BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

In the Matter of the Application of ) Application No. 06-08-010
San Diego Gas & Electric Company ) (Filed August 4, 2006)
(U-902) for a Certificate of Public )
Convenience and Necessity for the )
Sunrise Powerlink Transmission Project. 

PHASE 2 REBUTTAL TESTIMONY OF DR. REN ORANS
ON BEHALF OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION

Nancy Saracino
Vice President and General Counsel
Judith B. Sanders Senior Counsel
California Independent System
Operator Corporation
151 Blue Ravine Road
Folsom, CA 95630
916-351-4400 - office
916-608-7296 – facsimile
jsanders@caiso.com

Jeffrey P. Gray
DAVIS WRIGHT TREMAINE LLP
505 Montgomery Street, Suite 800
San Francisco, CA 94111-6533
Tel. (415) 276-6500
Fax. (415) 276-6599
Email: jeffgray@dwt.com

Attorneys for the CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION

Dated: March 28, 2008
1

2  I. INTRODUCTION........................................................................................................3

3  II. DRA’S PROPOSED MODIFICATIONS TO THE CAISO’S RPS COMPLIANCE BENEFITS ANALYSIS.................................................................4

5  III. THE EFFECT CAUSED BY DELAY IN THE DEVELOPMENT OF RENEWABLE RESOURCES IN THE IMPERIAL VALLEY........................................ 18

7  IV. THE CAISO’S RMR COST ASSUMPTIONS.................................................................19

8  V. UPDATES TO THE CAISO’S NET BENEFITS ANALYSIS TO REFLECT SDG&E’S PHASE 2 DIRECT TESTIMONY .................................................. 20
I. INTRODUCTION

Q. Please state your name, titles and employer.
A. My Name is Ren Orans, Managing Partner of Energy and Environmental Economics, Inc. (E3)

Q. Are you the same Ren Orans who provided direct testimony in Phase 2?
A. Yes.

Q. On whose behalf are you submitting this rebuttal testimony?
A. I am submitting this testimony on behalf of the California Independent System Operator Corporation (CAISO).

Q. What is the purpose of your rebuttal testimony?
A. The purpose of my rebuttal testimony is to rebut the Phase 2 Direct Testimony of Daniel Suurkask on behalf of the Division of Ratepayer Advocates (DRA) addressing renewable procurement standard (RPS) compliance benefits associated with the Sunrise Powerlink Project (Sunrise) as proposed by San Diego Gas & Electric Company (SDG&E) or another Imperial Valley-San Diego transmission line (IV-SD TL);1 to rebut the Phase 2 Direct Testimony of Kevin Woodruff of the DRA addressing the reasonableness of reducing reliability must-run (RMR) costs and the impact of the amount of Locational Capacity Requirements (LCR) provided by Imperial Valley renewable (IV) generation; and to update the

---

1 For purposes of his analysis, Mr. Suurkask focuses on IV-SD TLs, which apparently includes Sunrise and the environmentally superior southern (DEIR/EIS Alternative 4) and northern (DEIR/EIS Alternative 5) route alternatives. For consistency, this testimony will use the “IV-SD TL” acronym.
CAISO’s cost and benefit summary tables to conform to recently filed changes made by SDG&E in its Phase 2 direct testimony.

II. DRA’S PROPOSED MODIFICATIONS TO THE CAISO’S RPS COMPLIANCE BENEFITS ANALYSIS.

Q. Please describe the modifications to the CAISO’s RPS compliance benefits analysis proposed by DRA witness Suurkask.

A. Mr. Suurkask proposes several modifications to the CAISO’s RPS compliance model for the purpose of “updating its benefit-cost estimates” and “shedding light on particular questions of relevance to this proceeding.” In particular, the changes he proposes are largely based on information from the California Public Utilities Commission (CPUC) regarding approved or pending RPS contracts, a Western Electricity Coordinating Council (WECC) economic analysis, and the Greenhouse Gas (GHG) modeling that has been performed by E3 for the CPUC in Docket 06-04-009.

Q. Please describe the results of DRA’s updated analysis of the renewable procurement benefits associated with an IV-SD TL?

A. DRA’s base case analysis shows that an IV-SD TL would produce $30.5 million per year in renewable procurement benefits. While lower than the $45M/yr base case RPS benefits described in the CAISO's Phase 1 Rebuttal Testimony, DRA’s $30.5M/yr benefit estimate is significant, and as a general matter corroborates the CAISO’s analysis in Phase 1 that a IV-SD TL would lower California’s cost of

---

2 DRA Phase 2 Direct Testimony Volume 2 (Suurkask) at 3.
3 CAISO Ex. I-6 at 29.
RPS compliance. Moreover, the DRA analysis acknowledges that an IV-SD TL line has “considerable upside potential” depending on the potential of solar thermal technology cost reductions.²

Q. What is the CAISO’s opinion of the results of DRA’s updated analysis of the renewable procurement benefits associated with a IV-SD TL?

A. The CAISO believes the range of benefits, which Mr. Suurkask estimates to be between $0/yr to $100.2M/yr, is unreasonably low. As the CAISO testified in Phase 1, “[a]lthough zero benefits is possible, it is extremely unlikely and therefore should not be the low end of a plausible range.”⁵ Rather, for the reasons explained in Phase 1, the CAISO’s RPS benefit estimate for Sunrise “is conservative and should be adopted as the low end of a plausible range.”⁶ Accordingly, Mr. Suurkask’s estimate of zero RPS benefits should not be used to establish the low end of the expected range of benefits of Sunrise. Additionally, the high end of the expected range of benefits identified by Mr. Suurkask fails to account for the full extent of the upside potential in RPS benefits, as I discuss in more detail below.

Q. Please summarize the model, data and assumptions used by the DRA in their analysis.

A. The analysis Mr. Suurkask presents relies on the same model that I used in Phase 1 to estimate renewable energy procurement benefits.⁷ As far as I can determine,

---

² DRA Phase 2 Direct Testimony Volume 2 (Suurkask) at 9.
⁵ CAISO Ex. I-6 at 43 (emphasis in original).
⁶ CAISO Ex. I-6 at 43.
⁷ DRA Phase 2 Direct Testimony Volume 2 (Suurkask) at 4.
Mr. Suurkask makes no modifications to the costing methodology used in the model; however, he makes a number of changes to the input data and assumptions I used.

Q. How did Mr. Suurkask modify the input data you used in Phase 1?

A. Mr. Suurkask modified the input data in the following four significant ways:

1. He uses a new set of generator costs, transmission costs, capacity factors and wind integration costs from a set of interim results produced by a study that E3 is currently working on for the CPUC and California Air Resources Board on the costs of complying with GHG legislation in California.\(^8\)

2. He adds a cost to each resource zone for new transmission line losses calculated as 1% losses for every 100 miles of transmission line length.\(^9\)

3. He adds to the model 575 MW of wind resources in the Santa Barbara/LA Basin, 400 MW of geothermal resources in the Reno Area, and 1000 MW of renewable resources to the British Columbia (BC) region. He also removes from the model 1500 MW of wind from Montana and 3000 MW of wind from Wyoming.\(^10\)

4. He modifies the resource mix of renewables in the San Bernardino/Mono Area by reducing the amount of solar thermal

---

\(^8\) DRA Phase 2 Direct Testimony Volume 2 (Suurkask) at 5, 7.
\(^9\) DRA Phase 2 Direct Testimony Volume 2 (Suurkask) at 7.
\(^10\) DRA Phase 2 Direct Testimony Volume 2 (Suurkask) at 4, 5. BC resource addition is shown in DRA Workpaper “DRA_RPSBenefitEstimate.xls”, Table 4.5, cell N17.
resources in that region by 2000 MW and increasing the amount of
wind from that region by 2000 MW.\footnote{DRA Workpaper “DRA_RPSBenefitEstimate.xls”, Table 4.5, Sheet “Table_4.3 Modified”, cells K23 and K24.}

Q. How did Mr. Suurkask modify the assumptions you used in Phase 1?

A. Mr. Suurkask modified the following four assumptions:

1. He assumed that 100 percent of the out-of-state renewable energy potential in the model would be available for development and import into California, with the exception of Montana and Wyoming, which he cut by 50 percent. This assumption is reflected in his high, medium, and low cases.\footnote{DRA Workpaper “DRA_RPSBenefitEstimate.xls”, Table 4.5, Sheet “Supply_Curve_Scenario.” The Resource Cluster Scenario is set to “All resource clusters” in the model version DRA used to calculate the line’s benefits.}

2. To create the low value case, he increases by 5 percent the costs of all geothermal resources, which are found in abundance in the Imperial Valley.\footnote{DRA Phase 2 Direct Testimony Volume 2 (Suurkask) at 7 (Table 3-3).}

3. In the low value case, he lowers the cost of wind by 5 percent, which makes up a large share of the resources that would replace those developed in the study area.\footnote{DRA Phase 2 Direct Testimony Volume 2 (Suurkask) at 7 (Table 3-3).}

4. In the high value case, he increases the cost of wind by 5 percent, decreases the cost of geothermal resources by 5 percent, and decreases the cost of solar thermal resources by 20 percent.\footnote{DRA Phase 2 Direct Testimony Volume 2 (Suurkask) at 7 (Table 3-3).}
Q. Do you believe that the changes to the input data and assumptions made by Mr. Suurkask produce an implausibly low renewable energy procurement benefit?

A. Yes. I believe the resulting benefit level is unreasonably low for three reasons. First, given the difficulty of siting, developing and obtaining regulatory approval for out-of-state transmission facilities -- particularly transmission facilities that would be designed for the primary purpose of exporting energy to California, I believe that DRA’s modified assumption that 100 percent of out-of-state renewable generation is available for import into California is so improbable that the assumption is not even useful for purposes of developing a low estimate of RPS benefits, let alone for the medium and high cases where this improbable scenario is also used by Mr. Suurkask. Second, the arbitrary modifications of the costs of one resource versus another are not based on any studies or data and appear to me to be solely designed to produce a zero benefit. Finally, the modifications to the levels of resources in each zone blend the data and results of two different models, which I believe produces misleading results.

Q. What is a more plausible range of assumptions for the development and import of out-of-state resources?

A. Assuming that half of the out-of-state resources are available for development and import into California is an optimistic assumption that is suitable for calculating the low benefits case. In Phase 1, the CAISO addressed out-of-state project
development risk by assuming that only 50 percent of the projects requiring long
line transmission to other jurisdictions could be completed. Given the difficulty
of siting, developing and obtaining regulatory approval for out-of-state
transmission facilities, I believe this assumption is appropriate for producing a
conservative estimate of the renewable procurement benefits of Sunrise. In my
Phase 1 Rebuttal Testimony, however, I suggested that given recent opposition to
transmission developed solely for the purpose of importing energy into California,
even this 50 percent assumption may be too high, and it may be more accurate to
assume that only 25 percent of such projects could be constructed.16

Q. Please explain how changing this one assumption regarding the availability
of out-of-state renewable generation affects Mr. Suurkask’s estimates of the
RPS benefits of Sunrise?

A. Adjusting Mr. Suurkask’s model to include only 50% of out-of-state renewable
generation potential increases his base case value of the IV-SD TLs to $41.9M/yr,
and raises the low estimate to $6.8M/yr and the high estimate to $123.3M/yr. If
only 25% of out-of-state renewable generation potential is assumed, the base case
benefits estimate for Sunrise and other IV-SD TLs would be $78.5M/yr, bounded
by the low estimate of $30.3M/yr and the high estimate of $183.6/yr.17 Every
state in the Western Interconnect except three have adopted RPS standards as of
this date. The combination of both RPS standards and proposed federal and

16 CAISO Ex. I-6 at 35.
17 Note: In making this modification, we have left the resource availability from Wyoming and Montana
unchanged from DRA’s analysis because DRA has already reduced the wind resources in these regions by
50% from the original estimate.
regional efforts to regulate GHG emissions makes it increasingly unlikely that California will be able to develop and construct the necessary transmission facilities to import large amounts of renewable generation from out-of-state.

While it is reasonable to assume that some out-of-state generation can be imported into California, particularly from resource rich areas like Wyoming and Montana, it is not reasonable to assume that California will be able to develop and import all of the renewable resources from areas like the Pacific Northwest, where both the resource constraints and energy value are similar to those in California.

Q. Please explain why Mr. Suurkask’s modified costs for wind and geothermal resources cause an implausibly low renewable energy procurement benefit?

A. I believe that Mr. Suurkask’s low case sensitivity, in which he assumes that geothermal costs rise by 5% while wind costs fall by 5% relative to the base case costs is possible but unlikely; moreover, it is not supported by any data or studies. Wind and geothermal generation technologies are both mature technologies and both use many similar materials, such as steel and concrete. Accordingly, generation costs for these two technologies are more likely to move in the same direction rather than in opposite directions. The value of a sensitivity analysis is much more useful when it is associated with potential events that are likely to occur, as opposed to a sensitivity analysis that simply, and arbitrarily, changes input values. Any number of changes to geothermal and wind technology costs could be offered as alternative sensitivities to DRA’s high and low cases, creating a very wide range of resulting benefits, but these results would not be particularly
useful in a resource evaluation. In contrast, the sensitivity assumption in Mr. Suurkask’s high case that tests the effect of a 20% decrease in solar thermal costs is more relevant and useful because he explains that the potential success of the Stirling solar thermal project (which is a relatively immature technology at this time) could help lock-in or raise the renewable procurement benefits.18

Q. Please explain how Mr. Suurkask’s misuse of two different models contributes to his implausibly low estimate of renewable energy procurement benefits?

In his analysis, Mr. Suurkask replaces 2000 MW of solar thermal resources located in the San Bernardino/Mono zone with 2000 MW of wind resources, which results in a lower renewable energy procurement benefit. In his workpapers, Mr. Suurkask notes the change as follows: “Reduce relative weighting of solar thermal relative to wind, per E3’s GHG calculator.”19 I believe this change to the input data inappropriately blends information from the procurement benefits model used by the CAISO in Phase 1 and E3’s GHG calculator producing misleading results. The CAISO’s unaltered renewable procurement benefits model from Phase 1 used a single data source, an analysis by the Center for Resource Solutions (CRS),20 for all of its zonal estimates of in-state renewable resource availability. Relying on this single source ensures that a consistent methodology is used for the resource availability of each zone and

---

18 DRA Phase 2 Direct Testimony Volume 2 (Suurkask) at 9.
19 DRA Workpaper “DRA_RPSBenefitEstimate.xls”, Table 4.5, Sheet “Table_4.3 Modified”, cells K23 and K24.
20 Center for Resource Solutions (CRS), Achieving a 33% Renewable Energy Target – Prepared for the CPUC, 2005.
guards against having a more conservative estimate of resources in one zone and a
more optimistic estimate for another zone. In contrast, E3’s GHG calculator has its own methodology for estimating wind,
solar thermal, and geothermal resource availability in each zone that relies on an
extensive GIS database from the National Renewable Energy Laboratory (NREL),
and significant care was taken to keep this methodology as consistent as possible
across different zones and generation technologies.
Mr. Suurkask’s selective use of portions of the resource availability data from the
two different models undermines the intended consistency of each set of data and
produces misleading results. For instance, one could choose data from the two
different models and combine it in any number of ways to produce a wide range
of resulting renewable benefits, including benefits that are even higher than those
shown by the CAISO for Sunrise. However, as I described earlier, it is preferable
to rely on a single data source to the greatest extent possible. Because the CRS
resource data in the original Phase 1 data is what has been used by the CAISO to
calculate renewable benefits throughout this proceeding, it is reasonable and good
practice to continue using this same data source.

Q. **Could you, as Mr. Suurkask suggests, use the GHG data to estimate the**
**RPS procurement benefits of an IV-SD TL?**

A. Yes, the GHG calculator was designed to allow state agencies and third parties to
develop estimates of the costs to meet GHG reductions targets using different
resources. For example, the model allows the user to procure different amounts
of renewable resources from identified renewable resource zones in California and see the costs associated with each portfolio. It is important to note that the GHG calculator and its data are an interim product that is still being revised as part of ongoing analysis for the CPUC and CARB.

Q. Please describe the methodology used in the procurement benefits model from Phase 1 and in your GHG Calculator.

A. The methodology used in the procurement benefits model from Phase 1 is described in the CAISO’s Phase 1 Initial Testimony Part II, at section 4, pages 46 to 70. The GHG calculator computes the incremental cost of reducing electricity sector carbon emissions to a designated target level by 2020. This incremental cost is calculated as the amount over and above the cost of a 2020 reference case, in which California utilities meet obligations to serve their growing loads while also complying with existing state policies, such as energy efficiency mandates and RPS targets.

The calculator, which is a Microsoft Excel-based model, contains a pre-loaded reference and target case in which E3 has selected one particular combination of new generation resources and energy efficiency that complies with the relevant policy targets. The model also, however, has an interface that allows a user to select a different combination of clean new generation and energy efficiency and to recalculate resulting costs of the user-entered case. The cost calculations are based largely on E3-developed supply curves of new energy efficiency and new renewable generation available to California.
Q. Please compare the basic sources of data used in the procurement benefits model from Phase 1 and your GHG Calculator for the renewable energy supply curves?

A. As I mentioned above, the CAISO’s renewable procurement benefits model from Phase 1 used a single data source, an analysis by CRS, for all its zonal estimates of in state renewable resource availability. The GHG Calculator primarily uses data from the Energy Information Administration (EIA) of the U.S. DOE for a baseline generation cost for each technology. To estimate renewable resource availability the Calculator relies on resource potential data throughout the WECC to ensure comparability across regions. Wind and solar thermal resource estimates are from National Renewable Energy Laboratory (NREL) and rely on Geographic Information Systems (GIS) data that estimates the amount of land area with a particular level of resource quality—either wind speed or solar insolation—which is grouped into 5 levels or classes after applying exclusions for particular lands such as water bodies and protected park lands. Using the NREL data, along with additional information from the CEC for greater California-specific detail, the Calculator assigns higher and lower capacity factors to resources depending on their particular resource class. The calculator also makes use of site-specific geothermal and small hydro data from the Energy Information Association (EIA), which provided individual cost estimates for developing each site. Additionally, the GHG Calculator relies on transmission costing data from existing planning studies to estimate the cost of new transmission of various sizes from California
load centers to the general locations of the renewable resources. The transmission
costs were sized in 250 MW increments from 250 MW to 1000 MW and in 500
MW increments up to 6000 MW. Full documentation for the renewable data is
described in the following papers listed on our website: GHG Modeling Stage 1
Documentation,21 and Corrections to Stage 1 Documentation.22 All information on
the GHG Calculator is available on E3’s website.23

Q. Please describe the methodology used to construct the renewable energy
supply curve used in your GHG Calculator?

The GHG calculator groups the total resources identified into 11 renewable
resources regions within California and 13 different regions throughout the rest of
the WECC. The designated regions are listed in Table 1 below.

<table>
<thead>
<tr>
<th>California Regions</th>
<th>Rest of WECC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast CA</td>
<td>CFE</td>
</tr>
<tr>
<td>Geysers/Lake</td>
<td>Reno Area/Dixie Valley</td>
</tr>
<tr>
<td>Bay Delta</td>
<td>NE NV</td>
</tr>
<tr>
<td>Tehachapi</td>
<td>Alberta</td>
</tr>
<tr>
<td>San Bernardino</td>
<td>Arizona-Southern Nevada</td>
</tr>
<tr>
<td>Mono/Inyo</td>
<td>British Columbia</td>
</tr>
<tr>
<td>San Diego</td>
<td>Colorado</td>
</tr>
<tr>
<td>Imperial</td>
<td>Montana</td>
</tr>
<tr>
<td>Riverside</td>
<td>New Mexico</td>
</tr>
<tr>
<td>Santa Barbara</td>
<td>South Central Nevada</td>
</tr>
<tr>
<td>CA - Distributed</td>
<td>Northwest</td>
</tr>
<tr>
<td></td>
<td>Utah-Southern Idaho</td>
</tr>
<tr>
<td></td>
<td>Wyoming</td>
</tr>
</tbody>
</table>

Within each region, the Calculator ranks 500 MW increments of resources based
on the costs of delivering energy from those resources to the high voltage grid in

22 http://www.ethree.com/GHG/CorrectionsStage1.doc
23 http://www.ethree.com/cpuc_ghg_model.html
California. The model allows a user to enter a specific number of renewable MW to add from each resource zone up to the zone’s maximum value. The total cost of the selected group of renewables is then used by the GHG Calculator as a portion of the total cost of meeting the GHG reduction policy target. The GHG Calculator user interface also displays the cost of the least expensive increment to add in each zone (on a $/MWh basis), and shows the rank of that increment compared to other zones. Based on these rankings, a user wishing to add the least expensive bundle of renewables to meet a particular target of GHG emissions or renewable energy production could iteratively add resources in the lowest cost region until the target is reached.

Q. Can the GHG calculator be used to estimate the procurement benefits of an IV-SD TL?

A. Yes, and in fact as part of my review of Mr. Suurkask’s use of data from the GHG calculator, I used the GHG Calculator to estimate the total cost of meeting the RPS target levels for 2010, 2015, and 2020 if California added (a) only 600 MW of new renewable generation from the Imperial Valley region (for the base case) versus (b) if California added 2500 MW of new renewable generation from the Imperial region (for the Sunrise case). By comparing the results of these two cases, I found that an IV-SD TL RPS benefit would be $306.1 M/yr. These results indicate that by enabling the full development of 2500 MW from the Imperial Valley, with its rich, high capacity factor geothermal resources, the IV-SD TL would allow California to meet its
RPS targets at significantly lower cost than if only 600 MW could be developed in the area and other resource zones had to be developed to meet the same RPS targets.

To ensure comparability between the results of the GHG Calculator and the RPS benefits model, I removed all wind from the Imperial Valley renewable resource mix in the GHG Calculator and replaced it with solar thermal resources. This substitution guarantees that the renewable resources assumed to be developed in the Imperial Valley and delivered through the IV-SD TL would provide at least as much local and system reliability benefit as the Imperial Valley resource mix in the RPS model and in the CAISO’s analysis related to reliability.

Q. Are you suggesting that the GHG Calculator estimate of RPS procurement benefits replace the estimates you provided in Phase 1?

A. No. I continue to believe that my base case RPS procurement benefit provides a plausible and conservative low end estimate. However, in response to DRA’s continued assertions that uncertainty analysis lowers the expected benefits of transmission solutions that bring renewable resources into the San Diego load pocket, the results of running the GHG Calculator verifies my assertion that my estimates of RPS procurement benefits were very conservative and one could easily justify a much higher estimate of benefits.
III. THE EFFECT CAUSED BY DELAY IN THE DEVELOPMENT OF RENEWABLE RESOURCES IN THE IMPERIAL VALLEY.

Q. In his Phase 2 direct testimony, Mr. Woodruff states that “the CAISO is making some very specific – and possibly optimistic – assumptions about the development of renewable resources in the IV.”24 Would more “pessimistic” assumptions change the CAISO’s results dramatically?

A. No. First of all, it should be noted that the CAISO does not model capacity benefits from renewable generation until the year after the generation is assumed to be installed. Thus, for a 2011 Sunrise in-service date, new IID renewables are not valued for capacity benefits until 2012.

Nonetheless, to assess the sensitivity of the benefit estimates to the assumed renewable installation schedule as suggested by DRA, the CAISO analyzed the case where only 500MW of renewables were developed in IID through 2011 (as compared to 1080 MW in the CAISO’s prior analyses). Starting in 2012, the renewables then ramped up so that the total MW installed in 2015 matched the CAISO’s prior analysis. Under this phased-in construction schedule for new renewable generation (580 MW less renewable generation in 2011), the levelized reliability benefits of Sunrise declined by only $11 million.

---

24 DRA Phase 2 Direct Testimony Volume 1 (Woodruff) at 20.
IV. THE CAISO’S RMR COST ASSUMPTIONS

Q. In his Phase 2 direct testimony, Mr. Woodruff states that “DRA believes the CAISO’s assumption that Reliability Must-Run (RMR) process will be reduced in the presence of new ‘competition’ is incorrect. DRA does not believe that the costs of contracting for RMR units should be assumed to be able to fall appreciably below RMR units’ cost of service’ established by the FERC.”\textsuperscript{25} Did the CAISO’s Phase 1 analysis assume that RMR costs fall below cost of service?

A. No. The CAISO did not, and does not, assume that the price reduction is a result of RMR units being paid appreciably below their cost of service. Rather, the CAISO recognizes that RMR units have different cost of service levels. As the need for RMR capacity declines, the CAISO assumes that SDG&E will generally be able to contract with the lower cost RMR units, thus reducing its average RMR costs on a $/kW basis. The CAISO’s assumptions reflect this reality of lowest-cost contracting, not an assumption that RMR units would be forced to accept payments that do not compensate their full cost of service.

\textsuperscript{25} DRA Phase 2 Direct Testimony Volume 1 (Woodruff) at 21.
V. UPDATES TO THE CAISO'S NET BENEFITS ANALYSIS TO REFLECT SDG&E'S PHASE 2 DIRECT TESTIMONY

Q. SDG&E’s Phase 2 direct testimony uses a 58 year levelization term and a 7.81% discount rate for transmission expenditures for its cost analyses. These differ from what the CAISO used for the analyses in its Phase 2 direct testimony. Has the CAISO updated the costs used in its analysis to reflect these changes?

A. Yes. The CAISO has extended the cost and benefits streams in its economic models to reflect 58 years, and has levelized the costs and benefits over 58 years using the 7.81% discount rate. These changes are described in SDG&E’s Phase 2 direct testimony in Chapters 3 and 11, SDG&E’s Phase 2 Direct Testimony Workpapers 3/12/08 CD, and the FERC Offer of Settlement dated 27 March 2007 (Docket ER07-284-000). The updated costs and benefits are shown in Phase 2 Rebuttal Table 1 below.
Phase 2 Rebuttal Table 1: Levelized Costs and Benefits of Alternatives using updated costs, 58 year term and 7.81% discount rate

<table>
<thead>
<tr>
<th>Case</th>
<th>Transmission Cost ($M/yr)</th>
<th>Total Benefits</th>
<th>Net Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunrise + South Bay Repower (ED7)</td>
<td>191</td>
<td>420 594</td>
<td>229 403</td>
</tr>
<tr>
<td>Sunrise</td>
<td>183</td>
<td>327 500</td>
<td>145 318</td>
</tr>
<tr>
<td>TE/VS + LEAPS + Green Path</td>
<td>140</td>
<td>271 394</td>
<td>131 254</td>
</tr>
<tr>
<td>Sunrise + South Bay Repower + Green Path (ED8)</td>
<td>221</td>
<td>415 589</td>
<td>194 368</td>
</tr>
<tr>
<td>South Bay Repower</td>
<td>8</td>
<td>112 112</td>
<td>104 104</td>
</tr>
<tr>
<td>TE/VS + Green Path (ED2)</td>
<td>140</td>
<td>218 342</td>
<td>78 202</td>
</tr>
<tr>
<td>Sunrise + Green Path (ED9)</td>
<td>212</td>
<td>334 508</td>
<td>122 296</td>
</tr>
<tr>
<td>Sunrise + TE/VS + LEAPS (ED5)</td>
<td>293</td>
<td>356 518</td>
<td>63 225</td>
</tr>
<tr>
<td>Sunrise + TE/VS (ED3)</td>
<td>293</td>
<td>301 473</td>
<td>8 180</td>
</tr>
<tr>
<td>TE/VS + LEAPS</td>
<td>111</td>
<td>85 85</td>
<td>(26) (26)</td>
</tr>
<tr>
<td>Sunrise + TE/VS + LEAPS + Green Path (ED6)</td>
<td>323</td>
<td>371 546</td>
<td>48 223</td>
</tr>
<tr>
<td>TE/VS (ED1)</td>
<td>111</td>
<td>20 20</td>
<td>(91) (91)</td>
</tr>
<tr>
<td>Sunrise + TE/VS + Green Path (ED4)</td>
<td>323</td>
<td>301 475</td>
<td>(22) 152</td>
</tr>
<tr>
<td>DEIR/EIS Alternative 4</td>
<td>164</td>
<td>319 484</td>
<td>155 320</td>
</tr>
<tr>
<td>DEIR/EIS Alternative 5</td>
<td>306</td>
<td>319 484</td>
<td>13 178</td>
</tr>
<tr>
<td>SDG&amp;E Enhanced Northern Route</td>
<td>184</td>
<td>327 500</td>
<td>143 316</td>
</tr>
</tbody>
</table>

Differences may exist due to rounding

Q. Does Phase 2 Rebuttal Table 1 incorporate any other changes?

A. Yes, the CAISO has added a row for SDG&E’s Enhanced Northern Route. Similar to the assumption made for DEIR/EIS Alternatives 4 and 5 in the CAISO’s Phase 2 direct testimony, the CAISO has assumed that the benefits of
the Enhanced Northern Route are the same as the Sunrise route. The CAISO has also corrected its estimated project costs to conform to SDG&E’s Phase 2 direct testimony.

Q. Please describe the adjustments the CAISO made to the cost of Sunrise.

A. The direct cost of Sunrise increased from $1,015 million ($2010) to $1,518 ($2011). The CAISO updated the levelization term from 41 years to 58 years and Weighted Average Cost of Capital (WACC) from 8.23% to 7.81% to be consistent with SDG&E’s FERC Offer of Settlement. The Revenue Requirement Multiplier changed from 1.68 to 1.41 and the Levelization Factor changed from 8.6% to 7.9%, based on the updated term, discount rate, and to be consistent with SDG&E’s revenue requirement models. The resulting levelized cost equals $182.5 million ($2010), including mitigation, O&M, working capital and franchise fees and uncollectibles (FFU). Previously, the levelized Revenue Requirement was $173.4 million ($2010).

Q. Has the CAISO updated costs for Green Path North and South Bay?

A. Yes. The CAISO updated the South Bay levelization factor and Revenue Requirement Multiplier to be consistent with Sunrise. The direct costs were not changed. The updated levelized revenue requirement for South Bay is $8.4 million ($2010). Previously, the levelized Revenue Requirement was $9.3 million ($2010). The levelized revenue requirement for Green Path is $29.9 million ($2010). Previously, the levelized Revenue Requirement was $33.2 million ($2010).
Q. Has the CAISO updated costs for TE/VS?

A. Yes. The direct cost of TE/VS has been increased from $722 million ($2012) to $968 million ($2012). A mitigation cost of $124 million, in $2012, was added. The levelization term changed from 41 years to 58 years and WACC changed from 8.23% to 7.81%. Using 58 years and a WACC of 7.81%, the levelized Revenue Requirement, including Mitigation, O&M, working capital and FFU, equals $110.5 million ($2010). Previously, the levelized Revenue Requirement was $94.3 million ($2010).

Q. Has the CAISO updated costs for the environmentally superior southern route (DEIR/EIS Alternative 4)?

A. Yes. The direct cost of DEIR/EIS Alternative 4 decreased from $1,514 million ($2012) to $1,502 million ($2012). The Mitigation cost of $155 million, in $2012, did not change. Using 58 years and a WACC of 7.81%, the levelized Revenue Requirement, including Mitigation, O&M, working capital and FFU, equals $164.2 million ($2010). Previously, the levelized Revenue Requirement was $217.7 million ($2010).
Q. Has the CAISO updated costs for the environmentally superior northern route (DEIR/EIS Alternative 5)?
A. Yes. The direct cost of DEIR/EIS Alternative 5 decreased from $2,978 million ($2012) to $2,968 million ($2012). Using 58 years and a WACC of 7.81%, the levelized Revenue Requirement, including Mitigation, O&M, working capital and FFU, equals $305.9 million ($2010). Previously, the levelized Revenue Requirement was $414.6 million ($2010).

Q. Why was the SDG&E Enhanced Northern Route added to the CAISO’s analysis?
A. The Enhanced Northern Route was added to the analysis to reflect SDG&E’s Phase 2 direct testimony. Mr. Sparks provides additional testimony about the Enhanced Northern Route.

Q. What are the costs related to the Enhanced Northern Route?
A. As provided by SDG&E, the direct cost of the Enhanced Northern Route is $1,532 million ($2011) and Mitigation Cost is $191 million ($2011). Using 58 years and a WACC of 7.81%, the levelized Revenue Requirement, including Mitigation, O&M, working capital and FFU, equals $183.7 million ($2010), or $192.9 million ($2011).

Q. Please provide a summary of these project costs.
A. Phase 2 Rebuttal Table 2 below summarizes the results associated with adjusting the costs.
Phase 2 Rebuttal Table 2: Project Cost Estimates

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Cost incl AFUDC ($M)</td>
<td>1,518</td>
<td>63</td>
<td>400</td>
<td>968</td>
<td>1,502</td>
<td>2,968</td>
</tr>
<tr>
<td>Costs in $2010 ($M)</td>
<td>1,446</td>
<td>75</td>
<td>472</td>
<td>878</td>
<td>1,362</td>
<td>2,692</td>
</tr>
<tr>
<td>Mitigation or interconnection ($M)</td>
<td>199</td>
<td>124</td>
<td>155</td>
<td>198</td>
<td>191</td>
<td></td>
</tr>
<tr>
<td>Costs expressed in year X dollars</td>
<td>2011</td>
<td>-</td>
<td>-</td>
<td>112</td>
<td>140</td>
<td>180</td>
</tr>
<tr>
<td>Costs in $2010 ($M)</td>
<td>190</td>
<td>-</td>
<td>-</td>
<td>112</td>
<td>140</td>
<td>180</td>
</tr>
<tr>
<td>Total Cost (2010$M)</td>
<td>1,636</td>
<td>75</td>
<td>472</td>
<td>990</td>
<td>1,503</td>
<td>2,872</td>
</tr>
<tr>
<td>Share included for TAC customers</td>
<td>100.0%</td>
<td>100.0%</td>
<td>56.7%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Total TAC Cost (2010$M)</td>
<td>1,636</td>
<td>75</td>
<td>268</td>
<td>990</td>
<td>1,503</td>
<td>2,872</td>
</tr>
<tr>
<td>Revenue Requirement Multiplier</td>
<td>1.41</td>
<td>1.41</td>
<td>1.41</td>
<td>1.41</td>
<td>1.38</td>
<td>1.35</td>
</tr>
<tr>
<td>TAC PV Revenue Requirement ($M)</td>
<td>2,307</td>
<td>106</td>
<td>378</td>
<td>1,397</td>
<td>2,076</td>
<td>3,866</td>
</tr>
<tr>
<td>Levelization Factor (7.81%, 58 yrs)</td>
<td>7.9%</td>
<td>7.9%</td>
<td>7.9%</td>
<td>7.9%</td>
<td>7.9%</td>
<td>7.9%</td>
</tr>
<tr>
<td>Levelized Cost (2010$M/yr)</td>
<td>182.5</td>
<td>8.4</td>
<td>29.9</td>
<td>110.5</td>
<td>164.2</td>
<td>305.9</td>
</tr>
</tbody>
</table>

A1: Tables 3.2 and 11.5. Table 11.5 figures are inclusive of mitigation costs.
B1: Cost of transmission from CAISO March 1, 2007 Filing
C1: April 20 GPN Cost. 1/4/07 note from LADWP
D1: Tables 3.2 and 11.5, and CAISO DR3-28-08 Part2. $1.7 billion Associated Cost excluded.
E1: Confidential Attachment 3-4 dated 3/24/08. Includes Coastal Link System Upgrade.
F1: Confidential Attachment 3-4 dated 3/24/08. Includes Coastal Link System Upgrade.
G1: Tables 3.2 and 11.5. Table 11.5 figures are inclusive of mitigation costs.

Line 3: Line 1 adjusted to 2010 by Handy-Whitman escalation factors:
2006-7: 3% 2007-8: 5% 2008-9: 6% 2009-10: 3% 2010-1: 5% 2011-2: 5%

Line 4 and Line 5: Table 3.2
D4: SDG&E and SCE interconnection costs not included.
Line 6: Line 4 adjusted to 2010 by Handy-Whitman escalation factors.
Line 7: Line 3 + Line 6
C8: 56.7% is the CAISO's estimate of the percentage of the GPN capacity that would be available for transportation of renewables for parties other than LADWP, SCPPA, or IID.

Line 9: Line 7 * Line 8
Line 10: Revenue requirement multiplier = (PVRR/capital cost).
Column A,E,F,G PVRR calculated from SDG&E Revenue Requirement models.
Columns B,C,D use Sunrise multiplier because revenue requirements model not available for these costs.
Line 12: Levelization factor for 58 years, using 7.81% discount rate
Line 13: Columns A, E, F, G are calculated 58-yr results from SDG&E revenue requirements models.
Columns B,C,D are Line 11 * Line 12 (No SDG&E revenue requirements model for these costs).

Levelized cost does not include RMR, Consumer Energy or Capital Replacement costs.

Q. What impact has the cost updates and other input assumption changes described above had on the cost-effectiveness of Sunrise?

A. Similar to the analysis described in my Phase 2 direct testimony, the CAISO’s updated analysis demonstrates that Sunrise still has positive levelized net benefits and remains cost effective.
Q. How does Sunrise compare to TE/VS, TE/VS + LEAPS, DEIR/EIS Alternatives 4 and 5 and the Enhanced Northern Route?

A. Phase 2 Rebuttal Table 1 above shows that the use of SDG&E’s updated costs still result in substantial positive net benefits for Sunrise, the DEIR/EIS Alternative 4 and SDG&E’s Enhanced Northern Route. All three of these alternatives now are expected to produce between 143 and 155 million dollars per year of net benefits under the conservative Base Case RPS assumptions. The higher cost DEIR/EIS Alternative 5 has an estimated 13 million dollars per year of net benefits under the conservative Base Case RPS assumptions. The TE/VS (ED1) alternative costs approximately 91 million dollars per year more than its estimated benefits and TE/VS + LEAPS is estimated to cost approximately 26 million more per year than its benefits.

Q. Does this conclude your Phase 2 rebuttal testimony?

A. Yes, it does.
CERTIFICATE OF SERVICE

I hereby certify that I have served, by electronic and United States mail, a copy of the foregoing Phase 2 Rebuttal Testimony of Dr. Ren Orans on Behalf of The California Independent System Operator to each party in Docket No. A.06-08-010.

Executed on March 28, 2008 at Folsom, California.

/s Susan L. Montana
Susan L. Montana
An Employee of the California Independent System Operator
NANCY PARINELLO  
PO BOX 516  
JULIAN, CA 92036-0516  
nparinello@gmail.com

PETER SCHULTZ  
OLD JULIAN CO.  
PO BOX 2269  
RAMONA, CA 92065  
oldjulianco@integrity.com

S. NANCY WHANG  
MANATT, PHELPS & PHILLIPS, LLP  
11355 WEST OLYMPIC BLVD.  
LOS ANGELES, CA 90064  
nwhang@manatt.com

PATRICIA GUERRERO  
LATHAM & WATKINS  
600 WEST BROADWAY, SUITE 1800  
SAN DIEGO, CA 92101-3375  
patricia.guerrero@lw.com

PAUL G. SCHEUERMAN  
SHEUERMAN CONSULTING  
3915 RAWHIDE RD.  
ROCKLIN, CA 95677  
PGS@IEEE.org

PHILIPPE AUCLAIR  
11 RUSSELL COURT  
WALNUT CREEK, CA 94598  
phil@auclairconsulting.com

MICHAEL PAGE  
17449 OAK HOLLOW ROAD  
RAMONA, CA 92065-6758  
oakhollowranch@wildblue.net

PAT/ALBERT BIANEZ  
1223 ARMSTRONG CIRCLE  
ESCONDIDO, CA 92027  
patricia_fallon@sbcglobal.net

PAUL C. LACOURCIERE  
THELEN REID BROWN RAYSMAN & STEINER  
101 SECOND STREET, SUITE 1800  
SAN FRANCISCO, CA 94105  
placourciere@thelenreid.com

PETER V. ALLEN  
THELEN REID BROWN RAYSMAN & STEINER  
101 SECOND STREET, SUITE 1800  
SAN FRANCISCO, CA 94105-3606  
pvallen@thelen.com

PAM WHALEN  
24444 RUTHERFORD ROAD  
RAMONA, CA 92065  
pwhalen2@cox.net

RANDY S. HOWARD  
LOS ANGELES DEPT. OF WATER AND POWER  
111 NORTH HOPE STREET, ROOM 921  
LOS ANGELES, CA 90012  
randy.howard@ladwp.com

BRETT L. BROWN  
THELEN REID BROWN RAYSMAN & STEINER  
101 SECOND STREET, SUITE 1800  
SAN FRANCISCO, CA 94105  
brett_brown@thelenreid.com

QUINN EASTMAN  
NORTH COUNTY TIMES  
207 E. PENNSYLVANIA AVE  
ESCONDIDO, CA 92025  
QEastman@nctimes.com

PETER V. ALLEN  
THELEN REID BROWN RAYSMAN & STEINER  
101 SECOND STREET, SUITE 1800  
SAN FRANCISCO, CA 94105-3606  
pvallen@thelen.com

RICHARD W. RAUSHENBUSH  
LATHAM & WATKINS LLP  
505 MONTGOMERY STREET, SUITE 2000  
SAN FRANCISCO, CA 94111  
richard.raushenbush@lw.com

RANDALL W. KEEN  
MANATT, PHELPS & PHILLIPS, LLP  
11355 WEST OLYMPIC BLVD.  
LOS ANGELES, CA 90064  
rkeen@manatt.com

RICHARD LAUCKHART  
GLOBAL ENERGY  
2379 GATEWAY OAKS DRIVE, SUITE 200  
SACRAMENTO, CA 95833  
rlauckhart@globalenergy.com

SARA FELDMAN  
CA STATE PARKS FOUNDATION  
714 W. OLYMPIC BLVD., SUITE 717  
LOS ANGELES, CA 90015  
sara@calparks.org

SCOT MARTIN  
PO BOX 1549  
BORREGO SPRINGS, CA 92004  
scotmartin478@msn.com

SCOTT J. ANDERS  
UNIVERSITY OF SAN DIEGO - LAW  
5998 ALCALA PARK  
SAN DIEGO, CA 92110  
scottanders@sandiego.edu