cost because its outage rate is much less, typically 1%.

The Sunrise Powerlink also addresses outages at SONGS, Palomar, and Otay Mesa at a lower cost than the alternative new capacity because increased imports allow access to the lowest cost energy sources.

The Sunrise Powerlink offers other RMR savings due mainly to the fact that absent the Sunrise Powerlink, in-area generation will be run longer and harder, incurring more wear and tear and higher maintenance costs. These could take the form of usage penalties as in the current RMR contracts or extra maintenance charges.

The total RMR levelized benefits of $114 million per year for the Sunrise Powerlink compared to the “no-project” reference case should be considered a conservative estimate. Several conservative aspects of the estimate have been addressed. However, the entire analysis is based on perfect utilization of all RMR plants without any over commitment to provide a safety margin. In the real world operators can’t follow all reliability limits to the nearest MW as this analysis does. The use of RMR resources will always be slightly below optimal and the gap is larger for generation than transmission resources. The main reason is transmission is instantly responsive and doesn’t have a ramp rate like a generator to respond to system disturbances.[7] Also, transmission import capability is not dependent on properly predicting reliability requirements in advance to dispatch a generator so it will be available to provide reliability when needed. The generation alternative to Sunrise Powerlink would have additional reliability costs due to larger operational reliability margins.

B. Total Energy Saving (Reduced RMR, Congestion, and Line Losses)

By increasing the transfer capability between the Imperial Valley and the San Diego area, the Sunrise Powerlink will reduce congestion and allow the WECC grid to be dispatched more economically. This will reduce costs that would otherwise have to be paid by consumers within the CAISO control area. Including RMR savings, the levelized net consumer energy benefits are projected to total $210 million per year over the assumed 40-year life of the project beginning in year 2010. Comparing these energy benefits to the “low” and “high” levelized revenue requirements associated with recovering the costs of constructing and operating the Sunrise Powerlink, discussed in Chapter II, results in benefit/cost ratios of 1.37/1 and 1.00/1, respectively.

Because the alternating current (“AC”) powerflow and stability analysis necessary to apply the relevant reliability criteria are extraordinarily detailed, data-intensive, and complex, the number of system conditions that can be studied at the level of detail used to define the project scope are necessarily limited. The Sunrise Powerlink project scope was identified through consideration of three basic system conditions: “Heavy Summer”, “Heavy Winter” and “Light Autumn”. While adequate for establishing conformance with applicable reliability criteria, the detailed analyses of these three basic conditions are not

[7] Stated differently, the Sunrise Powerlink ties the San Diego area more closely to a much larger network of generating units. The collective capability of this large network of generators offers far more responsiveness and reliability than relatively fewer generating units within the San Diego area.

suitable for assessing the *economic* impact of the project since the line will be in service during virtually all hours of a year, i.e., during 8,760 distinct system conditions each year.

To assess the economic impacts of the Sunrise Powerlink, SDG&E has employed a modeling tool that simplifies the simulation of grid powerflows, thereby allowing an evaluation of 8,760 hours per year of system operation. The results of this evaluation (which captures the economic effects of least-cost generator dispatch and congestion management with LMP), along with an estimate of the reduction in RMR contract costs, are used to predict the annual customer savings that will result from construction of the new line. The resulting savings, extrapolated over the life of the facility, compared against the revenue requirements necessary to recover the capital costs SDG&E will expend to implement the project scope described above, provide an indication of the relative cost-effectiveness of the line.

By simulating the dispatch of generation across the WECC grid with and without the Sunrise Powerlink; while observing applicable transmission limits, including the N-0 import limits into the San Diego area without and with the Sunrise Powerlink (2,850 MW and 4,000 MW, respectively); an estimate of the energy costs that will be incurred by consumers in the CAISO control area—without and with the Sunrise Powerlink—are determined. The difference in consumer energy costs between the *without* and *with* Sunrise Powerlink cases represents the energy savings of the new line. The CAISO's Transmission Economic Assessment Methodology ("TEAM"), described below, provides a methodological framework for predicting these energy savings.

Because the generator dispatch algorithm employed by SDG&E uses a strict "least cost" optimization routine, the effect of the Sunrise Powerlink on the CAISO's out-of-merit dispatch of RMR units must be separately captured. Section A, above, describes the methodology SDG&E used to estimate the RMR contract costs, with and without the Sunrise Powerlink, that are in addition to those included in the least-cost optimization routine. Table V-5 below summarizes these benefits and costs.

Table V-5

Sunrise Powerlink			
Benefits (Levelized 2010 – 2049)		**(millions)**	
Energy Savings		**$96**	
RMR Savings		**$114**	
Total Savings		**$210**	
Fixed Costs (Levelized 2010 – 2049)		**“Low” Capital Cost Estimate (millions)**	**“High” Capital Cost Estimate (Millions)**
Transmission Revenue Requirement		**$153**	**$212**
Benefit/Cost Ratio		**1.37/1**	**1.00/1**

SDG&E emphasizes that the Sunrise Powerlink’s relative cost-effectiveness is but one measure of the value of the line. The Sunrise Powerlink will also ensure that there is enough import capability to meet all grid loads should there be an over-lapping outage of the most critical in-area generator and the most critical transmission line followed by the outage of any other transmission element during any reasonably plausible adverse weather peak load condition. This analysis shows, at a minimum, that the economic benefits of the Sunrise Powerlink exceed its costs and the project will pay for itself. SDG&E has not attempted to quantify the economic value of satisfying the CAISO’s B-1/N-1 reliability criteria because the “no project” alternative of not satisfying this criteria, i.e., dropping load, is not considered an acceptable alternative.

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1. Determining Import Levels Used for Normal Operations; i.e., the Import Levels to be Used for Estimating Energy Benefits

Congestion exists when transmission constraints (a) prevent resources east of the CAISO load centers with relatively low variable operating costs from running, and (b) require resources within the CAISO load centers with relatively high variable operating costs to run. If these transmission constraints are reduced—which the Sunrise Powerlink accomplishes by adding a second 500 kV connection between the Imperial Valley and the San Diego load center—increased amounts of lower variable cost power from areas east of the CAISO load centers can be used to displace sources of higher variable cost power within the CAISO load centers.

Absent new import capability, the maximum level of imports into the San Diego area that can be achieved under typical operating conditions is 2,850 MW. This limit is based on application of the NERC/WECC N-0 reliability criteria which specifies that the outage of any one ("N-1") grid element (transmission line segment, transformer, or generator) may not overload any facility or result in any unacceptable voltage levels (a "Category B" contingency). The 2,850 MW import capability represents the combined capability of the five South of SONGS 230 kV lines which connect the San Diego area to the SCE system at SONGS. With the outage of the Imperial Valley-Miguel 500 kV line, and assuming the cross-trip of the Imperial-La Rosita 230 kV line, the power that was flowing into the San Diego area from the east prior to the outage swings instantly counterclockwise and flows into the San Diego area from the north on the South of SONGS lines.[8] At import levels above 2,850 MW, the outage of the Imperial Valley-Miguel line creates a risk of voltage collapse.

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[8] The maximum 2,850 MW import capability into the San Diego area under N-1 contingency conditions assumes a net scheduled interchange of zero between CFE and the CAISO grid.

With the Sunrise Powerlink, there will be a significant increase in the amount of power that can be imported into the San Diego area under typical operating conditions. SDG&E has performed studies with the Sunrise Powerlink in-service that conservatively indicate that at least 4,000 MW can be imported into the San Diego area under N-0 conditions in anticipation of the most critical single element outage (the Imperial Valley-Miguel 500 kV line). With the outage of Imperial Valley-Miguel power that was flowing into the San Diego area from the east prior to the outage, will instantaneously redistribute itself among the remaining ties to the San Diego area: the connection through Mexico via Tijuana, the five South of SONGS lines, and the Sunrise Powerlink. The studies indicate that with 4,000 MW of combined imports the resulting distribution of flows do not overload any facilities and do not result in any unacceptable voltage levels.[9]

The addition of the Sunrise Powerlink and associated increase in import capability will allow for a more efficient dispatch of generation throughout the WECC. The change in WECC generation dispatch patterns—compared to the reference case without the Sunrise Powerlink—changes the magnitude and pattern of line flows and congestion within the CAISO control area. To illustrate this, Figure V-1 shows the annual duration curve of imports into the San Diego area in year 2015 with and without the Sunrise Powerlink.[10] Figure V-1 shows graphically how the Sunrise Powerlink enables the cost effective importation of power during times of peak demand, when the cost of power is typically highest. Figure V-2 shows the annual duration curve of CAISO congestion rents in year 2015 without and with the Sunrise Powerlink on the West Of River ("WOR") interface.

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9 The assumed 4,000 MW import capability for the San Diego area under N-1 contingency conditions assumes a net scheduled interchange of zero between CFE and the CAISO grid.

10 Imports into the San Diego area are measured as the sum of (a) flows into Miguel substation on the Imperial Valley ("IV")-Miguel 500 kV line, (b) flows on the five South of SONGS lines, (c) flows at the U.S.-Mexico border on the 230 kV line connecting the SDG&E system to CFE's Tijuana substation, and (d) for the case with the Sunrise Powerlink, flows into Central substation on the IV-Central 500 kV line.

Figure V-1

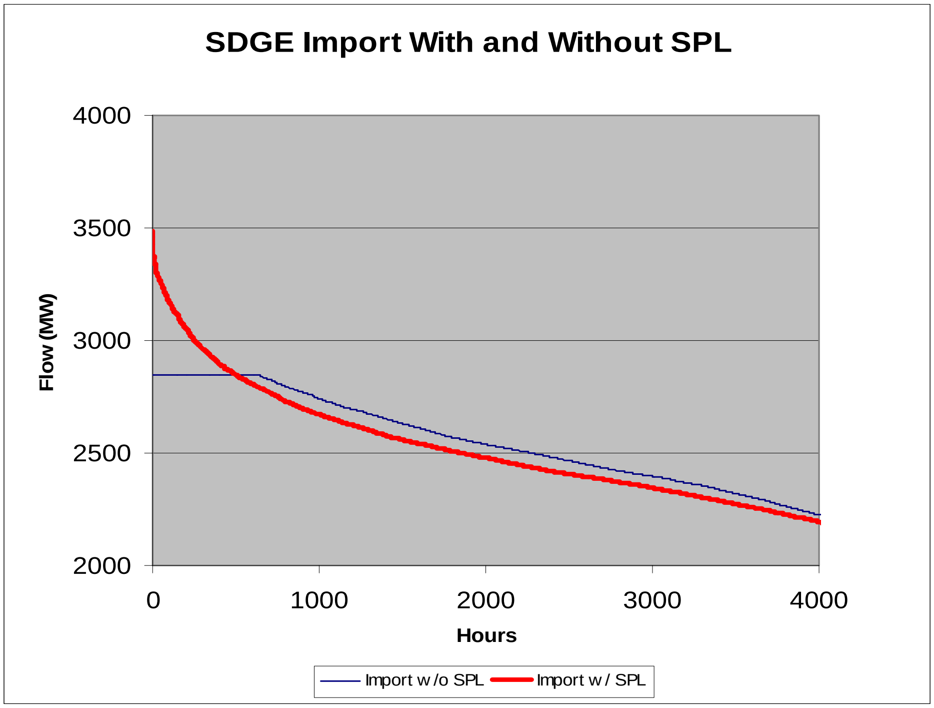
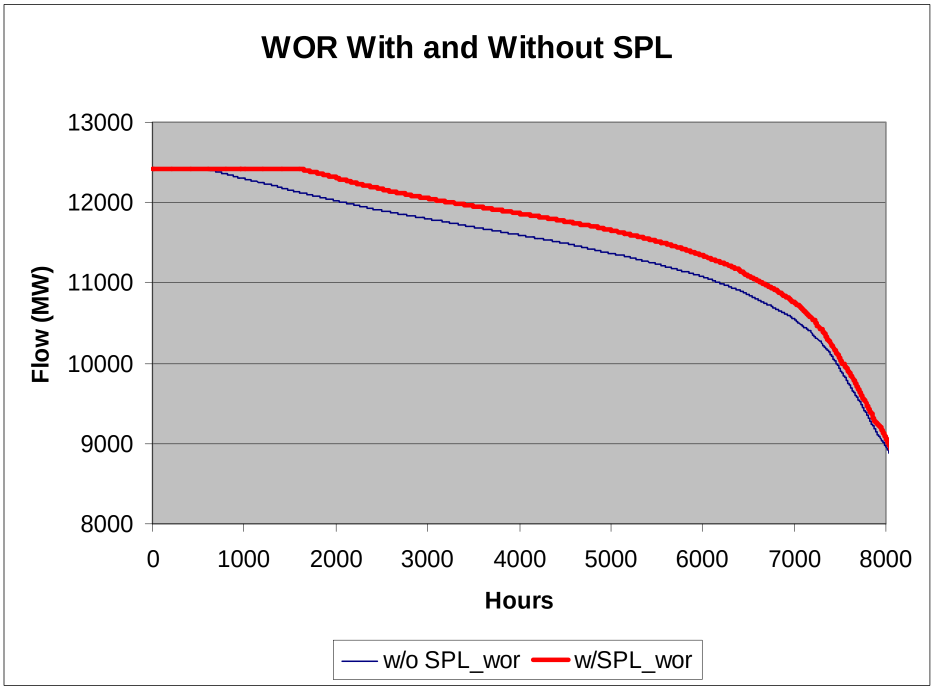


Figure V-2[11]



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[11] The WOR cut plane is comprised of a "Northern System" and a "Southern System". The lines that comprise these systems are generally the high voltage facilities which cross the Colorado River and connect Southern Nevada and Arizona to Southern California. The WOR cut plane is east of the Sunrise Powerlink.

2. <u>CAISO's Transmission Economic Assessment Methodology (TEAM)</u>

The CAISO has developed a Transmission Economic Assessment Methodology (TEAM) to estimate the economic value of adding new transmission. As described in the CAISO's June, 2004 report concerning application of its *Transmission Economic Assessment Methodology (TEAM)* to the proposed Path 26 upgrade project, the TEAM offers five major enhancements to traditional transmission evaluations. It:

1. Utilizes a framework to consistently measure the benefits of a transmission expansion project to various participants.
2. Utilizes a network model that can capture the physical constraints of the transmission grid as well as the economic impacts of a project.
3. Provides a simulation method that incorporates the impact of strategic bidding on market prices.
4. Addresses the uncertainty about future market conditions by providing a methodology for selecting a representative set of market scenarios to measure benefits.
5. Captures the interaction between generation, demand-side management, and transmission investment decisions recognizing that transmission expansion can impact the profitability of new resource investments.

The TEAM has been used by the CAISO to estimate the economic value of the proposed Path 26 upgrade[12] and SCE's proposed Devers-Palo Verde # 2 ("DPV2") line[13]. The CAISO Board approved both of these proposed projects. The Commission is currently engaged in an OII to consider the circumstances under which the Commission could defer to the CAISO's determination that proposed transmission is "needed". The Commission is considering whether the CAISO's application of the TEAM to proposed

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[12] See the CAISO's June, 2004 report concerning application of its *Transmission Economic Assessment Methodology (TEAM)* to the proposed Path 26 upgrade project.

[13] See the CAISO's February 24, 2005 Board Report for the *Economic Evaluation of the Palo Verde-Devers Line No. 2 (PVD2).*

transmission projects could be used as a basis for deferring to the CAISO's determination of need or for adopting a rebuttable presumption of need.[14]

In accordance with the TEAM, SDG&E has performed integrated production costing/powerflow analysis to estimate the energy cost savings that will result from the addition of the Sunrise Powerlink. This analysis simulates grid operations for every hour of the year and produces powerflows that honor applicable line capabilities, path ratings and nomogram limits. As a practical matter, this means that at the simulated powerflow levels ("N-0" conditions), the outage of any element on the interconnected WECC grid (an "N-1" event) will not result in the loss of load, thermal overloads or unacceptable voltages.[15]

To compute energy cost savings, SDG&E compared energy costs between two cases: the Sunrise Powerlink is not built ("Case 00") and the Sunrise Powerlink is built ("Case 1"). In the former case, the simulation model utilizes the existing 2,850 MW simultaneous import limit and in the latter case the simulation model utilizes the predicted new import limit of at least 4,000 MW. While the actual N-0 import limit with the Sunrise Powerlink is likely greater than 4,000 MW, it was not necessary for the instant analysis t know exactly what this limit is. This is because at 4,000 MW of import capability, congestion into the San Diego area is eliminated.

In both cases CAISO consumer costs are approximated by the quantity of load at each bus times the LMP at the respective bus. These costs are then reduced by (a) the

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[14] Order Instituting Investigation on the Commission's Own Motion into Methodology for Economic Assessment of Transmission Projects – Investigation 05-06-041, Filed June 30, 2005

[15] Because of the large number of transmission elements in the WECC, it is computationally impractical to enforce every transmission limit. SDG&E elected to enforce only the higher voltage limits, where the majority of the grid congestion costs arise. Moreover, it is reasonable to expect that congestion on the low voltage network will be addressed through transmission upgrades that are identified in the annual grid assessment process as needed to meet on-going load growth.

producer surplus for generation that is owned by utilities serving load in the CAISO control area[16], and (b) the congestion rents that are generated on transmission that is subject to the CAISO's congestion management protocols. The first adjustment is necessary because market revenues in excess of variable operating costs for utility-owned generation act to reduce the net energy cost to consumers within the CAISO control area. The second adjustment recognizes that CAISO consumers, having paid for the development of the integrated grid, are entitled to the revenues that the use of that grid generates.[17]

Table V-6 below shows how the gross energy charges to CAISO consumers are adjusted to arrive at the net energy savings associated with adding the Sunrise Powerlink.

Table V-6

Net Consumer Energy Savings from Adding Sunrise Powerlink

CAISO Energy Costs (2005$, millions)						
	Case 00		**Case 1**		**Case 00–Case 1**	
	w/o Sunrise Powerlink		**w/ Sunrise Powerlink**			
	2010	**2015**	**2010**	**2015**		
Consumer Energy Costs	**11656**	**12973**	**11611**	**12873**		
Less Utility-Owned Producer Surplus	**2446**	**2561**	**2439**	**2542**		
Less CAISO Congestion Rents	**151**	**230**	**153**	**229**		
Net Consumer Energy Costs	**9059**	**10182**	**9018**	**10102**		
					2010	**2015**
Net Consumer Energy Savings (annual, 2005$)					**41**	**80**
Net Consumer Energy Savings (annual, nominal $)					**45**	**101**
Net Consumer Energy Savings (levelized, 2010-2049)					**$96**	

[16] This adjustment also accounts for utilities' *contract* rights to generation where SDG&E was aware of such rights. For example, SDG&E's bundled customers receive the consumer surplus associated with SDG&E's 15% contractual entitlement to the output of the Boardman coal plant. SCE's bundled customers and certain municipal utilities within the CAISO control area have a similar entitlement to a portion of the consumer surplus generated by Hoover Dam.

[17] Exactly which CAISO consumers receive exactly how much of the congestion revenues is an entirely separate matter. Because nearly all of the costs of the Sunrise Powerlink project will be socialized across all CAISO consumers, it is appropriate to evaluate the benefits on a similarly aggregated basis.

In this analysis, SDG&E applied the TEAM to the Sunrise Powerlink for two years, 2010 and 2015. Results between years 2010 and 2015 were interpolated. After year 2015, SDG&E applied a conservative escalation series, the "PPI All Commodities" index, to extrapolate results over the assumed life of the project (40 years).

In addition to identifying the effect of a proposed transmission line on CAISO consumers, the TEAM approach provides results which indicate how other market participants may be affected. Because loads, resources and transmission across the entire WECC are included in the simulations, the directional effects of the new line on consumers (changes in overall energy cost levels) and producers (changes in producer surplus) outside of the CAISO control area can be identified. Similarly, directional changes in WECC-wide production costs can be identified. These results are considered directional rather definitive because the simulation method assumes *all* control areas use a market-based, rather than contract-path based, open access regime with LMP for determining which market participants will use the transmission grid when transmission constraints arise.[18] In reality, it is unlikely that all control areas will convert to market-based open access with LMP in the foreseeable future.

To the extent market-based open access with LMP is not used by other control areas, there is an overall loss of grid-dispatch efficiency within the WECC. Exactly how this difference in transmission access regimes effects the economic analysis conducted here for the Sunrise Powerlink is uncertain. It is possible that the lower levels of grid dispatch efficiency in other areas of the WECC would actually enhance the value of the

[18] The CAISO is in the final design stage of its Market Redesign and Technology Upgrade (MRTU) project. MRTU is scheduled for implementation in February, 2007. MRTU incorporates market-based open access and will reveal LMPs at each node (bus) within the CAISO control area. While other areas of the WECC are considering the use of market-based open access approaches and LMP, the ultimate outcomes and their timing are highly uncertain.

Sunrise Powerlink because the new line increases access by suppliers in these other regions to the CAISO's more efficient market mechanisms.

The TEAM approach makes certain internal adjustments to account for the differences in open access regimes. These adjustments are described in detail in Appendix N "Alternative Market Paradigms" of the CAISO's *Technical And Other Appendices* for the "*Economic Evaluation of the Palo Verde Devers Line No. 2 (PVD2)*". The congestion rents reported above in Table V-6 incorporate these adjustments.

3. <u>Accounting for Uncertainty</u>

In the study that underlies the analysis of the economics benefits of the Sunrise Powerlink, SDG&E considered three key variables that might have significant impact on the resulting economic benefits. The Sunrise Powerlink and an in-area generation alternative were subjected to a range of future demand levels, future gas price levels, and future hydro production levels. Tables V-7, V-8, V-9 and V-10 in Appendix V show the range of respective peak demand forecasts, energy consumption forecasts, gas price levels and hydro-electric conditions, by WECC region, for years 2010 and 2015.

Regional loads (peak and energy) were derived from the annual levels studied in the CAISO's analysis of SCE's DPV2 transmission line (years 2008 and 2013). Expected case load levels for years 2010 and 2015 were estimated by applying the compound growth rate between years 2008 and 2013. Hourly load levels, by load bus, were estimated by first applying historical hourly load curves for each region (that were obtained from the Seams Steering Group – Western Interconnection's (SSG-WI's) database) to each region's annual peak and energy load forecast. This produces regional hourly load curves. Hourly regional loads were then disaggregated to the individual load buses within each region according to each bus' percentage contribution to regional load at the time of system peak. The percentage contribution is determined from WECC basecase powerflows. Loads in the SDG&E service area were updated to the levels reflected in SDG&E's demand forecast discussed in Appendix VI herein. CFE's loads were also updated to reflect recent recorded load levels (provided by CFE) in the northern Baja peninsula. The "high" and "low" load forecast levels were developed by using the same ratios that were used in CAISO's DPV2 analysis.

The "medium" gas price forecast used in the analysis is based on a forecast of annual average Henry Hub gas prices developed by the Southern California Gas Company ("SoCalGas") for SDG&E's 2005 Long-Term Resource Plan filed with the Commission in connection with R.04-04-003. The associated monthly and regional gas price forecasts, and the "high" and "low" gas price scenarios, were developed by applying the same ratios used by the CAISO in its DPV2 analysis.

The "average" hydroelectric scenario uses hourly hydro production data obtained from the database being developed by SSG-WI and from hourly hydro production data provided by the CAISO. The "wet" and "dry" hydroelectric scenarios were developed by ratioing the average hourly production data by the annual regional differences shown on Table D.5 of the CAISO's DPV2 technical appendix. In the "wet" hydroelectric scenario a further adjustment was made to Northwest hydroelectric production to account for the increased storage of water that would take place during the spring and summer months in order to maximize production during the higher value fall periods.

In addition several sensitivities were tested to see how specific resource and transmission assumptions might affect the results. In total, 31 scenarios have been evaluated. The combination of the future demand levels, gas price levels, and future hydroelectric production levels, and their effects on the simulation results represent a large set of possible future states of the WECC transmission/generation system. Given the large number of potential combinations, it is simply not possible to simulate every potential combination. Instead a small but representative sample was selected and analyzed. This sample provides a reasonable estimate of the range of expected economic benefits that the Sunrise Powerlink will provide under a wide range of system conditions.

Each of the selected scenarios (cases) were assigned a probability and the results weighted together to produce an overall expected result. The selected scenarios and their respective weights are depicted in Table V-11 in Appendix V. This is consistent with the weights shown on Table A.1 of the CAISO's DPV2 technical appendix.[19]

Tables V-12 and V-14 below show the range of outcomes in relation to the reference case (Case 00), including the expected value result, assuming the "low" capital cost estimates for the Sunrise Powerlink. Tables V-13 and V-15 show the range of outcomes in relation to the reference case (Case 00) assuming the "high" capital cost estimates. Both tables also show outcomes for sensitivities that include the Sunrise Powerlink. The results for the Sunrise Powerlink scenarios with expected load growth, medium gas prices and average hydro conditions are those that are summarized on Table V-5 above. The results for the transmission and in-area generation *alternatives* to the Sunrise Powerlink are described in Chapter VI. Table V-16 in Appendix V lists the capital cost, fixed O&M, heat rate, and variable O&M assumptions used in the economic analysis for the Sunrise Powerlink and each of the related sensitivities studied.

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[19] A probability of 17.7% is assumed for the high load growth, medium gas price, average hydro scenario.

<u>Table V-12</u>

Economic Benefits of Sunrise Powerlink with "Low" Estimated Capital Costs

	Levelized Energy Savings (2010-2049) (millions)			Levelized Fixed Costs (millions)			
	Energy Savings	**RMR Savings**	**Total Energy Savings**	**Transmission (2010-2049)**	**Generation (2010-2043)**	**Total Fixed Costs**	**Benefit/ Cost Ratio**
Sunrise Powerlink (expected load forecast, medium gas price, average hydro conditions)	**$96**	**$114**	**$210**	**$153**	**$0**	**$153**	**1.37/1**
Sunrise Powerlink (expected value)	**$98**	**$114**	**$212**	**$153**	**$0**	**$153**	**1.38/1**
Sunrise Powerlink w/ wind generation in Mexico	**$164**	**$114**	**$278**	**$153**	**$76**	**$229**	**1.21/1**
Sunrise Powerlink w/wind at Warners instead of Boulevard	**$98**	**$114**	**$212**	**$153**	**$0**	**$153**	**1.38/1**
Sunrise Powerlink w/ LEAPS connection to Talega-Escondido	**$104**	**$114**	**$218**	**$205**	**$66**	**$271**	**0.80/1**
Sunrise Powerlink w/ LEAPS connection at Central	**$172**	**$114**	**$286**	**$205**	**$66**	**$271**	**1.05/1**

<u>**Table V-13**</u>

Economic Benefits of Sunrise Powerlink with “High” Estimated Capital Costs

	Levelized Energy Savings (millions)			**Levelized Fixed Costs (millions)**			
	Energy Savings	**RMR Savings**	**Total Energy Savings**	**Transmission (2010-2049)**	**Generation (2010-2043)**	**Total Fixed Costs**	**Benefit/ Cost Ratio**
Sunrise Powerlink (expected load forecast, medium gas price, average hydro conditions)	**$96**	**$114**	**$210**	**$212**	**$0**	**$212**	**0.99/1**
Sunrise Powerlink (expected value)	**$98**	**$114**	**$212**	**$212**	**$0**	**$212**	**1.00/1**
Sunrise Powerlink w/ wind generation in Mexico	**$164**	**$114**	**$278**	**$212**	**$76**	**$288**	**0.96/1**
Sunrise Powerlink w/wind at Warners instead of Boulevard	**$98**	**$114**	**$212**	**$212**	**$0**	**$212**	**1.00/1**
Sunrise Powerlink w/ LEAPS connection to Talega-Escondido	**$104**	**$114**	**$218**	**$264**	**$66**	**$330**	**0.66/1**
Sunrise Powerlink w/ LEAPS connection at Central	**$172**	**$114**	**$286**	**$264**	**$66**	**$330**	**0.87/1**

<u>Table V-14</u>

Economic Benefits of Sunrise Powerlink (assuming "low" capital cost)
Market Sensitivities

	Levelized Energy Savings (2010-2049) (millions)			Levelized Fixed Costs (millions)			
	Energy Savings	**RMR Savings**	**Total Energy Savings**	**Transmission (2010-2049) "Low Cost"**	**Generation (2010-2043)**	**Total Fixed Costs**	**Benefit/ Cost Ratio**
Sunrise Powerlink (low load forecast, medium gas price, average hydro conditions)	**$58**	**$114**	**$172**	**$153**	**$0**	**$153**	**1.12/1**
Sunrise Powerlink (high load forecast, medium gas price, average hydro conditions)	**$181**	**$114**	**$295**	**$153**	**$0**	**$153**	**1.93/1**
Sunrise Powerlink (medium load forecast, low gas price, average hydro conditions)	**$40**	**$114**	**$154**	**$153**	**$0**	**$153**	**1.00/1**
Sunrise Powerlink (medium load forecast, high gas price, average hydro conditions)	**$169**	**$114**	**$283**	**$153**	**$0**	**$153**	**1.85/1**
Sunrise Powerlink (medium load forecast, medium gas price, dry hydro conditions)	**$117**	**$114**	**$231**	**$153**	**$0**	**$153**	**1.51/1**
Sunrise Powerlink (medium load forecast, medium gas price, wet hydro conditions)	**$75**	**$114**	**$189**	**$153**	**$0**	**$153**	**1.23/1**

Table V-15

Economic Benefits of Sunrise Powerlink (assuming "high" capital cost) Market Sensitivities

	Levelized Energy Savings (2010-2049) (millions)			Levelized Fixed Costs (millions)			
	Energy Savings	**RMR Savings**	**Total Energy Savings**	**Transmission (2010-2049) "High Cost"**	**Generation (2010-2043)**	**Total Fixed Costs**	**Benefit/ Cost Ratio**
Sunrise Powerlink (low load forecast, medium gas price, average hydro conditions)	**$58**	**$114**	**$172**	**$212**	**$0**	**$212**	**0.81/1**
Sunrise Powerlink (high load forecast, medium gas price, average hydro conditions)	**$181**	**$114**	**$295**	**$212**	**$0**	**$212**	**1.39/1**
Sunrise Powerlink (medium load forecast, low gas price, average hydro conditions)	**$40**	**$114**	**$154**	**$212**	**$0**	**$212**	**0.73/1**
Sunrise Powerlink (medium load forecast, high gas price, average hydro conditions)	**$169**	**$114**	**$283**	**$212**	**$0**	**$212**	**1.33/1**
Sunrise Powerlink (medium load forecast, medium gas price, dry hydro conditions)	**$117**	**$114**	**$231**	**$212**	**$0**	**$212**	**1.08/1**
Sunrise Powerlink (medium load forecast, medium gas price, wet hydro conditions)	**$75**	**$114**	**$189**	**$212**	**$0**	**$212**	**0.89/1**

4. **Discussion of Sensitivities**

SDG&E has performed several sensitivities involving the Sunrise Powerlink. The first sensitivity assumes that in addition to the Sunrise Powerlink, the Lake Elsinore Advanced Pump Storage ("LEAPS") project is constructed and that the southern terminus of the associated 500 kV transmission is located at a new 500/230 kV substation on SDG&E's existing SONGS-Talega 230 kV line. The second sensitivity assumes that in addition to the Sunrise Powerlink, the LEAPS project is built and the southern terminus of the associated 500 kV transmission is located at Central substation. Both sensitivities include two 250 MW pump/generator sets interconnected with the CAISO grid via a 500 kV line connecting to the SDG&E system and a 500 kV line connecting to the SCE system on SCE's existing Serrano-Valley 500 kV line.

The first sensitivity represents SDG&E's understanding of the LEAPS project sponsors' current proposal for integrating the LEAPS project into the CAISO grid. The second sensitivity represents a logical modification of the LEAPS project sponsors' current proposal because it eliminates the need for a 500/230 kV substation and has the advantage of completing a 500 kV loop through the Southern California load centers. The second sensitivity does require additional 500 kV transmission to reach Central substation. For analytic purposes, SDG&E has assumed that the cost of the 500/230 kV substation on the existing SONGS-Talega 230 kV line and the cost of the additional 500 kV transmission necessary to reach Central substation are approximately equal.

The economic results indicate that the energy benefits of the first sensitivity (relative to the "no project" reference case) are similar to those for the Sunrise Powerlink. This indicates that adding the LEAPS project to the Sunrise Powerlink case does produce a modest price reduction for CAISO consumers. However the benefits of this price reduction are offset by a loss of revenues from utility-owned generation and by a decline in congestion revenues. Moreover, including the fixed costs of the LEAPS project and the associated transmission facilities drives the benefit/cost ratio for the first sensitivity well below 1.0/1.

The second sensitivity (relative to the "no project" reference case) provides larger energy benefits than those for the Sunrise Powerlink. This is consistent with the results of the "full loop" transmission alternative (described in Chapter VI) which indicate that completing the 500 kV loop through the Southern California load centers has significant energy benefits for CAISO consumers. Nevertheless, when the fixed costs of the LEAPS project and the associated transmission are included the benefit/cost ratio for the second sensitivity is also well below 1.0/1 (assuming the "high" cost estimate for the Sunrise Powerlink portion of the sensitivity).

Both the first and second sensitivities are likely to significantly understate the energy benefits associated with the LEAPS project. The simulation model used by SDG&E to dispatch the WECC grid is currently incapable of dispatching pumped storage generation on an economic basis. Specifically, the model does not currently have the ability to make dispatch decisions based on the *price* of energy that the facility would have to pay to perform the off-peak pumping, and the *price* of energy that the facility would receive for its on-peak generation. Instead the simulation model dispatches pumped storage generation on the basis of relative hourly *load levels*, pumping during enough "low" load hours to fill the upper storage reservoir and generating during "high" load hours to empty the reservoir. The results for LEAPS sensitivities confirm that on an annual basis the LEAPS project is being run at a net operating loss. This is an illogical outcome because the unit owners would always elect not to run if the alternative was to run at a loss. What is happening in the model runs is that the pumped storage facility is being operated during hours when it would actually be uneconomic to operate, and not operating when it would be economic to do so. With improved modeling functionality, the energy benefits for the LEAPS sensitivities would improve and the benefit/cost ratios would increase accordingly.

A third sensitivity assumes that in addition to the Sunrise Powerlink, Load Serving Entities ("LSEs") within the CAISO control area enter into arrangements whereby 400 MW of wind generation is built in the northern Baja region of Mexico. The results of this sensitivity indicate that compared to building the Sunrise Powerlink without the Mexico wind generation, the Mexico wind generation provides substantial additional energy benefits to CAISO consumers. These benefits come from the producer surplus that is created by selling the wind generation into the market, i.e., the net of market revenues less variable costs of operating the wind machines. However, when the capital costs of the wind generation are taken into account the result is overall slightly less beneficial to CAISO consumers than building the Sunrise Powerlink by itself.

A fourth sensitivity assumes that in addition to the Sunrise Powerlink, 500 MW of in-area wind generation is built in the Warners substation area rather than in the Boulevard/Crestwood area as is assumed for all other cases. All other cases, including the "no project" reference case, assume the Boulevard/Crestwood area wind generation is connected to the Imperial Valley-Miguel 500 kV line via a 230 kV trunk line and a new 500/230 kV substation south of Boulevard substation. The fourth sensitivity assumes the Warners wind generation is connected via a 230 kV line to the 230 kV bus at Central substation.

Moving 500 MW of in-area wind generation from the Boulevard/Crestwood area to the Warners substation area would have little effect on congestion and therefore does not significantly change how the WECC grid would be dispatched to minimize overall energy costs. The savings come only from the fact that, with the Sunrise Powerlink, it costs less to interconnect significant amounts of wind generation in the Warners substation than to interconnect the same amount of wind generation in the Boulevard/Crestwood area.

Assuming that absent the Sunrise Powerlink wind generation would be added in the Boulevard substation area, and assuming construction of the Sunrise Powerlink resulted in wind generation being added in the Warners substation area rather than in the Boulevard substation area because of the lower interconnection costs at the Central substation, then CAISO consumers would save at least $50 million per year on a levelized basis. This represents the difference between the revenue requirements associated the transmission needed to interconnect wind in the Boulevard substation area to the Southwest Powerlink and the revenue requirements associated with the transmission needed to interconnect wind in the Warners substation area to Central substation. If these levelized savings are factored into the results shown on Tables V-12 and V-13 for the "Boulevard to Warners" Sunrise Powerlink wind sensitivity[20], the overall benefit/cost ratios increase from 1.37/1 to 2.06/1 in the "low" cost Sunrise Powerlink sensitivity and from 1.00/1 to 1.31/1 in the "high" cost Sunrise Powerlink sensitivity.

5. <u>WECC Grid Configuration, Resources and Loads</u>

"Case 00", the "no project" reference case, originated from the WECC grid configuration provided by WECC members in the powerflow basecases developed in connection with WECC's coordinated transmission planning process for year 2008. The

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[20] By reducing the levelized annual fixed costs by $50 million.

approved WECC cases used as a starting point included "08HS2S-SA.sav" (2008 Heavy Summer, approved February 2004) and "08LA1SA.sav" (Light Autumn, approved February 2005). In connection with the Phase 1 Study (the Transmission Comparison Study), these cases were reviewed and significantly modified by the CAISO, SCE, IID and CFE.[21] Less significant changes were made in other areas, such as Arizona and Nevada. The Heavy Winter and Light Autumn cases used in the Phase 2 study[22] incorporated all the changes made to the Heavy Summer cases in Phase 1. Further changes were made to all the powerflow cases for all seasons to reflect newer information available since the Phase 1 Study. "Case 1" reflects the grid configuration represented in "Case 00" plus the project scope for the Sunrise Powerlink as discussed in Chapter II.

SDG&E's economic analysis of the Sunrise Powerlink incorporates the existing and planned resources depicted in the Seams Steering Group-Western Interconnection's (SSG-WI's) data base as of 2002. These resources include the planned generation listed on Table D.5 of the CAISO's DPV2 technical appendix. These additions are shown in Table V-17 in Appendix V.

The SSG-WI resource data base was modified to reflect (1) the San Diego area resources included in SDG&E's bundled customer resource plan submitted to the CEC in connection with the CEC's 2005 Integrated Energy Policy Report ("IERP"), and (2) other San Diego area resources with which SDG&E is familiar. In addition, loads were updated to match the service area load forecast included in SDG&E's submittal for the CEC's 2005

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[21] The Phase 1 study was conducted as part of an open stakeholder process that screened a large number of transmission options for increasing transfer capability between the Imperial Valley and the Southern California load centers. The Imperial Valley Study Group Report was submitted as part of the CEC's 2005 Integrated Energy Policy Report.

[22] The Phase 2 Studies were designed for the purpose of developing a proposed plan of service in preparation for regulatory filings and the WECC Regional Planning Process.

IEPR. The San Diego area loads and resources that are simulated in the least-cost WECC-wide grid dispatch, with the Sunrise Powerlink, are shown on Table V-18 in Appendix V.

Because the economic analysis of the Sunrise Powerlink simulates grid operations for *every* hour of the year, SDG&E adopted load and resource assumptions that are reflective of typical operating conditions. Because the demand response programs would not be operational in most hours of the year and would therefore not have a significant effect on energy costs, their potential impact on SDG&E loads were not modeled in the simulations.[23] Because energy efficiency programs and distributed generation would have effects in all hours of the year, their projected impacts on SDG&E's system peak loads are included (via a reduction in forecast loads that would otherwise have to be served). Wind resources were modeled using hourly wind generation profiles obtained from the SSG-WI database. Existing QFs and other existing renewable resources in the San Diego area were modeled at historical levels of output.[24]

6. Renewable Resource Additions and Grid Expansion in the Imperial Valley

In addition to the resource additions shown in Table V-17, it is assumed that by 2010 there will be 600 MW of new renewable resources in the Imperial Valley. This 600 MW is comprised of 285 MW of solar thermal resources and 315 MW of geothermal resources. Based on the work of the Imperial Valley Study Group ("IVSG"), SDG&E has also incorporated into the year 2010 grid configuration certain transmission upgrades to the IID system.

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[23] Demand response programs do have a significant impact in resource planning and SDG&E includes these program impacts in determining the amount of supply resources it needs to obtain in order to meet the Commission's resource adequacy requirements. However, resource planning is not the focus of the instant filing.

[24] Recall that for purposes of estimating net energy savings, only two years were simulated, 2010 and 2015.

The IVSG also identified a long-term renewable resource build-out scenario that includes 2,200 MW of new renewable resources along with a significant expansion of the IID transmission system.[25] To capture the effects of this long-term build-out scenario on the economics of adding the Sunrise Powerlink, SDG&E has incorporated these resource and transmission additions into the year 2015 analysis. Table V-19 in Appendix V lists the resources assumed to be available in the Imperial Valley for years 2010 and 2015. Table V-20 describes the additions to the IID transmission system SDG&E assumed for years 2010 and 2015.

7. The "No Project" Alternative: Isolating the Benefits of the Sunrise Powerlink

General Order 131-D, Paragraph V(14)(b) expressly states that "the specific alternative of 'no project' must also always be evaluated, along with the impact." Similarly, Section 15126.6 of the California Environmental Quality Act ("CEQA") Guidelines requires an evaluation of the "no project" alternative.

SDG&E has developed and analyzed a "no project" reference case referred to as "Case 00". The "no project" reference case does not include the Sunrise Powerlink but does include exactly the same quantity and mix of resources in years 2010 and 2015 as the case with the Sunrise Powerlink ("Case 1"). This was done in order to distinguish the economic value of the Sunrise Powerlink from the economic value that comes with adding large amounts of renewable resources.

It should be noted that the "without" Sunrise Powerlink case (i.e., the "no project" reference case) is fictional in the sense that resources would have to be added within the SDG&E service area in order to satisfy the CAISO's G-1/N-1 reliability criteria for the

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[25] The September 30, 2005 Imperial Valley Study Group Report submitted as part of the CEC's 2005 Integrated Energy Policy Report.

San Diego area transmission system. However, SDG&E has developed alternative cases (Case 3 and Case 20) which evaluate the economics of doing exactly that: adding in-area resources to satisfy the CAISO's G-1/N-1 reliability criteria for the San Diego area transmission system. The results of these alternative cases are presented in Chapter VI.

An argument can be made that were the Sunrise Powerlink not built, the quantity of renewable resources added in the Imperial Valley, particularly in the outer years, would be significantly reduced. This argument is based on the possibility that buyers, and renewable resource developers in the Imperial Valley, would be unwilling to accept the congestion cost risks which would exist if the transmission capability between the Imperial Valley and the southern California load centers were not increased. However, given the Commission's and the state's renewable energy goals, the result would simply be either to shift the required renewable resource development to other locations where such congestion cost risks are "acceptable" to buyers and renewable resource developers. But it is not apparent what an "acceptable" congestion cost risk is or where such alternative locations would be. The choice of alternative locations would likely involve different renewable resource technologies with capital costs that are different, and likely higher, from those of the renewable resources assumed for the Imperial Valley (for example, wind in the Tehachapi area versus geothermal in the Imperial Valley).

Moreover, assumptions would still have to be made regarding the nature and cost of possible transmission upgrades that would reduce the congestion costs associated with delivering renewable resource energy from alternative locations to the San Diego area. The results of such comparisons would intertwine the relative benefits of the assumed transmission upgrades with the relative benefits that flow from the choice of renewable resource technology and the assumed location of such resources. It would be difficult to isolate the portion of those intertwined benefits attributable to the assumed transmission upgrades.

In summary, SDG&E believes the most meaningful and conservative way to value the Sunrise Powerlink on its own merits is to fix the quantity, mix and location of resources outside of the San Diego area and then compare outcomes without and with the new line. This approach avoids the need to account for the differences in cost that result from different locations and different renewable resource technologies: The location and costs are the same in both the without line and with line cases.

Given the magnitude of renewable resource potential in the Imperial Valley, LSEs within the San Diego basin would have the ability to procure and import enough renewable energy to meet the Commission's 2010 renewable resource goals *even if* the Sunrise Powerlink were not built. The interesting question—the question that the instant economic analysis addresses—is whether building the Sunrise Powerlink will reduce the costs of transmitting energy from the desert Southwest to the California load centers by an amount that exceeds the costs CAISO consumers would incur to build the line.

The cost of transmitting energy from the desert Southwest to the California load centers is comprised of transmission losses and congestion. As described below, SDG&E has performed a separate analysis of how the Sunrise Powerlink will affect losses. With respect to congestion it should be noted that energy from renewable energy sources has relatively low variable operating costs and is therefore unlikely to be physically curtailed in the event congestion arises. Instead congestion will typically be managed by curtailing gas-fired boiler and combined cycle generation with relatively higher variable operating costs.

So, while it is reasonable to expect that the Commission's 2010 renewable resource goals could be *physically* achieved even if the Sunrise Powerlink were not built, the results of the analysis presented in this application demonstrate that the Commission's renewable resource goal can be met at a lower overall cost if the Sunrise Powerlink *is* built. SDG&E is convinced that the Sunrise Powerlink will reduce the costs of delivering energy from the desert Southwest to the California load centers by an amount which, in combination with RMR contract cost savings, will exceed the cost of building the line.

8. <u>Loss Savings</u>

SDG&E has also analyzed the savings the Sunrise Powerlink will provide in the form of reduced line losses. The results of this analysis are shown in Table V-19 and are discussed below.

<u>Table V-19</u>

Type	Annual Savings in Losses (MWh)	Energy Saving in Dollars ($)
Case 0 less Case 1	15,414	$ 1,048,151
Case 0 less Case 2	17,679	$ 1,202,203
Case 0 less Case 3	87,811	$ 5,971,182

If the dispatch pattern of generation on the grid is *held constant*, the addition of new transmission will reduce transmission losses since the size of the pipe carrying power from generation to load is increased. In practice, the Sunrise Powerlink upgrade is expected to lead to a more efficient generation dispatch, i.e., the pattern of dispatched generation *will change* compared to the "no project" reference case ("Case 00"). Accordingly, the project will most likely provide greater savings than are estimated here due to the conservative assumptions used in this assessment.

To the extent the addition of the Sunrise Powerlink results in increased desert Southwest generation, and decreased generation within the California load centers, powerflows on the long lines connecting the California load centers to the Imperial Valley, Arizona and Southern Nevada will increase. The increase in grid powerflows will tend to increase grid losses. It is difficult to know in advance whether the combined effect of increased powerflows (which increases losses) and reduced grid impedance (which reduces losses) will result in an overall increase or decrease in grid losses. The discussion below provides an example to demonstrate this interplay.

Because the analysis used by SDG&E to estimate the economic benefits of the Sunrise Powerlink uses a direct current ("DC"), power flow model to simulate dispatch of generation and resulting powerflows throughout the WECC grid,[26] transmission losses are not modeled internally. The level of transmission losses with and without the Sunrise Powerlink, and the associated costs of supplying these losses, must therefore be evaluated outside of the simulation model. SDG&E has used the same approach outlined in Appendix J of the CAISO's DPV2 technical appendix to quantify the cost of supplying losses in the without and with Sunrise Powerlink simulations. For purposes of this estimate, the price of energy to compensate for transmission losses is $68/MWh and the analysis is limited to a single year (2010).

The results of this analysis suggest that compared to the "no project" reference case, the addition of the Sunrise Powerlink will result in a net reduction in grid losses and a corresponding decrease in the cost of supplying losses. SDG&E has not included this

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[26] Economic simulation algorithms that incorporate an "AC" powerflow model have been developed. These models are far more data intensive and computationally demanding. Stable results across all hours of the simulation are much more difficult to achieve. Considering that losses are a relatively small factor in the overall project economics, the "DC" models' ease of use outweighed the "AC" model's ability to internalize the affect of losses on grid dispatch decisions.

benefit in its overall economic results for several reasons. First, because the simulation model does not account for the cost of supplying losses when it dispatches WECC generation, the costs of dispatching some generators is understated and the cost of dispatching other generation overstated. The extent to which this dispatch imprecision distorts least cost generation dispatch on the WECC grid and resulting grid powerflows, and thus losses, is not known.

Second, in the CAISO's DPV2 analysis only a select group of WECC transmission lines were evaluated to estimate the effect of the proposed line on grid losses. SDG&E believes that by evaluating the effect of losses on the lines identified in the CAISO's DPV2 technical appendix, the majority of the grid losses impacts from adding new transmission between the Southern California load centers and the desert Southwest is captured. However, many WECC lines are not included in this evaluation so the results should be considered indicative, not dispositive.

Finally, the CAISO's methodology does not attempt to allocate the loss impacts between CAISO consumers and other entities. Under the CAISO's MRTU project, any market participant who injects power onto the CAISO grid (i.e., suppliers) and any market participant who withdraws power from the CAISO grid (i.e., LSEs), will be assessed the full marginal loss rate at their respective locations.[27]

Because the simple methodology used by the CAISO to evaluate loss impacts is incapable of accurately identifying full marginal losses on a bus-by-bus basis, there is no practical way to establish which share of the calculated losses will be paid by CAISO

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[27] As noted elsewhere, LSEs will actually pay the respective California Investor Owned Utility (IOU) service area average of the Locational Marginal Prices (LMPs) for the load buses within the IOU's service area (also known as the IOU Load Aggregation Point (LAP) prices). Thus LSEs will pay an *average* of the full marginal loss rates within an IOU LAP. In contrast, suppliers will pay the full marginal loss rate at their respective injection bus.

consumers and which share by sellers within the CAISO controlled grid. Moreover, a significant share of the lines evaluated in the CAISO's analysis is outside of the CAISO controlled grid or will otherwise be exempt from its full marginal loss settlement mechanism. Hence it is unclear what portion of the cost of losses would actually end up being paid by entities doing business on the CAISO controlled grid. It should also be noted that the difference between (a) cost of losses at the full marginal loss rate, and (b) the actual (i.e., "average") costs incurred by the CAISO to provide losses, end up being rebated to CAISO consumers. This introduces another level of allocation complexity.

a) Methodology

The CAISO's DPV2 loss methodology contains the following steps:

1. Obtain hourly flows (P_i) in MW for each of the major transmission lines (line i) of interest. The hourly powerflows are obtained from the year 2010 simulations of the WECC grid dispatch, i.e., from the "no project" reference case ("Case 00") and from the with Sunrise Powerlink case ("Case 1").

2. Approximate the hourly line losses (L_i) in MW using the per unit resistance of each line (R_i) by applying the formula $L_i = R_i*(P_i)^2/100$ (the formula assumes adequate reactive support to maintain nominal voltages and the100 number in the denominator represents the MVA base used for per unit computations).

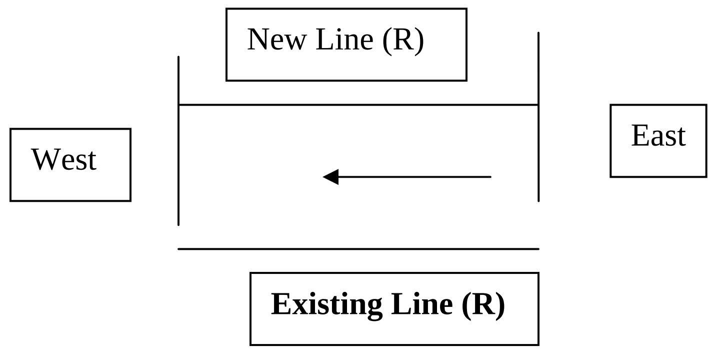
3. Add up the transmission losses for all lines of interest.

4. Using a weighted average energy price, compute the annual energy costs associated with these transmission losses.

5. Perform steps 1 through 4 without and with the Sunrise Powerlink. The difference in the cost of losses between the "no project" reference case and the with Sunrise Powerlink case provides an indicator of how the addition of the Sunrise Powerlink will impact the cost of WECC grid losses.

b) Example of Interplay Between Changed Powerflows and Lower Impedance

Whether or not a transmission upgrade results in reduction of transmission losses depends on the interplay between two factors: (a) the upgrade increases power transfers thus potentially increasing transmission losses, and (b) the upgrade re-routes power flow on paths of less resistance and reduces the power flow on existing paths, thus reducing transmission losses. The following simple example demonstrates these two factors:



Here the existing and the new line both have a per unit resistance of R. The rating of the path before the upgrade is T1 and after the upgrade (both lines together) it is T2 (with T2>T1). Assume the path is at full capacity both before and after upgrade to bring less-expensive energy from East to West. Assume the balance of the load in the West is served locally from more expensive energy with no transmission losses.

Before the upgrade the losses are: $L(NU) = R*(T1)^2/100$, and after the upgrade, $L(U) = 2*R*(T2/2)^2/100 = 0.5* R*(T2)^2/100$. The ratio $r = L(U)/L(NU)$ determines whether transmission losses increase or decrease as a result of the upgrade. Here: $r = 0.5*(T2/T1)^2$. Thus if the increase in rating is 40% or less, i.e., $T2/T1 < 1.4$, the transmission losses decrease as a result of the upgrade. The CAISO's DPV2 analysis of losses used the computed power flows before and after the upgrade, which implicitly include the interplay between these factors.

c) <u>Summary</u>

In summary, while the estimated loss savings are a relatively small portion of the total economic benefits of the Sunrise Powerlink, the analysis does suggest that the addition of the Sunrise Powerlink will reduce line losses on the CAISO bulk power grid.

SUNRISE POWERLINK

CHAPTER VI

ALTERNATIVES

SDGE
A Sempra Energy utility

Application No.: A.05-12-______

Exhibit No.: ____________________

Date: December 14, 2005

Witness: Jan Strack

VI.

<u>ALTERNATIVES</u>

SDG&E's authorized Long-Term Resource Plan[1] uses a balanced strategy to meet customer energy needs through a mixture of energy efficiency initiatives, demand response initiatives, renewable resources, new generation, and new transmission, consistent with the EAP loading order. Each of these resource elements is essential to providing a balanced portfolio of energy resources and infrastructure.

SDG&E is aggressively implementing measures to ensure the energy service it provides customers is sufficiently adequate, affordable, technologically advanced and environmentally sound, consistent with the objectives of the EAP. SDG&E's Long-Term Resource Plan incorporates significant levels of energy efficiency and demand response, as established by the Commission in D.04-09-060 and D.05-09-043, respectively. Similarly, SDG&E is committed to meeting California's renewable energy goals and is aggressively pursuing power purchase agreements with renewable energy suppliers. At the time of this filing, SDG&E is in the process of finalizing a number of renewable resource agreements resulting from its 2004 solicitation and is evaluating bids in response to two renewable resource solicitations issued in 2005. With respect to conventional resources, SDG&E and its contract counterparties are adding, significant local generation through the Miramar gas turbine plant (46 MW in 2005), the Palomar combined cycle plant (541 MW in 2006), and the Otay Mesa combined cycle plant (561 MW in 2008).

As presented in Chapters I through V of this report, SDG&E believes that new transmission—specifically, the Sunrise Powerlink—is a necessary and beneficial "next

[1] SDG&E's Long-Term Resource Plan was approved by the Commission in D.04-12-048.

step" that must be taken to adequately meet customer energy needs, consistent with the State's resource procurement policies and appropriate resource planning principles.

In this Chapter, SDG&E presents its assessment of various potential alternatives to the Sunrise Powerlink. As introduction and background regarding potential transmission alternatives, Section A discusses SDG&E's Transmission Comparison Study that considered potential transmission alternatives and ultimately resulted in the selection of the Sunrise Powerlink as the preferred transmission alternative. Section B presents the results of the economic analysis SDG&E performed to determine the costs and benefits of certain transmission and generation alternatives that might be considered instead of the Sunrise Powerlink. Sections C and D more fully describe the transmission and generation alternatives that were included in this economic analysis.

The "non-transmission" alternatives considered in this analysis include various large, conventional generation plant scenarios. As discussed in Chapter III, Appendix III, SDG&E does not believe that additional energy efficiency, demand response, and in-area self-generation are viable substitutes to the Sunrise Powerlink given the significant extent to which these measures are already included in SDG&E's planning assumptions and the fact that any increased efforts in these areas would simply not be sufficient to defer the need for new transmission beyond a reasonable planning horizon.

A. Transmission Comparison Study ("TCS")[2]

The TCS evaluated various transmission alternatives and selected the best alternative(s) to accomplish all of the following objectives:

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[2] The TCS is described in SDG&E's October 4, 2005 *Report for SDG&E's Transmission Comparison Study*. This report was prepared in cooperation with the CAISO and the STEP participants.

- Increase import capability into the SDG&E service area to meet a grid reliability deficiency that would otherwise occur beginning in 2010;
- Access, at an acceptable cost, renewable resources in support of goals set by the state of California and the Commission; and
- Reduce congestion and RMR contract costs for California ratepayers and improve access to economic resources.

The genesis of the TCS can be found in SDG&E's Long Term Resource Plan, as approved by D.04-12-048. The adopted Long-Term Resource Plan sets forth a strategy of mixed resources to ensure long-term, reliable and affordable power in the region. This mixture of resources includes four elements:

- Demand Reduction
- Renewable Resources
- New Generation
- New Transmission

SDG&E has been actively pursuing all of these resource elements. With regard to new transmission, the Commission directed SDG&E to continue its work in pursuing a new 500 kV transmission line that would ultimately be placed in service by 2010.

> "While we do not approve SDG&E's 500 kV transmission line here, we do acknowledge the lengthy process needed to plan, license and construct transmission, and thus encourage SDG&E to continue its planning efforts and move forward with evaluating these transmission alternatives for meeting a local resource deficiency by 2010."[3]

Toward that end, SDG&E performed the TCS to select the preferred transmission alternatives to pursue this essential and needed resource.

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3 D.04-12-048 at p.228, Finding of Fact 9; see also *id.* at p.45.

The TCS was essentially a screening study that compared several transmission alternatives on a common basis in order to select the best one. The TCS did not consider generation alternatives since its objective was to select the best transmission alternative which in turn could be compared to any potential non-transmission alternatives.

SDG&E conducted the TCS as an open stakeholder process and reported to the regional planning meetings of the Southwest Transmission Expansion Plan ("STEP"). As discussed in Chapter II, Scope and Cost, the Technical Working Group was formed from interested stakeholders and included representatives from the CAISO, CEC, SDG&E, SCE, IID, CFE, APS, LEAPS, Intergen, Coral Energy, and Sempra Energy Resources.

The TCS reviewed a total of eighteen alternatives, which were grouped into six collections of alternatives called "options". Each of these options had common points of termination or other similar characteristics. With the help of the Technical Working Group, these eighteen alternatives were narrowed to the four alternatives listed below:[4]

1. Imperial Valley – Central – Serrano/Valley 500 kV Project (the Full Loop)
2. Imperial Valley – Central 500 kV Project (the Sunrise Powerlink)
3. Imperial Valley – Miguel 500 kV Project
4. Serrano/Valley – North 500 kV Project

The four transmission alternatives were then subjected to a comprehensive matrix analysis, focusing on three main areas: (1) grid reliability and technical performance; (2) access to renewable energy; and (3) economic benefits. This assessment determined the two highest ranking alternatives: the Imperial Valley – Central – Serrano/Valley 500 kV

[4] Appendix VI discusses these four transmission alternatives and summarizes the performance of each alternative relative to the matrix analysis performed in the TCS.

alternative (or the "Full Loop"[5]); and the Imperial Valley – Central 500 kV alternative (the "Sunrise Powerlink"). These two alternatives are the best performing thermally and economically, and provide the best access to renewable energy resources.

SDG&E then developed a full "plan of service" for these preferred alternatives. This included an analysis of their performance under peak and off-peak conditions and assuming different generation dispatch scenarios, as well as more exhaustive thermal, transient stability, post-transient, and economic analysis. The Sunrise Powerlink emerged as the preferred project as a result of this more refined analysis. The Full Loop option is included in the comprehensive alternatives analysis presented in this chapter.

B. Alternatives Analysis – Summary of Results

Table VI-1 lists the alternatives to the Sunrise Powerlink that were subjected to economic analysis, and the conditions under which these alternatives were evaluated.[6]

Table VI-1

Alternative	Case No.	Load Growth	Gas Prices	Hydro Condition	Probability
Transmission					
IV-Central-SerVal	2	Expected	Medium	Average	100%
Generation					
In-Area Combined Cycle	3	Expected	Medium	Average	15.3%
In-Area Combined Cycle	6	Expected	Medium	Dry	13.8%
In-Area Combined Cycle	8	Expected	Medium	Wet	18.2%
In-Area Combined Cycle	10	High	Medium	Average	17.7%
In-Area Combined Cycle	12	Low	Medium	Average	17.7%
In-Area Combined Cycle	14	Expected	High	Average	3.2%
In-Area Combined Cycle	16	Expected	Low	Average	14.1%
In-Area Gas Turbines (2010) and In-Area Combined Cycle (2015)	20	Expected	Medium	Average	Sensitivity Only

5 The Full Loop would complete the 500 kV loop through Southern California, connecting SCE's 500 kV Palo Verde-Devers-Valley-Serrano system to SDG&E's 500 kV Southwest Powerlink.

6 This evaluation is also discussed in Chapter V. The probabilities indicated in Table VI-1 herein are based on Table A.1 of the CAISO's DPV2 analysis.

These alternatives include the Full Loop transmission alternative; as well as several in-area generation alternatives, i.e., new combined cycle plants as well as new gas turbine capacity. The combined cycle alternative models 750 MW of new combined cycle capacity in 2010 and another 900 MW in 2015. The gas turbine alternative models 750 MW of gas turbines in 2010 and 900 MW of combined cycle capacity in 2015. SDG&E believes these in-area generation alternatives provide bookends for what reasonably could be done to satisfy local reliability requirements over the identified planning horizon absent new import capability.

The economic analysis for the alternatives takes into account both the effect on CAISO energy costs and the fixed costs of building and operating the new facilities. Table VI-2 below indicates the capital cost, fixed O&M, heat rate, and variable O&M assumptions used in the analysis for the alternatives and related sensitivities studied.

Table VI-2

		Transmission (millions)			**Generation (millions)**				
Project Sensitivities	Assumed In-Service Date	"Low" Capital Costs w/ AFUDC (nominal $)	"High" Capital Costs w/ AFUDC (nominal $)	Fixed O&M ($/year in 2005$)	Capital Costs w/ AFUDC (nominal $)	Fixed O&M ($/kW-year in 2005$)	Avg Heat Rate (BTU/ kWh)	Pump-Back Efficiency	Variable O&M costs ($/MWh in 2005$)
Imperial Valley-Central-SerVal	2010	$1789	$2453	$18	N/A	N/A	N/A	N/A	N/A
In-Area CC	750 MW in 2010, incremental 900 MW (1650 MW total) in 2015	$271		$2.3	$1613	$12.93	7000	N/A	$2
In-Area GT and In-Area CC	750 MW GT in 2010, 900 MW CC in 2015	$271		$2.3	$1490	$5.69 (GT) $12.93 (CC)	8500 (GT) 7000 (CC)	N/A	$5 (GT) $2 (CC)

The results for the Full Loop transmission alternative and the in-area generation alternatives are provided in Table VI-3 below.[7]

Table VI-3

Economics of Transmission and Generation Alternatives to the Sunrise Powerlink

	Levelized Energy Benefits (millions)			Levelized Fixed Costs (millions)			
	Energy Savings	**RMR Savings**	**Total Energy Savings**	**Transmission (2010 – 2049)**	**Generation (2010 – 2043)**	**Total Fixed Costs**	**Benefit/ Cost Ratio**
Imperial Valley-Central-SerVal ("Full Loop") with "Low" capital cost estimate	**$135**	**$114**	**$249**	**$246**	**0**	**$246**	**1.01**
Imperial Valley-Central-SerVal ("Full Loop") with "High" capital cost estimate	**$135**	**$114**	**$249**	**$328**	**0**	**$328**	**0.76**
In-area Combined Cycle (expected load forecast, medium gas price, average hydro conditions)	**$105**	**$0**	**$105**	**$37**	**$196**	**$233**	**0.45**
In-area Combined Cycle (expected value)	**$101**	**$0**	**$101**	**$37**	**$196**	**$233**	**0.43**
In-area Gas Turbines (2010) and In-Area Combined Cycle (2015)	**$84**	**$0**	**$84**	**$37**	**$167**	**$204**	**0.41**

[7] The Sunrise Powerlink preferred alternative is assessed in Chapter V, Economic Benefits, has a benefit-to-cost ratio of 1.37 for the "low" capital cost, and 1.00 for the "high" capital cost.

C. The Full Loop Transmission Alternative

The following discusses the Full Loop transmission alternative in comparison to the Sunrise Powerlink. This alternative includes the same transmission upgrades between the Imperial Valley substation and the Central substation as contemplated for the Sunrise Powerlink, and then adds a 500 kV segment between the Central substation and a connection to SCE's 500 kV system somewhere along the Serrano-Valley 500 kV line in Riverside and Orange Counties. The Full Loop option completes a 500 kV loop through the Southern California load centers, a goal of the CAISO.

A variation of the Full Loop is to incorporate the 500 kV transmission system associated with the planned LEAPS project which, as currently envisioned, would have a southern terminus at a new 500/230 kV substation somewhere along SDG&E's Talega-Escondido 230 kV line in northern San Diego County. It would have a northern terminus at a 500 kV switchyard somewhere along SCE's Serrano-Valley 500 kV line. A logical "full loop" grid configuration would be to substitute the 500 kV transmission associated with the LEAPS project for most or all of the Central – Serrano/Valley portion of the Full Loop alternative. This configuration would eliminate the need for the LEAPS project's planned 500/230 kV substation on SDG&E's Talega-Escondido 230 kV line.

The specific routing and ownership of facilities connecting the southern end of the LEAPS 500 kV transmission system to SDG&E's 500 kV transmission facilities would need to be worked out. However, for purposes of establishing the relative economic value of the Full Loop transmission alternative to consumers within the CAISO control area, it does not matter significantly whether the LEAPS project sponsors, SDG&E or some other party builds and owns the new facilities between the new Central substation and SCE's Serrano-Valley 500 kV line. The transmission capital costs for the Full Loop are estimated to be $1.789 billion on the "low-end" and $2.453 billion on the "high-end".

By strengthening the transmission ties between the Los Angeles and San Diego areas, CAISO consumers obtain increased energy benefits through lower prices in the California load centers (as compared to the Sunrise Powerlink). While the Full Loop improves energy savings within the CAISO grid, it is considerably more costly to build than the Sunrise Powerlink. The higher capital cost is due to the additional length of the 500 kV transmission line between the Central substation and the Serrano-Valley 500 kV transmission line. SDG&E estimates that the Full Loop transmission alternative will result in a levelized cost of $246 million per year on the "low-end" and $328 million per year on the "high-end" with projected benefit-to-cost ratios of 1.01/1 and 0.76/1, respectively.

D. In-Area Generation Alternatives

The in-area generation alternatives are not economic compared to the "no project" reference case and clearly less economic than the Sunrise Powerlink. While the in-area combined cycle alternative reduces net energy costs for consumers within the CAISO controlled grid, it takes a much larger capital investment to achieve the same level of energy benefits as the Sunrise Powerlink: $1.884 billion for the in-area combined cycle alternative versus $1.015 billion to $1.437 billion for the Sunrise Powerlink.

Not surprisingly, the in-area gas turbine alternative provides a lower level of energy benefits than does the in-area combined cycle alternative. This is because the simple cycle gas-turbines are modeled with an 8,500 BTU/kWh heat rate versus 7,000 BTU/kWh for the combined cycle units. The capital costs for the in-area gas turbine, while lower than the new combined cycle facilities, are nevertheless too high to overcome the efficiency advantage of the combined cycle facilities. Part of the reason that the capital costs are not lower is that the in-area generation alternatives require significant transmission additions within the San Diego area to accommodate the maximum output of the generating facilities.

While the net energy benefits of the in-area combined cycle generation alternative are similar to the Sunrise Powerlink, they are achieved through a somewhat different mechanism. Compared to the "no project" reference case, the Sunrise Powerlink produces net energy benefits by eliminating congestion into the San Diego area thereby allowing a larger quantity of relatively efficient gas-fired generation in the desert Southwest to displace less efficient gas-fired generation in the Southern California load centers. At the same time, the higher power flows from the desert Southwest actually increase congestion on transmission paths east of San Diego, for example across the West Of River ("WOR") interface. Nevertheless, the combined effect of less gas-fired generation in the California load centers, more desert Southwest generation, and increased congestion east of San Diego, is still positive overall for CAISO consumers.

In contrast, the energy produced by the new in-area combined cycle units displaces not only less efficient boiler generation in the California load centers, but also the output of the relatively efficient combined cycle units in the desert Southwest. The latter effect occurs because the efficiency of the new in-area combined cycle units is similar to that of the combined cycle generation in the desert Southwest, but the cost of delivering the in-area combined cycle generation to load is not similarly burdened by congestion costs. Considering only energy benefits, it is not surprising that locating efficient generation close to load centers has natural advantages. However, as described above, the in-area generation alternatives suffer from the comparatively high capital costs (as compared to the Sunrise Powerlink) necessary to obtain the simulated (as modeled) level of energy production. In addition, as described in Chapter V, the in-area generation alternatives will not reduce RMR contract costs. The end result is that, when compared to the "no project" reference case, the generation alternatives have benefit-to-cost ratios that range from 0.41/1 to 0.45/1.

The analysis of the in-area generation alternatives does not include the capital costs that might be required on the SDG&E's natural gas delivery network to accommodate maximum electric output of the new generating facilities. These costs are estimated at between $51 and $364 million depending on whether the new combined cycle generation elects interruptible or firm gas delivery service. Interruptible service would require 5.7 miles of new gas pipe. Firm service could require as much as 86 miles of new pipe. The costs also include on-site compression facilities. Including these costs in the economic analysis of the in-area generation alternatives would lower the overall benefit/cost ratios.

Economics aside, there are other reasons why in-area generation won't provide the long-term strategic benefits discussed in this filing. As a practical matter in-area generation that is effective in satisfying the CAISO's G-1/N-1 reliability criteria for the San Diego area transmission system will have to be fueled by natural gas. Recent events have demonstrated that the reliability and availability of natural gas supplies on a long-term basis are uncertain. It will be hard to stabilize electricity prices for consumers within the San Diego area if the majority of in-area generation resources are dependent on the same volatile fuel source and if the ability of out of area suppliers to compete with in-area generation is constrained by import limitations.

Increasing import capability will allow a wider variety of resources to reach San Diego area consumers, thereby facilitating more competitive local and regional energy markets and minimizing any opportunity of local suppliers to exercise local market power. In contrast with the in-area gas-fired generation alternatives, the Sunrise Powerlink affords cost-effective access to renewable resources that are mainly located in remote areas of the state. The Sunrise Powerlink will connect to and traverse areas having the potential for significant levels of renewable resource development.

This analysis evaluates in-area generation alternatives within a limited planning horizon (the years 2010 and 2015), however, it should be understood that there are longer-term implications. Even if the in-area generation alternatives identified herein were determined to be preferable to the construction of the Sunrise Powerlink—which they are clearly not—it is still important to ask the question "what next?" Because the electrical needs of the San Diego area will continue to grow, policy makers will inevitably have to confront the issues that will arise with the continued addition of new local generating units. These issues include land use and local environmental impacts.

Air emissions are a concern for many areas of California. As demand for energy increases, in-area generation, as compared to new import capability, will have a negative impact on local air quality. In addition to reaching renewable energy sources, the Sunrise Powerlink provides economic access to existing resources in the desert Southwest. The ability to make more efficient use of existing resources outside the San Diego area avoids the need for new local generation and the associated cost of obtaining local air emission credits. Because the Sunrise Powerlink eliminates the need for additional local gas-fired generation, expansions of local gas delivery infrastructure can be deferred and the associated environmental impacts avoided.

As noted above, transmission upgrades will have to be constructed to accommodate the full output of the in-area generation alternatives. Therefore, the environmental impacts for the in-area generation alternatives are not limited to the construction and operation of the plants and the associated expansion of the gas delivery system; but also include the impacts of the required in-area transmission infrastructure upgrades.

There are practical limits to the amount of baseload generation that could be economically constructed within the San Diego basin. The WECC has established a south to north rating for the north of SONGS path ("Path 43") of 2,440 MW. When loads in the San Diego area are high, this limit is unlikely to be binding because a portion of the 2,150 MW output of the SONGS generating units will flow south into the San Diego area. The portion that flows north will be well below the 2,440 MW limit.   However, when loads in the San Diego area are low the situation changes. The output of in-area generation combined with imports into the San Diego area on the Imperial Valley-Miguel 500 kV line, and from Mexico on the 230 kV line, could easily exceed loads within the San Diego area and result in a northbound export on the five south of SONGS lines. These northbound exports would combine with the SONGS generation and easily consume all of the remaining south to north capability on the north of SONGS path.

This situation would be aggravated with additional in-area baseload generation. When south to north flows reach the path rating, the CAISO will impose its congestion management protocols and it will be necessary to reduce the output of this baseload generation and/or curtail imports into the San Diego area from the desert Southwest and Mexico. This will cause local prices to drop. The combined effect of reduced output and lower prices during low load periods could compromise the economic viability of additional in-area baseload generation.

Finally, if significant amounts of new baseload generation are added within the San Diego basin, it is reasonable to assume that the older, inefficient, boiler generation will be retired. But the retirement of the older generation will create a capacity hole that will have to be filled in order to ensure no violations of the CAISO's G-1/N-1 reliability criteria. As shown in Chapter III, Reliability, the in-area generating capacity lost due to retirement of existing generation will have to replaced on a megawatt-for-megawatt basis just to maintain the current level of in-area generating capacity, let alone provide the incremental capacity necessary to satisfy the CAISO's G-1/N-1 reliability on a going-forward basis.

For example, if the entire Encina generating plant were retired (960 MW), it would take 1,960 MW of new generation to replace the megawatts lost to retirement and to add the same amount of import capability as provided by the Sunrise Powerlink. Hence, the likely retirement of older in-area generation could--for the in-area generation alternative to the Sunrise Powerlink--result in a large increases in baseload generation and create the off-peak export concern noted above. In summary, SDG&E believes the economic viability of an in-area baseload generation alternative is highly uncertain.

E. **Conclusion**

SDG&E believes a window of opportunity exists for the expansion of regional transmission capability. The confluence of high fuel costs, renewable resource mandates, and public demand for immediate action to ensure reliable and affordable energy service, have produced an environment in which decisive action can result in the addition of critically needed transmission infrastructure.

As shown in Chapters I through V, the Sunrise Powerlink effectively meets the needs of customers in the San Diego transmission service area. Moreover, the project best achieves the established state policy goals of ensuring reliable service, promoting renewable energy resource procurement, and reducing energy costs to the benefit of all ratepayers statewide. As demonstrated specifically in this chapter, the Sunrise Powerlink is economically superior to all of the transmission and non-transmission projects that could be considered in the alternative. Moreover, the Sunrise Powerlink best meets the criteria and objectives by which any transmission alternative should be measured.

Given this assessment and the significant need for the project, California cannot afford to delay or defer action on this opportunity. New transmission takes many years to properly plan, construct, and place into service. Given this reality, the CPUC, CAISO, CEC and other key stakeholders and customers should support the expeditious approval of the Sunrise Powerlink; otherwise, this major infrastructure project will be increasingly difficult, if not impossible, to bring to fruition.

This concludes this chapter.

APPENDIX VI

Discussion of Potential Transmission Alternatives

The following describes the four transmission alternatives that were initially selected as part of the Transmission Comparison Study ("TCS") and summarizes the performance of each relative to the matrix analysis performed in the TCS. These are:

1. Imperial Valley – Central – Serrano/Valley 500 kV Project (the Full Loop)
2. Imperial Valley – Central 500 kV Project (the Sunrise Powerlink)
3. Imperial Valley – Miguel 500 kV Project
4. Serrano/Valley – North 500 kV Project

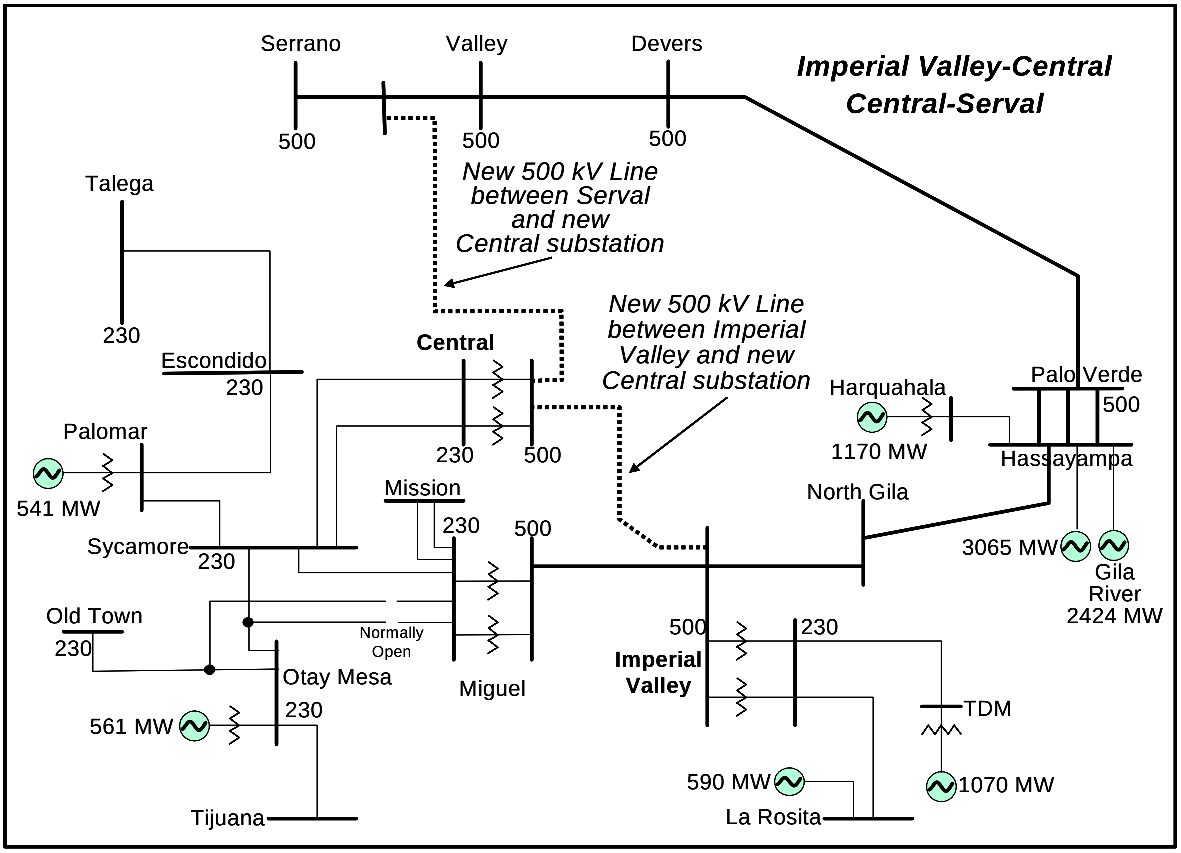
The TCS subsequently determined that the two highest ranking alternatives were: (a) the Imperial Valley – Central – Serrano/Valley 500 kV alternative (the "Full Loop"[1]), and (b) the Imperial Valley – Central 500 kV alternative (the "Sunrise Powerlink"). These two alternatives were the best performing thermally and economically, and provide the best access to renewable energy resources. After the TCS, SDG&E developed a full "plan of service" for these two preferred alternatives. This included an analysis of peak versus off-peak, different generation dispatch scenarios, as well as more exhaustive thermal, transient stability, post-transient, and economic analysis. The Sunrise Powerlink emerged as the preferred project as a result of this more refined analysis. The Full Loop option is included in the comprehensive alternatives analysis presented in this chapter.

Also included in the following discussion are two alternatives that were not selected as part of the original TCS screening. These are:

5. Imperial Valley – Miguel 230 kV through Mexico
6. Imperial Valley – Central 230 kV

[1] The Full Loop would complete the 500 kV loop through Southern California, connecting SCE's 500 kV Palo Verde-Devers-Valley-Serrano system to SDG&E's 500 kV Southwest Powerlink.

1. The Full Loop



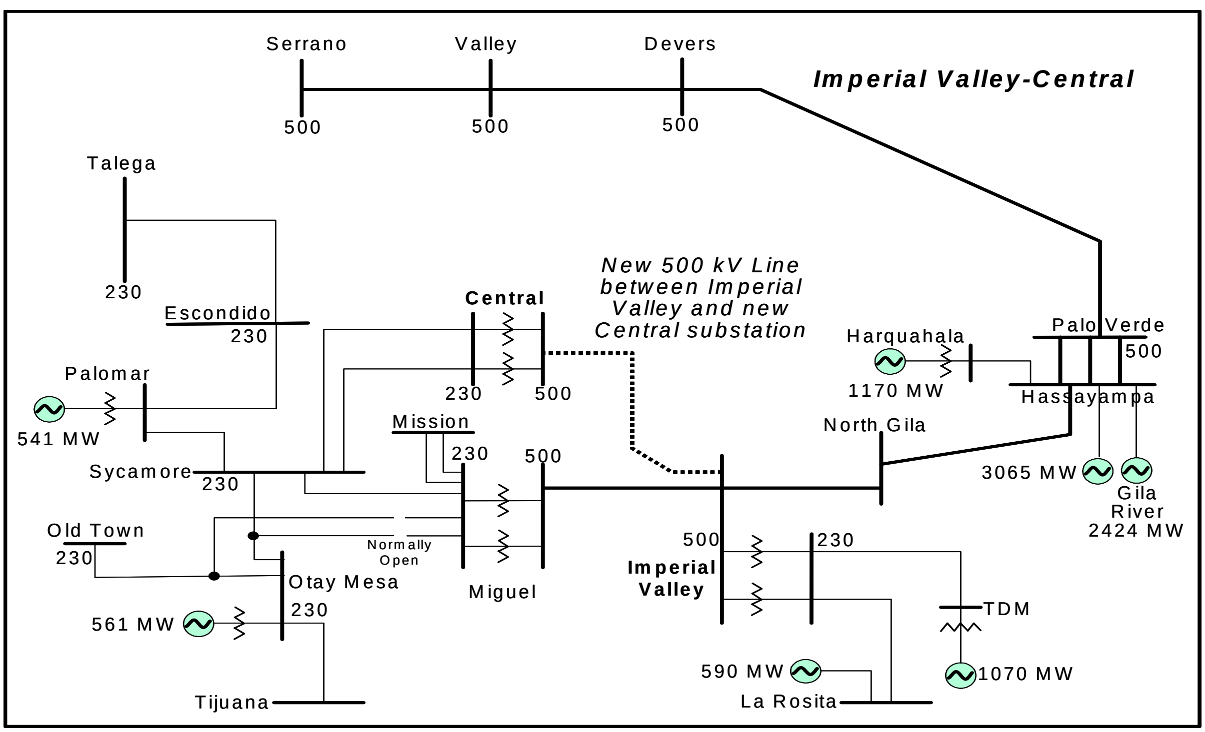
The first member of the final short list of four alternatives is Imperial Valley – Central – Serrano/Valley or "Full Loop" (diagramed above and shown in Figure VI-1). This alternative would connect SDG&E's 500 kV system to SCE's 500 kV system through a new 500/230 kV Central Substation, which feeds into SDG&E's existing 230 kV system near the center of its system and then connects to SCE's 500 kV system. This was the best performing alternative overall. It had very good technical performance and provided the most relief for flow into the Miguel Substation, one of the most heavily congested buses in the region, and required very few associated upgrades but includes the most miles of 500 kV transmission line.

The Full Loop alternative provided the highest economic benefit and had the largest CAISO ratepayer benefit. Also, like the Sunrise Powerlink (which essentially comprises a portion of the Full Loop option), the Full Loop alternative would provide some of the best access to renewable resources.

However, of the four alternatives, the Full Loop alternative is the most costly to build due to its greater length and may not be feasible to build all of the segments of this alternative by 2010.

Lastly, this alternative includes a 500 kV line which would connect SDG&E's system to the Serrano/Valley area of SCE's 500 kV system. It should be noted that this connection is consistent with the transmission additions that have been proposed in association with the Lake Ellsinore Advanced Pumped Storage ("LEAPS") project.

2. <u>The Sunrise Powerlink</u>



The Imperial Valley – Central alternative or Sunrise Powerlink (diagramed above and shown in Figure VI-2) includes a 500 kV line from SDG&E's existing Imperial Valley Substation to a new Central Substation, somewhere near the center of San Diego County, which then ties into SDG&E's existing Sycamore Canyon substation via a pair of 230 kV lines.

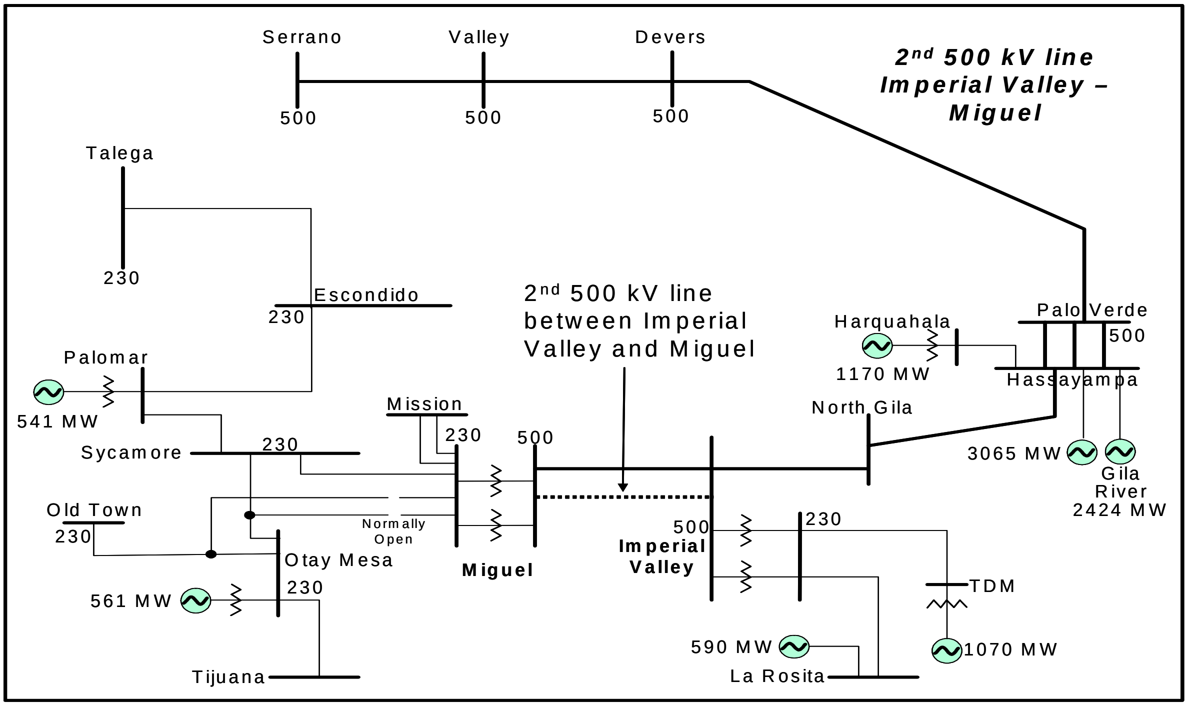
Also on the final short list of four alternatives, the Sunrise Powerlink was one of the best alternatives with regard to its technical performance. It also provided a high level of relief to flows into the Miguel Substation.

With regard to economic performance, this alternative had the highest consumer benefit when looking at just SDG&E customers. From the perspective of all CAISO ratepayers, the Sunrise Powerlink had the second highest benefit, behind the Full Loop alternative.

Similar to the Full Loop alternative, the Sunrise Powerlink would provide direct access to renewable resources in eastern San Diego County and in the Imperial Valley. The alternative would also free up some amount of capacity on the existing Imperial Valley – Miguel 500 kV transmission line (the Southwest Powerlink or "SWPL") and thereby allow renewable energy resources to economically connect to this existing 500 kV line. This could encourage renewable energy development that might otherwise not be feasible.

The Sunrise Powerlink also had among the lowest system losses and offers the best long-term expandability, being capable of expansion to either North Gila or a Full Loop at some point in the future.

3. <u>Imperial Valley – Miguel 500 kV Alternative</u>:

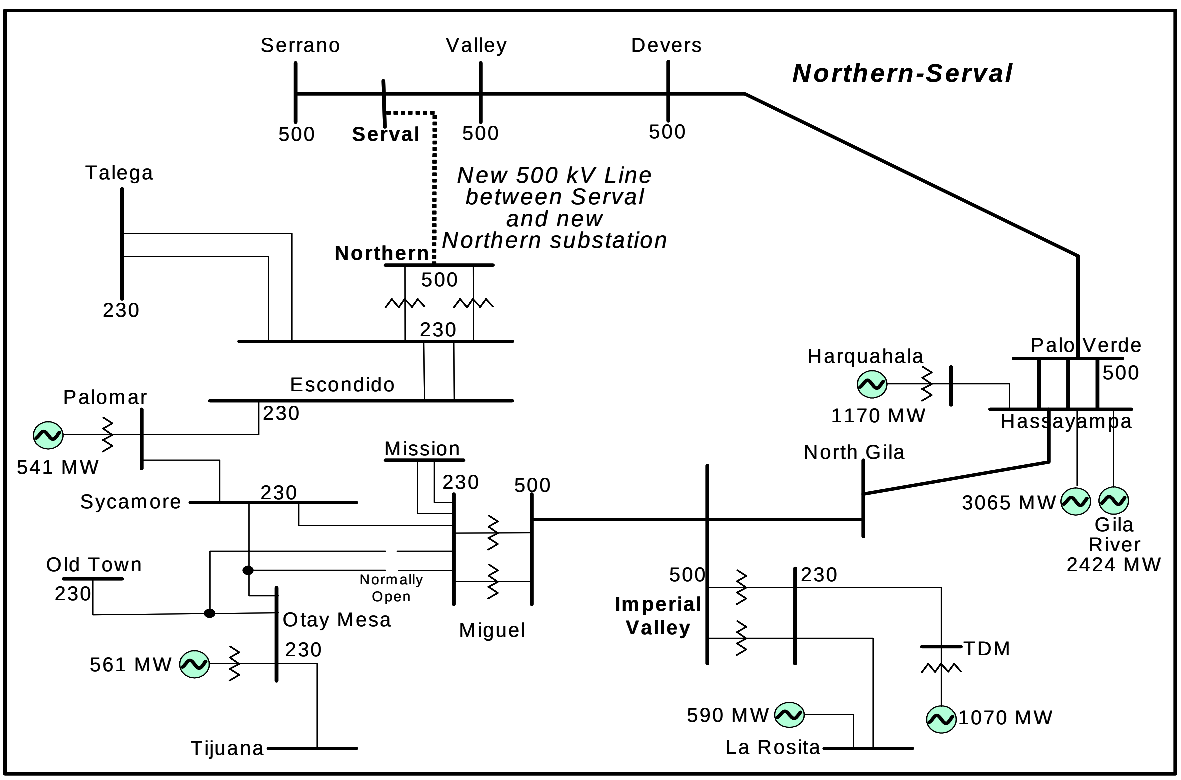


The Imperial Valley – Miguel 500 kV alternative (diagramed above and shown in Figure VI-3) includes a new 500 kV transmission line between the existing Imperial Valley substation and the Miguel substation. This new line would parallel the existing SWPL. In general, the TCS determined that the Imperial Valley – Miguel 500 kV alternative (or second SWPL) had poor technical performance, limited access to renewable energy resources, and poor economics. Moreover this alternative *increased* flow into the Miguel substation, which is already heavily loaded.

The alternative of building a second SWPL was not evaluated because placing two high voltage lines in the same corridor raises significant reliability concerns. If the two lines are determined to be subject to common mode outages—for example, as a result of a fire passing under the lines—they would be treated as a single facility for purposes of applying reliability criteria. Application of the CAISO's G-1/N-1 reliability criteria would require that both lines were assumed out of service and maximum permissible imports would then be established such that the next most critical outage did not result in thermal overloads or unacceptable voltages. But these outages would result in a grid configuration precisely the same as that which results from the application of the CAISO's G-1/N-1 reliability criteria to the system without the second Imperial Valley-Miguel 500 kV line, i.e., the system which exists today. Thus maximum import levels would be the same and it would not be possible to ascribe a reliability benefit to the second Imperial Valley-Miguel 500 kV line.

Because the existing SWPL has a history of outages and has been in the path of a number of fires, the corridor could receive such a designation. This line also has the drawback that it does not further the regional goal of tying the 500 kV systems together.

4. <u>Serrano/Valley – Northern Alternative</u>:



The Serrano/Valley – Northern alternative (diagramed above and shown in Figure VI-4) includes a new 500 kV transmission line from a new "Northern" substation, that would be located in the northern part of SDG&E's service territory, to a new Serrano/Valley substation, that would be located in the southern portion of SCE's service territory between its existing Serrano and Valley substations. This alternative also includes a phase angle regulator or other device, such as a phase shifter or unified flow controller, to encourage flow on the new line to move north to south, i.e., from Los Angeles to San Diego (since Los Angeles is a larger load sink). This alternative is essentially equivalent to the transmission line portion of the proposed LEAPS project.

While making the short list of the final four alternatives in the TCS, the Serrano/Valley – Northern alternative had weak technical performance, very limited access to renewable resources and the lowest economic benefit to CAISO ratepayers. It should be noted however, that although this alternative did not perform well on its own (as a means to increase import into SDG&E, access renewable energy and improve economics), when it was combined with other new transmission lines, such as the Full Loop option, it performs very well.

The Serrano/Valley – Northern alternative was one of the few alternatives in the TCS to have stability[2] problems, including numerous frequency violations. It did not relieve flow into Miguel, leaving the SWPL still heavily loaded. This alternative also required more voltage support than many of the other alternatives.

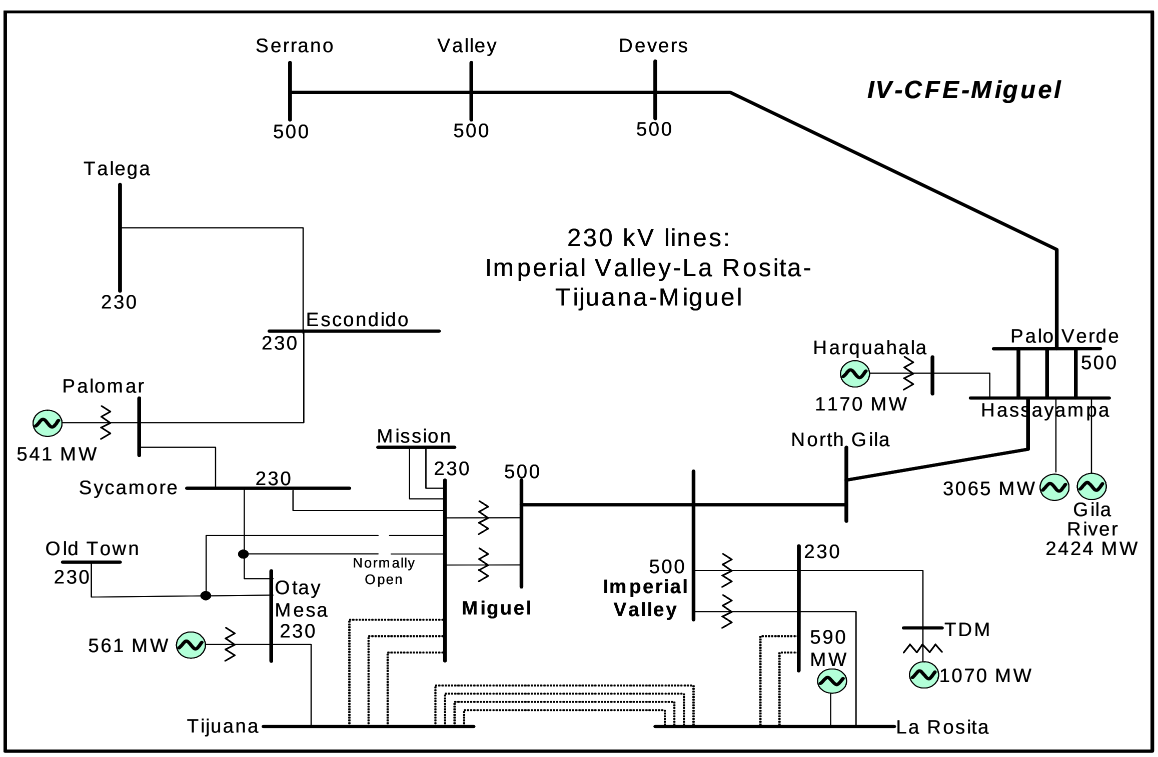
With regard to accessing renewable energy, the Serrano/Valley – Northern alternative is one of the poorest performing alternatives. It provided no direct access to

[2] Stability refers to the ability of an electrical system to restore itself to equilibrium after a disturbance (e.g., the ability of generation to resynchronize with the demands of the load after a disturbance).

renewable energy along its route or in the general vicinity. It did not relieve flow on other transmission lines which might therefore make it more economic for renewable generation to access these other lines, e.g., off-loading the SWPL thereby facilitating the tie-in of wind generation in the Boulevard area of San Diego county. In general, the Serrano/Valley – Northern alternative would not create the infrastructure that would promote the development of renewable resources in areas of known potential.

Finally tying into SCE's system would require filing an Interconnection Application with SCE. This increases the variables or unknowns with this alternative, since the interconnection requirements would be subject to the results of SCE's Interconnection Study. This interconnection process adds another step to the process of approval and building of a new line, which might possibly delay a 2010 in-service date.

5. Imperial Valley – Miguel 230 kV through Mexico



The Imperial Valley – Miguel 230 kV "through Mexico" alternative was another one of the alternatives considered in the TCS. It did not make the short list of final four alternatives because of its poor technical performance and limited access to sources of renewable energy, however, SDG&E describes it herein in response to inquiries made during the study process. This alternative entails construction of a series of new parallel 230 kV transmission lines, which would go through Mexico and connect SDG&E's existing Imperial Valley and Miguel Substations. This alternative also ties into CFE's existing La Rosita and Tijuana Substations. CFE is the state owned utility in Mexico which provides service in Northern Baja California.

The Imperial Valley – Miguel 230 kV through Mexico alternative had the poorest technical performance of all in the TCS with one of the highest number of overloaded elements for all contingencies studied (e.g., N-1 outages, credible N-2 outages, bus failure, and corridor contingencies). It also required the most total transmission line-miles of new or upgraded transmission facilities, e.g., to mitigate N-0 and N-1 overloads on SDG&E's system. This alternative also resulted in the highest flow into the Miguel 230 kV substation which is already heavily loaded. As a general objective, the addition of transmission infrastructure should enhance or improve system stability. However, the Imperial Valley – Miguel 230 kV through Mexico alternative provided no stability improvement, performing no better than the existing system.

The Imperial Valley – Miguel 230 kV through Mexico alternative connects only indirectly to areas with significant levels of proven renewable resource potential in the United States. It would provide no practical access to renewable energy in eastern San Diego County and only indirect access to renewable energy in the Imperial Valley.

According to CFE, the viable renewable resource potential in Baja California, Mexico is limited to only a few hundred megawatts. CFE has also indicated that these potential renewable resources could be interconnected to its existing bulk transmission system. Consequently, the Imperial Valley – Miguel 230 kV through Mexico alternative would not be needed to access these resources.

The Imperial Valley – Miguel 230 kV through Mexico alternative would also be faced with several legal, regulatory and operational issues. For these and all of the above reasons, the Technical Working Group eliminated this alternative.

6. Imperial Valley-Central 230 kV

An analysis was also performed by SDG&E to determine the viability of a 230 kV alternative for the 500 kV segment of the Sunrise Powerlink. The general conclusion of the analysis was that *four* 230 kV circuits would be required to provide the same capacity as the proposed *single* 500 kV circuit. With four circuits, the power losses for the 230 kV alternative are almost twice that of the 500 kV circuit. Requirements for rights-of-way would be equivalent for each, however, the total cost of constructing four 230 kV circuits is estimated to be 30% higher than for a single 500 kV circuit. In addition, the number of structures required for two parallel 230 kV lines will be twice that of the 500 kV option. Therefore, it is anticipated that the land use, visual and other impacts of the project will be significantly greater for the 230 kV alternative.

An analysis was performed to determine a 230 kV alternative for the 500 kV segment of the Sunrise Powerlink. The general conclusion of the analysis was that four 230 kV circuits would be required to provide the same capacity as the proposed single 500 kV circuit. With four circuits, the power losses for the 230 kV alternative are almost twice that of the 500 kV circuit. Assuming the four 230 kV circuits would be carried by two sets of towers on the same right-of-way (i.e., each tower carries two circuits), right-of-way requirements for the 230 kV alternative would be equivalent to the 500 kV portion of the Sunrise Powerlink, however, the total cost of constructing four 230 kV circuits is estimated to be 30% higher than for a single 500 kV circuit. The increased cost is due, in part, to the fact that more than twice the number of structures will be required to carry the four 230 kV circuits. And because more structures are required for the 230 kV alternative, it is anticipated that the land use, visual and other impacts of the project will be significantly greater for the 230 kV alternative.

Table VI-1

See chapter discussion at page VI-5

Table VI-2

See chapter discussion at page VI-6

Table VI-3

See chapter discussion at page VI-7

<u>Table VI-4</u>

Economic Benefits of In-Area Combined Cycle Generation Alternative Market Sensitivities

	Levelized Energy Savings (2010-2049, millions			Levelized Fixed Costs (millions)			
	Energy Savings	**RMR Savings**	**Total Energy Savings**	**Transmission (2010-2049)**	**Generation (2010-2043)**	**Total Fixed Costs**	**Benefit/ Cost Ratio**
In-Area Combined Cycle (low load forecast, medium gas price, average hydro conditions)	**$36**	**$0**	**$36**	**$37**	**$196**	**$233**	**0.15/1**
In-Area Combined Cycle (high load forecast, medium gas price, average hydro conditions)	**$195**	**$0**	**$195**	**$37**	**$$196**	**$233**	**0.84/1**
In-Area Combined Cycle (medium load forecast, low gas price, average hydro conditions)	**$54**	**$0**	**$54**	**$37**	**$196**	**$233**	**0.23/1**
In-Area Combined Cycle (medium load forecast, high gas price, average hydro conditions)	**$211**	**$0**	**$211**	**$37**	**$196**	**$233**	**0.91/1**
In-Area Combined Cycle (medium load forecast, medium gas price, dry hydro conditions)	**$120**	**$0**	**$120**	**$37**	**$196**	**$233**	**0.52/1**
In-Area Combined Cycle (medium load forecast, medium gas price, wet hydro conditions)	**$72**	**$0**	**$186**	**$37**	**$196**	**$233**	**0.80/1**

Figure VI-1

Imperial Valley – Central – Serrano/Valley

(completing the 500 kV loop)

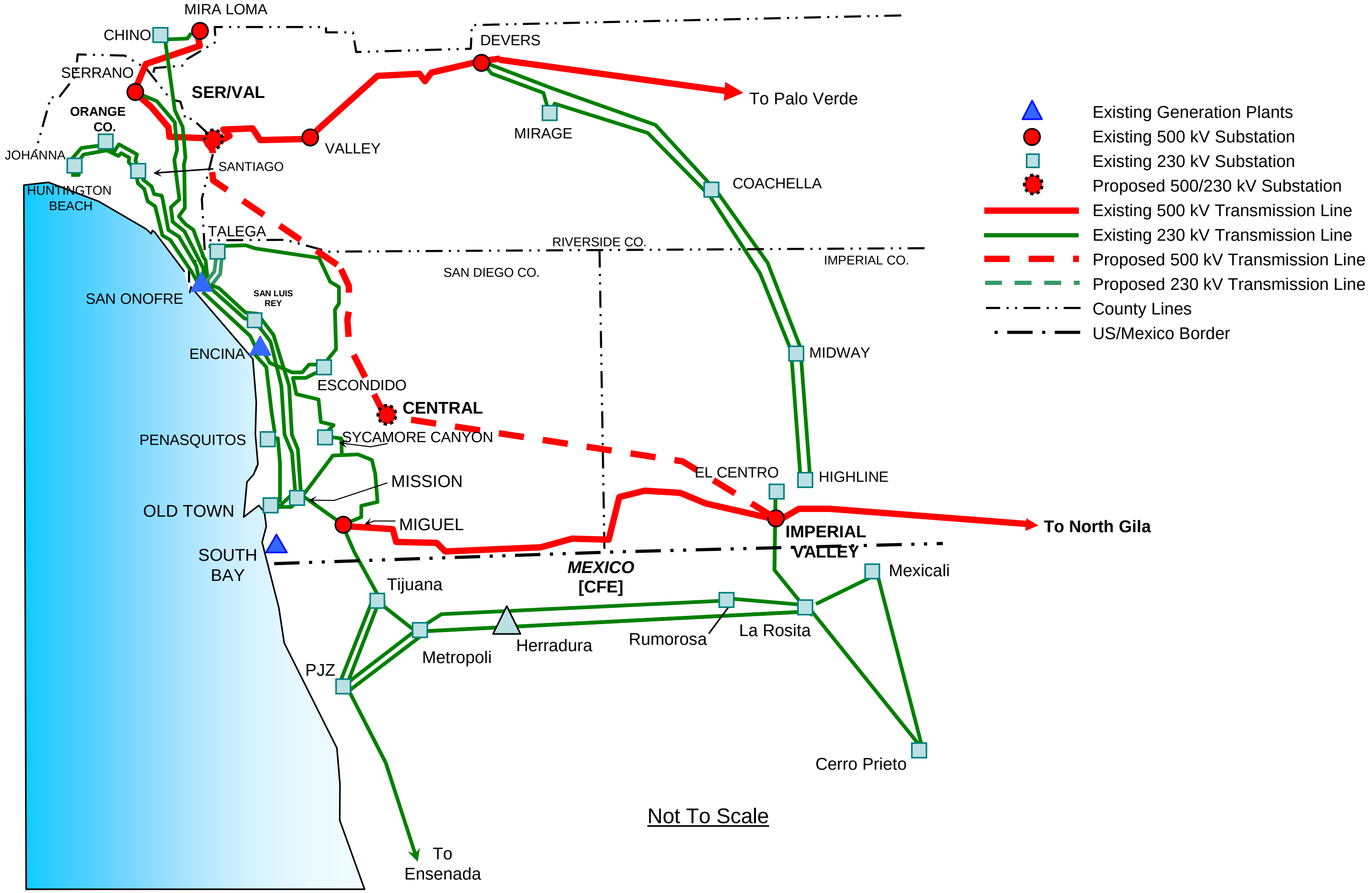


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Figure VI-2

Imperial Valley – Central

(Sunrise Powerlink)

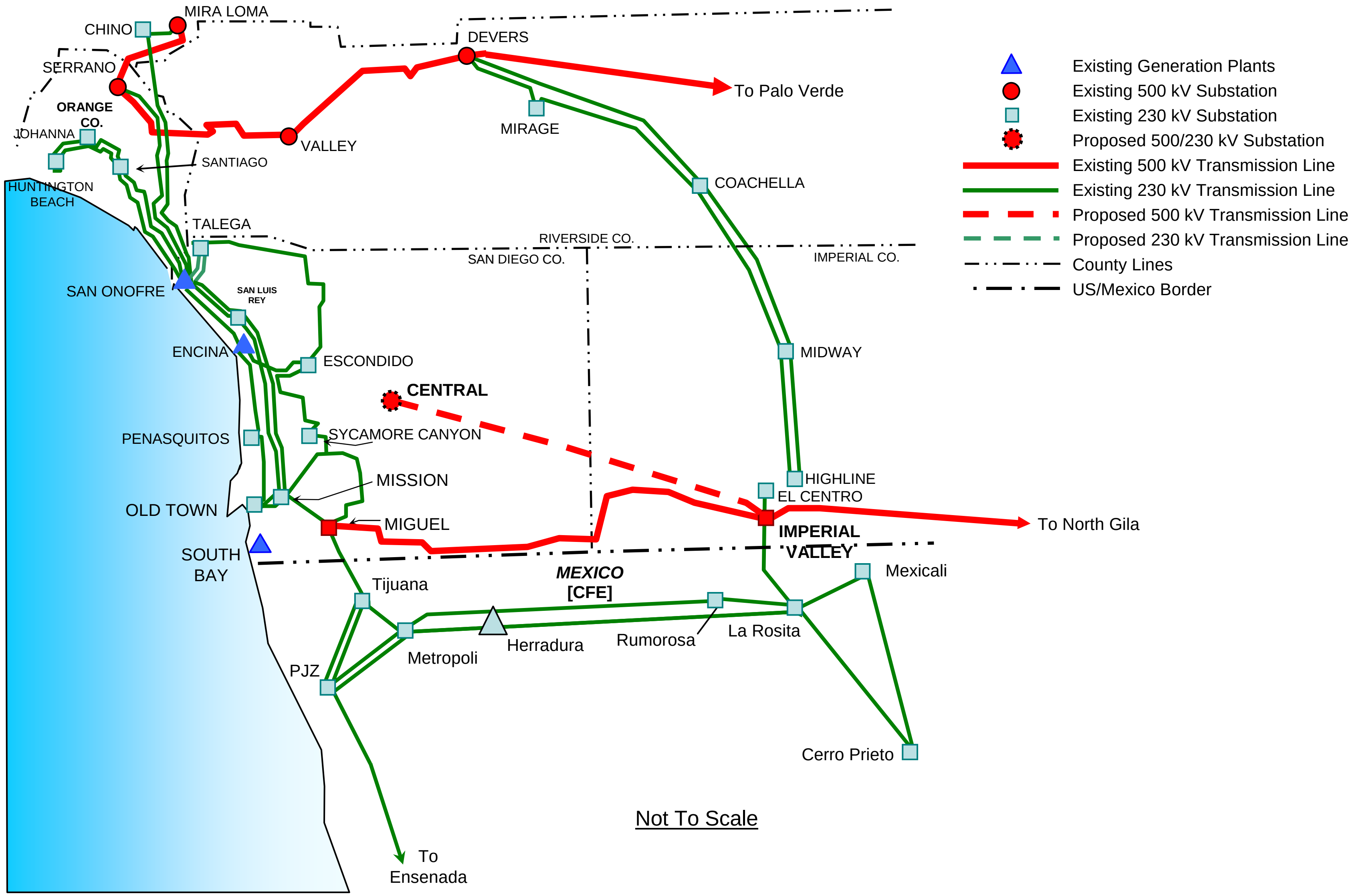


Figure VI-3

Imperial Valley – Miguel 500 kV #2

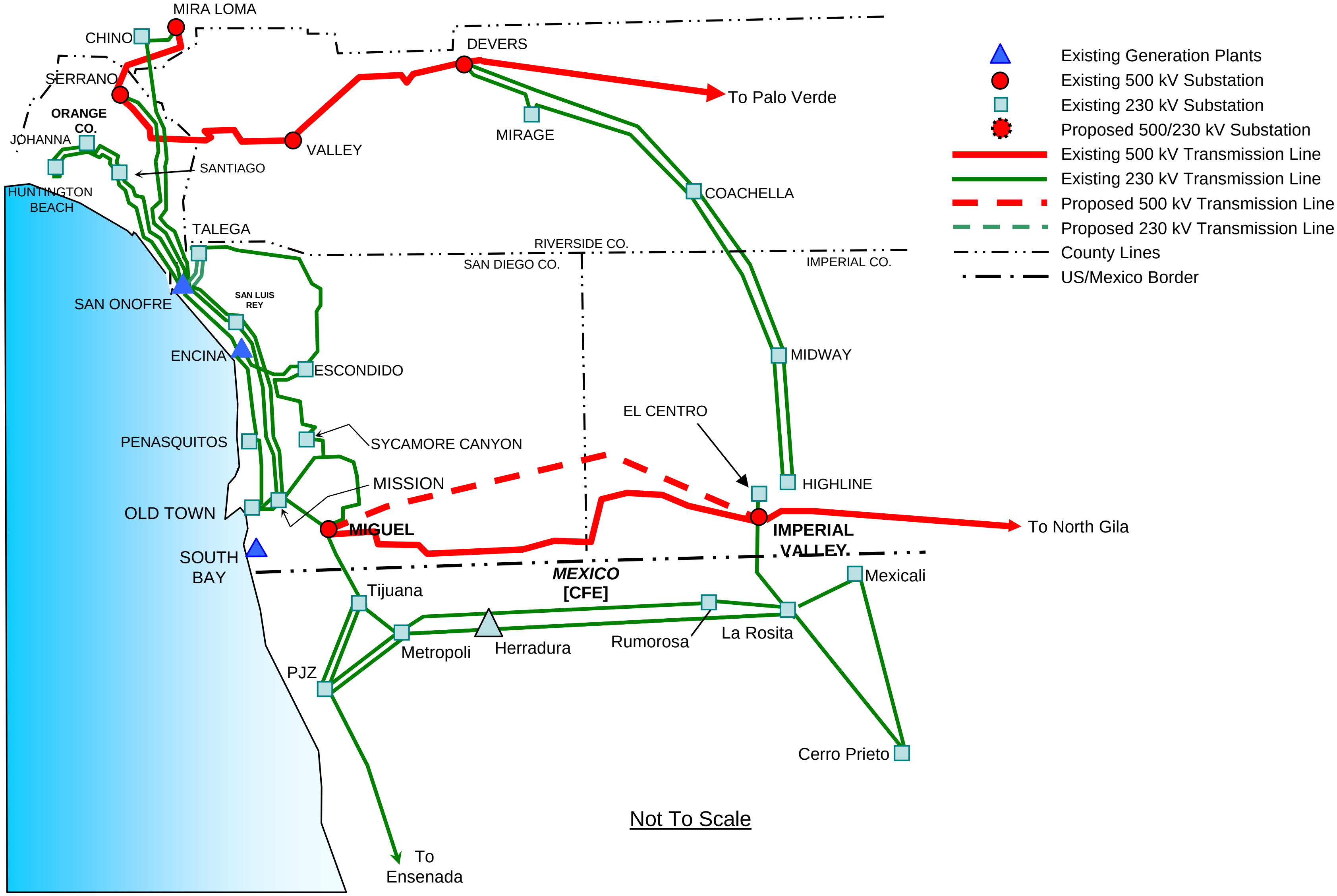
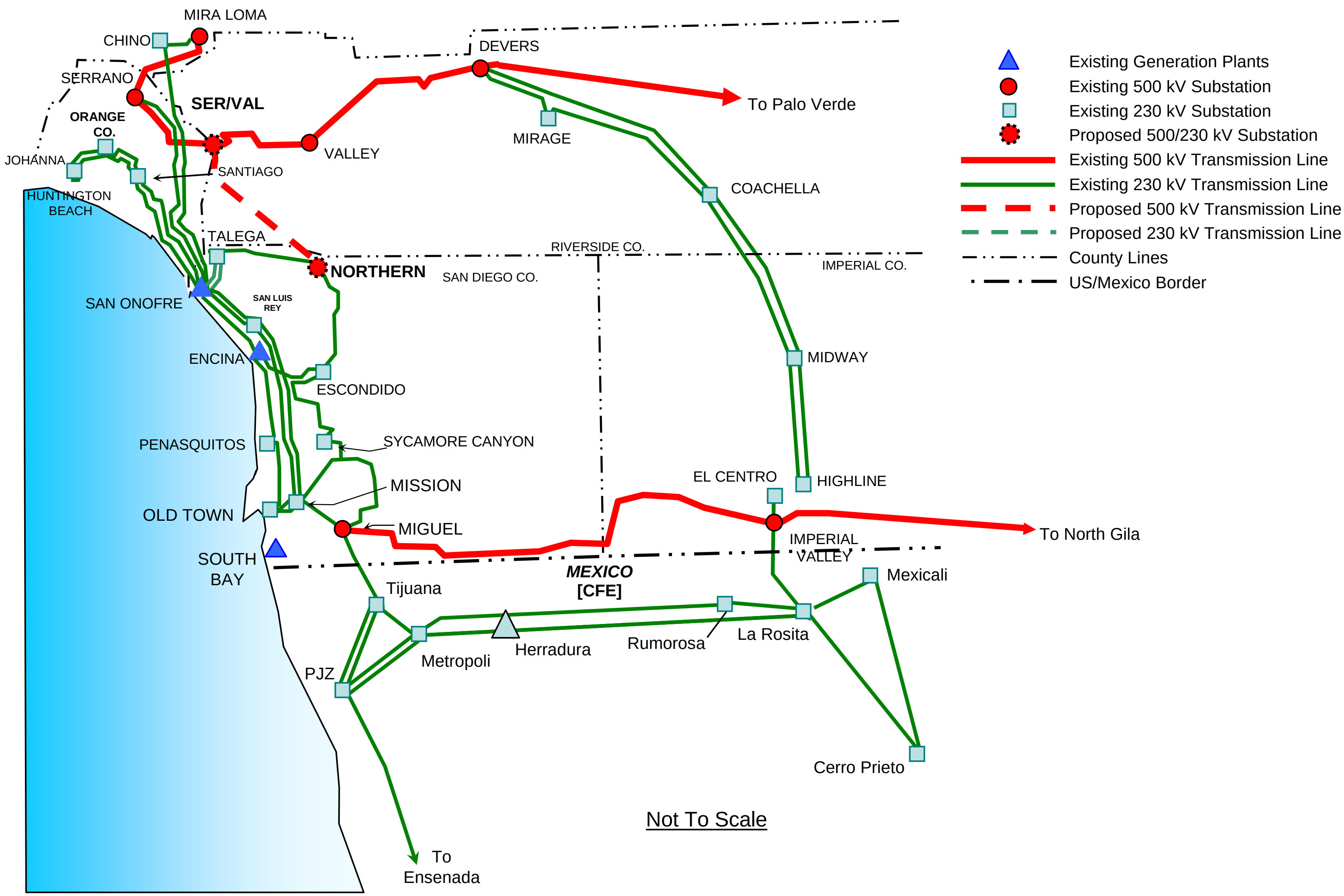


Figure VI-4

Serrano / Valley – Northern



Not To Scale

GLOSSARY

AC	Alternating Current
APS	Arizona Public Service Company
CAISO	California Independent System Operator
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CFE	Comisión Federal de Electricidad
CPCN	Certificate of Public Convenience and Necessity
CPUC	California Public Utilities Commission
CSI	California Solar Initiative
CSP	Concentrating Solar Power
DC	Direct Current
DG	Distributed Generation
DPV2	Devers-to-Palo Verde 2 500 kV Transmission Line
DRP	Demand Response Program
EAP	Energy Action Plan
EIR	Environmental Impact Report
ERP	Emerging Renewable Program
FERC	Federal Energy Regulatory Commission
Full Loop	Imperial Valley-Central-Serrano Valley 500 kV Transmission Line
Gen-tie	Transmission line connecting a generator to the grid
GWh	Gigawatt-hour
IERP	Integrated Energy Policy Report
IID	Imperial Irrigation District
IV	Imperial Valley
IVSG	Imperial Valley Study Group
IOU	Investor Owned Utility
IVSG	Imperial Valley Study Group
kWh	Kilowatt-hour
LADWP	Los Angeles Department of Water and Power
LMP	Locational Marginal Pricing
LSEs	Load Service Entities

LTRP	Long Term Resource Plan
MRTU	Market Redesign Technology Update
MW	Megawatt (1,000 kW)
NERC	North American Electricity Reliability Council
OII	Order Instituting Investigation
SP 15	South of Path 15
PEA	Proponent's Environmental Assessment
PG&E	Pacific Gas and Electric
PPA	Power Purchase Agreement
PRG	Procurement Review Group
PTO	Participating Transmission Owner
PV	Photovoltaic
PWG	IVSG Permitting Work Group
QF	Qualifying Facility
RAS	Remedial Action Scheme
RFO	Request For Offer
RMR	Reliability Must Run
ROW	Rights Of Way
RPS	Renewable Portfolio Standard
SB	Senate Bill
SCE	Southern California Edison Company
SDG&E	San Diego Gas and Electric Company
SGIP	Self-Generation Incentive Program
SES	Stirling Energy Systems
SONGS	San Onofre Nuclear Generating Station
STEP	Southwest Transmission Expansion Plan
SWPL	Southwest Power Link
TCS	Transmission Comparison Study
TEAM	Transmission Economic Assessment Methodology
TRCR	Transmission Ranking Cost Report
TWG	Technical Work Group
WECC	Western Electricity Coordinating Council
WOR	West Of River

WITNESS QUALIFICATIONS

JAMES P. AVERY

James P. Avery is Senior Vice President – Electric for SDG&E, and is sponsoring Chapter I of this report. His business address is 8330 Century Park Court, San Diego, California, 92123. Mr. Avery oversees the company's generation business unit, electric transmission engineering, grid operations, construction and maintenance, and electric distribution operations. He attended Manhattan College, New York City, New York, graduating with a Bachelor of Engineering Degree in Electrical Engineering with a major field of study in Electric Power. Prior to that, he attained an Associates Degree in the field of Electrical Engineering from New York City Community College. Prior to joining SDG&E in 2001, Mr. Avery was a consultant with R.J. Rudden Associates, one of the nation's leading management and economic consulting firms specializing in energy and utility matters. Prior to that, he functioned as the chief executive officer of the electric and gas operations at Citizens Utilities Company, a multi-service organization that provided electric, gas, telecom, water and wastewater services in over 20 states across the nation. He is currently on the Board of Directors of the California Power Exchange, and he also served as a member of the Board of Directors of R.J. Rudden Associates, and of Vermont Electric Power Company, a transmission-only company serving the state of Vermont, and he held positions at American Electric Power Service Corporation. Mr. Avery has previously testified before this Commission.

JAN STRACK

Jan Strack is sponsoring Chapters II, III, V (except for the RMR cost savings analysis) and VI of this report. He is currently employed by SDG&E as Senior Transmission Planner. His business address is 8330 Century Park Court, San Diego, California, 92123. In his capacity as transmission planner, he is responsible for regulatory issues affecting the SDG&E transmission system as well as economic analysis of proposed transmission projects. Previously, Mr. Strack worked in the FERC Regulatory Affairs group and was in charge of developing utility policy on FERC-jurisdictional market issues and ensuring that SDG&E met all FERC regulatory requirements. He has had extensive experience with CAISO market design and operation. He has worked in the real-time resource management and scheduling groups as well as in the long-term resource planning organization. His career in the electric utility industry has spanned more than 25 years. Mr. Strack graduated in 1978 from the University of Illinois with an electric engineering degree. .

VINCENT D. BARTOLOMUCCI

Vincent D. Bartolomucci is sponsoring Chapter IV of this report. He is employed by SDG&E, currently as Manager of Contract Administration in the SDG&E's Electric and Gas Procurement Department. His present duties include policy, planning and negotiation of contracts, relating to renewable resources. His duties also include the management and administration of existing contracts, including renewable contracts, QF contracts, allocated CDWR contracts, bi-lateral contracts and core and UEG related gas contracts. Previously, he held positions of increasing responsibility at SDG&E in the Systems Protection Department, Power Contracts Department, Customer Energy Contracts Section, Regulatory Affairs Department and Fuel and Power Supply Department.

Mr. Bartolomucci has extensive experience related to development of renewable policy and issues at both the California Public Utilities Commission and California Energy Commission ("CEC"). He has previously testified before both this Commission and the CEC. Mr. Bartolomucci received a Bachelor's degree in Electrical Engineering (BEE) from Manhattan College and is a member of IEEE.

VICTOR J. KRUGER

Victor J. Kruger is sponsoring the Reliability Must-Run ("RMR") cost savings analysis in Chapter V of this report. His business address is 9060 Friars Road, San Diego, CA 92108. He is Senior Energy Administrator and Team Lead of Grid Contracts in the Grid Operations Services Section within SDG&E's Electric Grid Operations Department. He is responsible for administering SDG&E's contracts related to transmission operations and reliability services including RMR contracts. His duties include forecasting RMR costs and providing testimony supporting cost recovery. From 1985 to 1995 he was in charge of rate design and cost of service for Wisconsin Electric Power Company. In that role, he prepared testimony for others and for himself on all state (Wisconsin and Michigan) and federal dockets pertaining to cost of service and rate design. He has previously testified before this Commission.