BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Continue Implementation and Administration of California Renewables Portfolio Standard Program.	Rulemaking 08-08-009 (Filed August 21, 2008)

DRAFT TRANSMISSION RANKING COST REPORT OF SAN DIEGO GAS & ELECTRIC COMPANY (U 902 E) FOR RENEWABLES PORTFOLIO STANDARD PROCUREMENT

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October 1, 2008

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In accordance with the *Amended Scoping Memo and Ruling of Assigned Commissioner Regarding 2009 RPS Procurement Plans*, issued June 20, 2008 in R.06-05-027, and the *Administrative Law Judge's Ruling Regarding Revised Schedule for 2009 RPS Procurement Plans*, issued August 12, 2008 in R.06-05-027, San Diego Gas & Electric Company ("SDG&E") hereby submits its draft 2009 Transmission Ranking Cost Report, attached hereto as Attachment A.

Respectfully submitted this 1st day of October, 2008.

/s/ *Aimee M. Smith*

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ATTACHMENT A

2009 DRAFT TRANSMISSION RANKING COST REPORT

SDG&E

2009 Renewables Transmission Ranking Cost Report
DRAFT

San Diego Gas & Electric Company
8316 Century Park Court
San Diego, CA 92123-1582

Prepared by the SDG&E Transmission Planning Dept.

October 1, 2008

Table of Contents

Executive Summary

This draft version of the Transmission Ranking Cost Report (TRCR) of San Diego Gas & Electric Company (SDG&E) is prepared and filed pursuant to direction provided by the Commission in its Amended Scoping Memo and Ruling of Assigned Commissioner (ACR) Regarding 2009 RPS Procurement Plans issued on June 20, 2008, in R.06-05-027, as modified by the Administrative Law Judge's Ruling Regarding Revised Schedule for the 2009 RPS Procurement Plans issued on August 12, 2008.

SDG&E's TRCR is prepared in accordance with the Commission's methodology for identifying and estimating conceptual transmission costs, as set forth in D.04-06-013 and D.05-07-040. The TRCR provides estimated transmission cost ranking information for transmission system improvements needed to integrate renewable energy projects into the SDG&E transmission system. The estimated cost information is based upon conceptual studies of proposed renewable additions modeled according to the Commission's methodology. The rankings are for renewable energy developers that provided bid solicitation information in compliance with the 2009 draft TRCR.

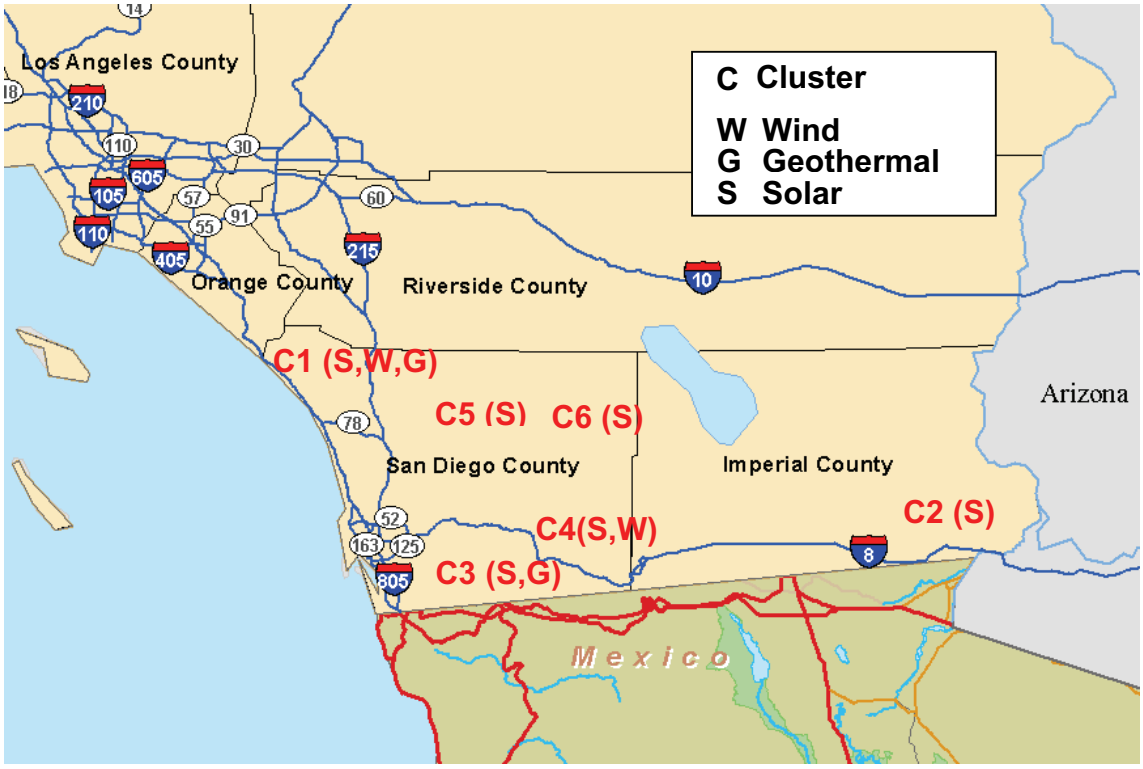
In August, 2008, SDG&E requested potential developers of renewable energy projects to provide information concerning the projects that they would like SDG&E to consider for delivery into and out of the SDG&E service territory. In response to that request, respondents submitted 30 projects for consideration. One project did not meet the minimum parameters for minimum MW and was excluded from SDG&E's analysis. The remaining 29 potential projects were organized into six geographic clusters as summarized in Figure 1. Excluding respondents from this study does not prevent them from participating in the RPS process or seeking interconnection to the California Independent System Operator (CAISO) grid.

The interconnection point for each cluster is designated according to the individual respondent information and the CPUC study methodology. External resources are modeled as interconnected and delivered to the first point of SDG&E's service territory within the CAISO controlled grid. Internal resources are modeled at the first point of interconnection to the CAISO controlled grid within SDG&E. The study assumed that energy from the renewable resource locations identified by each cluster would be delivered at, but not necessarily connected to the following:

- **Cluster 1 (external)**: The 230 kV bus at San Onofre Nuclear Generating Station (SONGS) for generation located north of SONGS
- **Cluster 2 (external)**: At Imperial Valley Substation
  - **Cluster 2A** : The 500 kV bus at Imperial Valley Substation (for generation located east of Imperial Valley Substation)
  - **Cluster 2B** : The 230 kV bus at Imperial Valley Substation (for generation located at the 230 kV Imperial Valley Substation bus)
  - **Cluster 2C** : The 230 kV bus at Imperial Valley Substation (for generation located in the Imperial Irrigation District (IID)
- **Cluster 3 (internal)**: Border 69 kV Substation
- **Cluster 4 (internal)** : Cameron 69 kV Substation
- **Cluster 5 (internal)** : Warner Springs 69 kV Substation
- **Cluster 6 (internal)** : Borrego 69 kV Substation

The map below illustrates the approximate location of the renewable resources. The cluster points (C) indicate the approximate points of delivery.

Figure 1 - Overview of Potential Renewable Projects



Screening level studies were performed to estimate the need for transmission system improvements (within the SDG&E system) to facilitate the interconnection of the prospective projects. All existing special protection schemes (SPS) are included in these studies. Where new generation interconnects to a substation with an existing SPS, re-evaluation of the SPS, to incorporate the new generation, would be required as part of the CAISO generation interconnection study process.

This screening level evaluation does not cover the transmission facilities necessary to connect any single generator to the first point of interconnection with the SDG&E-owned, CAISO-controlled grid, e.g. generation tie lines, breakers, and bays.

Moreover, this general conceptual assessment is made without the benefit of: (a) knowing the outcome of the renewable procurement proceeding, (b) generation project-specific data, (c) performing investigations of power flows, short circuit duties, or any of the other detailed analyses typical of formal interconnection studies, and (d) environmental studies or detail engineering design that would produce more accurate cost estimates. SDG&E's screening evaluation, therefore, will identify a possible transmission concept, but the evaluation results are subject to change following the more detailed technical studies that normally are performed as part of the CAISO interconnection-study process with detailed knowledge of the characteristics, location, and timing of proposed generation facilities. The studies will not evaluate specific routes for any necessary new transmission lines or locations for any necessary new substations, or the environmental impacts of any new or upgraded facilities.

These studies are conceptual, and integration of such a large amount of renewable generation would require detailed studies with operational considerations, in order to identify a more realistic list of required upgrades and cost estimates.

For purposes of this study transmission upgrades and their associated cost estimates were based on a 2012 power flow analysis. The base case used includes SDG&E's CAISO approved expansion projects for 2009 through 2012, one additional 500 kV transmission line (Sunrise Powerlink project) and then looping the existing 500kV South West Power Link (SWPL) into a new 500/230/69 kV substation in east county between Imperial Valley substation and Miguel substation. Without a new 500 kV transmission line out of the Imperial Valley area the amount of new generation that can be integrated and dispatched simultaneously is limited. All planned generation in SDG&E's territory that have power purchase agreements were modeled with their upgrades, but not necessarily dispatched in the cases. The generation projects include 300 MW at Imperial Valley 230 kV with a third 500/230 kV bank at Imperial Valley, 200 MW at the new substation between Imperial Valley and Miguel Substations, 99 MW at Pala 69 kV, 50 MW at Margarita 138 kV, and 27 MW at Border 69 kV with upgrades for transmission line TL 649 and the inclusion of possible tripping as part of the existing Border 69 kV generation Special Protection System (SPS).

This screening level study identifies upgrades for overloads during normal operation, and following outages of any single element (an "N-1 contingency"). This study does not evaluate transmission system improvements needed to deliver the output (of the renewable resources) to

the SDG&E system from the areas external to SDG&E service territory. There is no accounting of impacts on transmission systems other than SDG&E's.

The results of the transmission cost ranking study are summarized in Table 1. The conceptual costs are in millions of dollars, and estimates reflect the estimated capital investment needed to upgrade the transmission system to accommodate delivery of the output from the proposed renewable resources. Without the Sunrise Powerlink levels of dispatchable MWs in Table 1 are dependent on an existing SPS that trips up to 1150 MW of Imperial Valley area generation for a single contingency. Studies to modify/reconfigure existing SPS' are conducted as part of operational studies in coordination with the CAISO as transmission and generation are built. Table 1 also contains an estimate of carrying costs reflecting the CAISO transmission customer's Levelized Annual Capital Cost (LACC). The LACC is a uniform nominal-dollar cost stream whose present value is equal to that of the annual revenue requirements associated with the asset or assets. The MW levels within each cluster in the table are defined later in this report (Study Assumptions Case Parameters) and are consistent with the renewable applicant responses.

This report does not attempt to quantify power plant production costs, impacts on economics, or congestion management costs. The cost estimates in Table 1 are only to evaluate and compare the estimated transmission component of the RPS bids against each other and do not reflect the actual interconnection cost of connecting a renewable resource to the grid.

Operational and technical issues associated with integration of renewable resources, including known problems such as voltage control, instability, operating intermittency, and spinning reserve requirements must be considered when the interconnection studies are performed.

Table 1 - Transmission Cost Ranking Summary[1]

Cluster	Level	MW	Upgrades	Cost (Million)	Carrying Charge* (Million)
C1 ** SONGS	1	0 - 2399	None	$0.0	$0.0
		≥2400	Maximum Limit (Violation of maximum limit of WECC Path 44)	N/A	N/A
C2A IV 500 kV	1	0 - 200	None	$0.0	$0.0
	2	201-2000	Add 500/230kV transformer	$72.5	$8.3
C2B IV 230 kV (IV sub)	1	0 - 200	Bay position for 1st 230kV gen-tie	$2.9	$0.3
	2	201-450	Add 500/230kV transformer	$72.5	$8.3
	3	451-900	Bay position for 2nd 230kV gen-tie	$2.6	$0.3
	4	901-1250	Bay position for 3rd 230kV gen-tie	$10.5	$1.2
C2C IV 230 kV (from IID)	1	0 - 200	None	$0.0	$0.0
C3 Border Sub	1	0-15	Bay position for 1st 69 kV gen-tie	$5.3	$0.6
C4 Cameron Sub	1	0-20	Bay position for 1st 69 kV gen-tie	$0.8	$0.1
C5 Warners Sub	1	0-20	Bay position for 1st 69 kV gen-tie	$1.2	$0.1
C6 Borrego Sub	1	0-26	Bay position for 1st 69 kV gen-tie	$6.6	$0.8
	2	27-75	Upgrade 69 kV transmission lines	$125.5	$14.3

* Carrying Charge assumed 11.43% estimated LACC

** Simultaneously delivering 2400 MW of renewable from SONGS into the SDG&E system may not be a realistic operational scenario and could require transmission system upgrades outside SDG&E's transmission system. These issues would need to be studied in detail through the CAISO's interconnection process.

Clusters show stand-alone costs based on studies with proposed generation within its respective cluster. Clusters 2A and 2B have one common upgrade beyond the initial substation where the clusters were modeled. This upgrade is an additional 500/230 kV bank. Depending on the sequencing of generator additions at clusters 2A and 2B, this upgrade will be attributed to generators at one cluster or the other, but not at both.

At generation levels less than 2400 MW, Cluster 1 did not show upgrades for full dispatchability. However at 2400 MW (or more), of generation, Cluster 1 violated the Western Electricity Coordinating Council (WECC) Path 44 (South of SONGS) normal rating. Path re-rating studies are outside of the scope of this screening level study.

The cost estimates in this report are conceptual and do not establish the ultimate cost of connecting a renewable resource to the grid. As previously stated, the reported cost estimates will be used solely to evaluate the estimated transmission component of the bids against each other and are not representative of actual transmission upgrade costs. The estimates in this Report were not calculated for any other purpose and cannot be relied on for any other purpose. Additionally, the implied in-service dates for the transmission upgrades may not be achievable. Completion of identified transmission upgrades is dependent on many factors including permitting requirements and realistic construction schedules. However, potential RPS bidders should use the information regarding transmission upgrades in developing bid responses to SDG&E's RPS procurement solicitations.

1. All costs are based on conceptual estimates in year-of-expenditure dollars without Allowance for Funds Used During Construction (AFUDC).

Renewable projects desiring more detailed transmission upgrade and associated cost information are encouraged to participate in the CAISO interconnection process which will result in performing the appropriate detailed interconnection studies.

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Introduction

This screening level study examines the impacts on the SDG&E transmission network from integration of the potential renewable generation identified through SDG&E's Solicitation in August, 2008, in order to fulfill SDG&E's RPS-related obligations. These studies are cursory in nature and are intended only to identify the estimated transmission costs associated with adding new renewable generation from this TRCR solicitation.

Set forth below is an analysis of RPS-eligible renewable generation resources. SDG&E continues to use the Methodology for Development and Consideration of Transmission Costs in Initial Renewable Portfolio Standard Procurement (Interim Methodology) adopted in D.04-06-013 (s*ee*, D.04-06-013, *mimeo*, Attachment A), as modified by D.05-07-040. SDG&E's TRCR reflects data regarding potential renewable energy bidders provided in response to SDG&E's solicitation, which was performed in accordance with the ACR (the "Solicitation"). (*See*, ACR, Attachment D).

Study Objectives

The objectives of the study are to:

(1) Investigate the transmission system impacts of injecting energy from renewable resources into the SDG&E system at various locations,

(2) Identify potential transmission upgrades/expansion necessary to integrate the resources into the SDG&E system,

(3) Provide conceptual cost estimates associated with the transmission upgrades/expansion and,

(4) Address and discuss other issues associated with construction of the new facilities that may ultimately impact the transmission plan of service and cost.

The study focuses on identifying the magnitude of potential transmission upgrades and estimated costs as appropriate, and on identifying critical issues that might affect the development of those facilities. The scope and cost estimates of potential new transmission facilities or upgrades can only be as detailed as the resource development information that has been collected in the time frame allowed, and will be further dependent upon the order and timing of actual interconnections sought by developers of renewable energy projects.

The study delineates a set of system upgrades related to renewable resource development with various in-service dates, based on the geographic location and magnitude of resource provided by renewable developers during SDG&E's Solicitation.

Again, this is a screening level study and the results should only be used to estimate the transmission cost component for ranking purposes during RPS bid solicitation.

Applicability of Study

These screening level evaluations do not constitute Interconnection Studies under the CAISO Tariff on file with the Federal Energy Regulatory Commission (FERC), as modified or superseded from time to time. Any developer seeking interconnection to the CAISO controlled grid will have to submit an Interconnection Request to the CAISO. This requirement includes any developer whose RPS bid is accepted, based on the transmission cost estimates developed through this process that later seeks interconnection, or seeks to increase its generating capacity to make its RPS deliveries. Interconnection Studies required by the CAISO Tariff must be conducted based on the then-existing CAISO Controlled Grid Generation interconnection process. The final interconnection facilities, costs, and construction schedule for any developer resulting from an Interconnection Request to the CAISO may differ significantly from the transmission facilities, cost estimates, and implied construction schedule developed through this solicitation. Therefore, the conceptual cost estimates developed in this TRCR should not be relied upon to establish the actual cost of interconnection to the grid.

Study Assumptions

Case Parameters

This study assumes that each renewable resource connected in response to SDG&E's renewable solicitation would operate in accordance with existing and anticipated WECC/NERC path ratings, internal system operating limitations, and existing and anticipated SDG&E import capabilities and operating procedures.

The assessment covers transmission Network Upgrades designed to deliver energy from the first point of interconnection of the renewable resources to the SDG&E transmission system. Interconnection Facilities[2] or gen-ties are not included, but where deemed necessary, facility costs are estimated to integrate the renewable project(s) with the presumed point of interconnection. Transmission cost estimates are based on proxy facilities that could mitigate the identified potential overloads due to the addition of renewable resources, for normal operation and single contingency conditions. The studies do not include the impact on voltage profiles or any cost associated with voltage control and reactive power planning.

2 As defined in the CAISO FERC Electric Tariff Third Replacement Volume No, II "Interconnection Facilities are the TO's Interconnection Facilities and the Interconnection Customer's Interconnection Facilities. Collectively, Interconnection Facilities include all facilities and equipment between the Generating Facility and the Point of Interconnection, including any modification, additions or upgrades that are necessary to physically and electrically interconnect the Generating Facility to the ISO Controlled Grid. Interconnection Facilities are sole use facilities and shall not include Distribution Upgrades, Stand Alone Network Upgrades or Network Upgrades."

The power flow analysis utilized the current WECC approved GE PSLF load-flow program, Version 16, with the following assumptions:

- A 90/10 load forecast for SDG&E's service territory.
- An SDG&E import level of approximately 4000 MW in the 2012 heavy summer cases.
- A 2012 heavy summer season grid planning power flow case from the 2008 Grid Assessment and Expansion Study.
    - The base case used includes SDG&E's CAISO approved expansion projects for 2009 through 2012, one additional 500 kV transmission line (Sunrise Powerlink project) and then looping the existing SWPL 500 kV line into a new 500/230/69 kV substation in east county between the Imperial Valley substation and Miguel substation. Without a new 500 kV transmission line out of the Imperial Valley area the amount of new generation that would be allowed to be interconnected and/or dispatched simultaneously is limited.
    - All SDG&E projects and generation approved in the CAISO 2007 Grid Assessment study for SDG&E were modeled, but not necessarily dispatched in the cases.
    - All planned generation in SDG&E's territory (and their associated transmission upgrades) that have power purchase agreements were modeled, but not necessarily dispatched in the cases, include the following:
        - 300 MW at Imperial Valley 230 kV with a third 500/230 kV bank at Imperial Valley
        - 200 MW at the new substation between Imperial Valley and Miguel Substations
        - 99 MW at Pala 69 kV
        - 50 MW at Margarita 138 kV
        - 27 MW at Border 69 kV with upgrades for transmission line 649 and inclusion of possible tripping as part of the Border 69 kV generation SPS

Planning Horizon

Responses to SDG&E's Solicitation varied in type of resource capacity, type of renewable resources, and location. All generation in this screening study was modeled in 2012 for the best fit/least cost comparison. Most projects have an in-service date prior to summer 2012. Two projects have a 2013 in service date and one project has a 2014 in service date.

Cluster Development

In response to the Solicitation, respondents submitted 30 projects for consideration. One project did not meet the minimum parameters due to the minimum size requirement and was excluded from SDG&E's TRCR analysis. (Excluding respondents from this study does not prevent them from participating in the RPS process or seeking interconnection to the CAISO system).

SDG&E's TRCR includes conceptual transmission cost estimates for the following types of potential renewable energy bidders, which are assumed to be dispatched as if delivered into the SDG&E service territory. This approach allows for the determination of SDG&E system upgrades and is not intended to determine or constrict the business plan of various respondents.

- **SDG&E Internal** Renewable energy resources for which the first point of interconnection with the transmission grid is, or will be, at a facility inside SDG&E service area and whose output is expected to be sold to SDG&E.
- **SDG&E Export** Renewable energy resources for which the first point of interconnection with the transmission grid is, or will be, at a facility owned by SDG&E and whose output is expected to be sold to a different entity.
- **SDG&E External** Renewable energy resources located outside of the SDG&E service area, for which the project developer has indicated that it anticipates submitting an RPS bid to SDG&E.

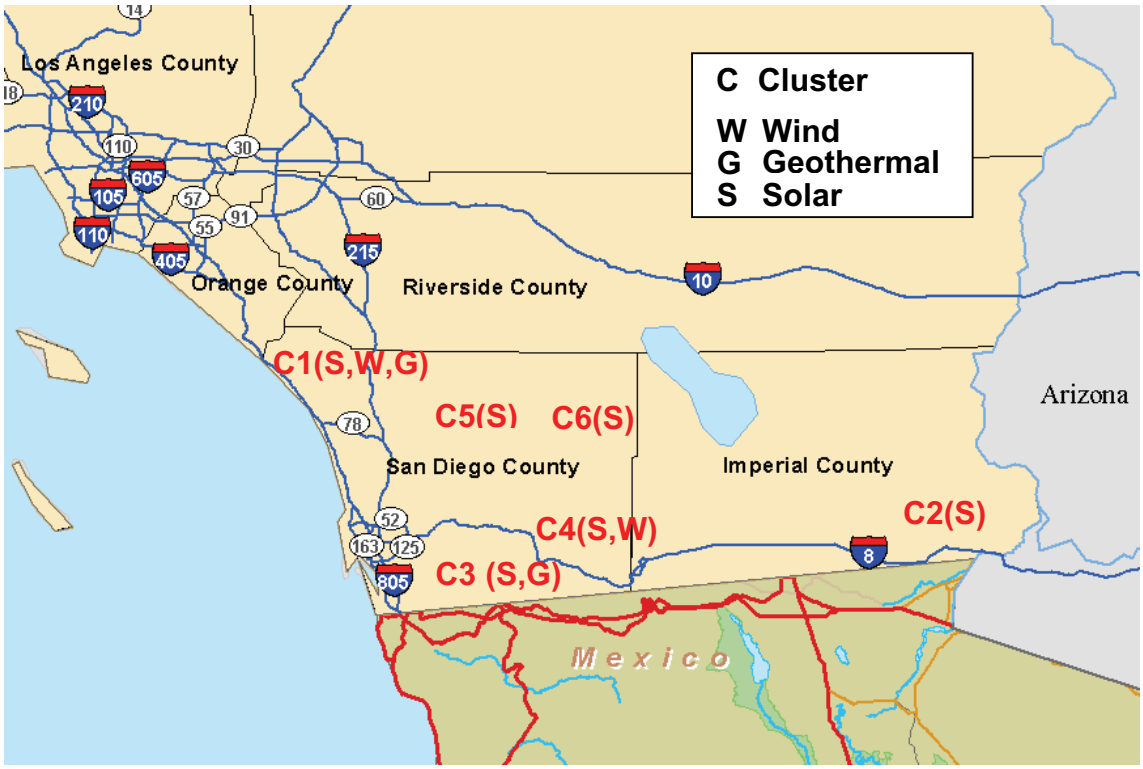
All respondents in this 2009 study are in either the SDG&E Internal or the SDG&E External categories. No respondents are in the SDG&E Export category.

SDG&E divided 29 renewable energy bidders into clusters, based on locations both geographically as shown in Figure 2 and electrically as summarized in Table 2, to which the identified renewable resources would most likely interconnect. If the renewable resource's first point of interconnection is at a substation or bus not owned by SDG&E, that renewable resource will be treated as part or all of a cluster, beginning at the first point where such added generation would reach the SDG&E's transmission system. Table 2 shows the details of the clusters.

Table 2 - Renewable Energy Cluster Details (MW)

Cluster	Location	Interconnection Point	Total MW
C1 (external)	North of SDG&E	San Onofre 230 kV	7035 MW
C2A (external)	East of SDG&E	Imperial Valley 500 kV	1960 MW
C2B (external)	East of SDG&E	Imperial Valley 230 kV	1206 MW
C2C (external)	IID	Imperial Valley 230 kV	170 MW
C3 (internal)	SDG&E	Border 69 kV	15 MW
C4 (internal)	SDG&E	Cameron 69 kV	20 MW
C5 (internal)	SDG&E	Warner Springs 69 kV	20 MW
C6 (internal)	SDG&E	Borrego 69 kV	75 MW

Figure 2 – Geographic Overview of Potential Renewable Projects



Three types of renewable energy generation responded to the Solicitation:

- Wind,
- Geothermal
- Solar

Table 3 summarizes the capacity and type of renewable energy proposals considered in the Transmission Ranking Cost Report.

Table 3 - SDG&E Renewable Energy Capacity (MW) Considered in the TRCR

Renewable Resorce	SDG&E Internal MW	SDG&E External MW	Total MW
Wind	0 MW	4500 MW	4500 MW
Geothermal	0 MW	185 MW	185 MW
Solar	130 MW	5686 MW	5816 MW
Total	130 MW	10371 MW	10501 MW

Note that the CAISO queued generation is not included in the renewable resources considered in the TRCR unless the planned generation has a power purchase agreement as described in the Study Assumptions Section.

Incremental Levels of Capacity

The transmission upgrade capacities and estimated transmission costs were divided into the following levels:

- **Level 1** – The available transmission capacity, taking into account all upgrades planned for generation projects in the CAISO interconnection queue with completed System Impact Studies and Facility Studies, which were included in the base case in the utilities' conceptual transmission studies. A third 500/230 kV bank at Imperial Valley, the existing SWPL 500 kV line looped into a new 500/230/69 kV substation in east county between Imperial Valley and Miguel substations, and upgrades for transmission line TL 649 are modeled in the base case, but these are attributable to undeveloped CAISO queued generator projects in or past the System Impact Study phase. If the generation projects are not developed the associated upgrades will not materialize.
- **Levels 2-4** – The transmission capacity available with the lowest cost (or most cost-effective) network upgrade, in addition to upgrades included in Level 1. An additional level will be created for each next-most cost-effective network upgrade.

Results

Summary of Results

SDG&E conducted thermal studies for each cluster, as described above, to determine transmission upgrades required for each level of capacity listed in Table 4.

This screening level study identifies upgrades for overloads during normal system operation and following the outage of any single element. This study does not evaluate transmission system improvements needed to deliver the output (of the renewable resources) to the SDG&E system from the areas external to the SDG&E service territory. There is no accounting of impacts on transmission systems other than SDG&E's.

Based on the results, conceptual transmission cost estimates for integration of the total number of renewable projects were prepared for all clusters except Cluster 1. At 2400 MW of generation, Cluster 1 violated the WECC Path 44 (South of SONGS (SOS)) normal operating limit. The full output delivery/dispatchability study for all of the proposed generation in Cluster 1 would require going through regional planning and the WECC three-phase rating processes for upgrading Path 44. Path re-rating studies are outside of the scope of this screening level study. The Interconnection Facilities costs are not included in the cost estimates in this study. The study assumes that these costs are to be paid by the generation developer.

The results of the transmission cost ranking study are summarized in Table 4. The conceptual costs are in millions of dollars, and are estimated to reflect the capital investment needed for upgrading the transmission system to accommodate integration of the proposed renewable resources. Without the Sunrise Powerlink levels of dispatchable MWs in Table 4 are dependent on an existing SPS that trips up to 1150 MW of Imperial Valley-area generation for a single contingency. Studies to modify/reconfigure existing SPS' are conducted in coordination with the CAISO as part of the normal operational studies. Costs in Table 4 do not include projects from the higher queued generation modeled in the case as described in the Case Assumptions Section.

Finally, Table 4 also contains an estimate of carrying costs reflecting the CAISO transmission customer's Levelized Annual Capital Cost. The LACC is a uniform nominal-dollar cost stream whose present value is equal to that of the annual revenue requirements associated with the asset or assets. The MW levels within each cluster in the table are defined prior in this report (Study Assumptions Case Parameters) and are consistent with the renewable applicant responses.

Table 4 - Transmission Cost Ranking Summary[3]

Cluster	Level	MW	Upgrades	Cost (Million)	Carrying Charge* (Million)
C1 ** SONGS	1	0 - 2399	None	$0.0	$0.0
		≥2400	Maximum Limit (Violation of maximum limit of WECC Path 44)	N/A	N/A
C2A IV 500 kV	1	0 - 200	None	$0.0	$0.0
	2	201-2000	Add 500/230kV transformer	$72.5	$8.3
C2B IV 230 kV (IV sub)	1	0 - 200	Bay position for 1st 230kV gen-tie	$2.9	$0.3
	2	201-450	Add 500/230kV transformer	$72.5	$8.3
	3	451-900	Bay position for 2nd 230kV gen-tie	$2.6	$0.3
	4	901-1250	Bay position for 3rd 230kV gen-tie	$10.5	$1.2
C2C IV 230 kV (from IID)	1	0 - 200	None	$0.0	$0.0
C3 Border Sub	1	0-15	Bay position for 1st 69 kV gen-tie	$5.3	$0.6
C4 Cameron Sub	1	0-20	Bay position for 1st 69 kV gen-tie	$0.8	$0.1
C5 Warners Sub	1	0-20	Bay position for 1st 69 kV gen-tie	$1.2	$0.1
C6 Borrego Sub	1	0-26	Bay position for 1st 69 kV gen-tie	$6.6	$0.8
	2	27-75	Upgrade 69 kV transmission lines	$125.5	$14.3

* Carrying Charge assumed 11.43% estimated LACC

** Simultaneously delivering 2400 MW of renewable from SONGS into the SDG&E system may not be a realistic operational scenario and could require transmission system upgrades outside SDG&E's transmission system. These issues would need to be studied in detail through the CAISO's interconnection process.

The cost estimates in Table 4 are to evaluate the transmission component of RPS bids against each other and do not reflect the actual interconnection cost of connecting a renewable resource to the grid.

Clusters show stand-alone costs based on studies with proposed generation within its respective cluster. Clusters 2A and 2B have one common upgrade beyond the initial substation where the clusters were modeled. This upgrade is an additional 500/230 kV bank. Depending on the sequencing of generator additions at clusters 2A and 2B, this upgrade will be attributed to generators at one cluster or the other, but not at both.

The cost estimates in this report are conceptual and do not establish the ultimate cost of connecting a renewable resource to the grid. The reported cost estimates will be used solely to evaluate the transmission component of RPS bids against each other and may not be representative of actual transmission upgrade costs. The estimates in this report were not calculated for any other purpose and cannot be relied on for any other purpose. Additionally, the implied in-service dates for the transmission upgrades may not be achievable. Completion of identified transmission upgrades is dependent on many factors, including permitting requirements and realistic construction schedules. Potential RPS bidders should use the information regarding transmission upgrades in developing bid responses to SDG&E's RPS procurement solicitations.

3. All costs are based on conceptual estimates in year-of-expenditure dollars without AFUDC.

Renewable projects desiring more detailed transmission upgrade and associated cost information are encouraged to participate in the CAISO interconnection process which will result in appropriate interconnection studies being performed.

Cluster 1 - North of San Onofre Nuclear Generating Station

Total Cluster Size: 7,035 MW

Cluster 1 represents twelve projects, including wind (4,000 MW), geothermal (35 MW) and solar generation (3,000), totaling 7,035 MW. All projects are external to and located north and northeast of SDG&E's service territory. Ten Cluster 1 projects are proposed to be in service by 2012, one 200 MW project by 2013, and one 2,000 MW project by 2014 but all were modeled in 2012 for purposes of this study.

It is notable that the TRCR methodology does not give an accurate flow pattern through the limiting SOS path. The North of SONGS cluster generation, located further north into Southern California Edison Company's (SCE) service territory, could offset local SCE load and would have less impact on southbound SOS flow, allowing for higher dispatch in SCE before reaching the SOS limit. Detailed studies would need to be done with the CAISO, SDG&E and SCE to accurately estimate the upgrades that would be required to deliver a substantial amount of renewables from SONGS.

Plan of Interconnection

Cluster 1 generation was modeled as an import at the San Onofre 230 kV substation, jointly owned by SDG&E and SCE, and this substation is the first point of interconnection to SDG&E's transmission system. It was assumed that this generation would not displace existing generation within SDG&E's transmission system and SDG&E's import level would not be changed. However import flows would shift, with higher import coming south from SCE and less import from the east to SDG&E.

Power Flow Results

Generation from Cluster 1 flows both north to SCE and south to SDG&E. Addition of 2400 MW of Cluster 1 generation causes WECC Path 44 to reach its normal southbound rating of 2200 MW. Detailed studies would need to be done with the CAISO, SDG&E and SCE to accurately estimate the upgrades that would be required to deliver a substantial amount of renewables from SONGS.

Table 5 - Transmission Cost Ranking Summary[4] for Cluster 1

Cluster	Level	MW	Upgrades	Cost (Million)	Carrying Charge* (Million)
C1 ** SONGS	1	0 - 2399	None	$0.0	$0.0
		≥2400	Maximum Limit (Violation of maximum limit of WECC Path 44)	N/A	N/A

* Carrying Charge assumed 11.43% estimated LACC
** Simultaneously delivering 2400 MW of renewable from SONGS into the SDG&E system may not be a realistic operational scenario and could require transmission system upgrades outside SDG&E's transmission system. These issues would need to be studied in detail through the CAISO's interconnection process.

Limitations

The WECC Path 44, SOS, transfer capability is limited to 2,200 MW from north to south, based on flowability on the path under normal conditions. Path re-rating studies is outside of the scope of this screening level study. Limiting generation in Cluster 1 to 2,400 MW eliminates the violation of Path 44's normal rating. However, impacts to SCE's transmission system have not been studied for this TRCR analysis.

4 All costs are based on conceptual estimates in year-of-expenditure dollars without AFUDC.

Cluster 2 - Imperial Valley

Cluster 2 generation was modeled at the Imperial Valley Substation. Three sub-clusters were created to reflect voltage and location differences:

- Cluster 2A represents interconnection to the 500 kV SWPL line and nearby 500 kV substations. This cluster is modeled at the Imperial Valley 500 kV substation bus.
- Cluster 2B generation connects directly to Imperial Valley's 230 kV substation bus.
- Cluster 2C interconnects through IID's service territory and is also modeled at the Imperial Valley 230 kV bus

It was assumed that all of the Cluster 2 generation would not displace existing generation within SDG&E's transmission system and SDG&E's import level would not be changed. However import flows would shift, with less import south from SCE and higher import from the east to SDG&E. These results assume one additional 500 kV transmission line (Sunrise Powerlink project) and looping the existing SWPL 500 kV line into a new 500/230/69 kV substation in east county between Imperial Valley and Miguel substations. Without a new 500 kV transmission line out of the Imperial Valley area the amount of new generation that can be integrated is limited due to the CAISO SPS limit of 1150 MW of generation tripping for a single contingency. All planned generation (and their associated upgrades) in SDG&E's territory that have power purchase agreements were modeled, but not necessarily dispatched in the cases including 300 MW at Imperial Valley 230 kV with a third 500/230 kV bank at Imperial Valley, and 200 MW at the new substation between Imperial Valley and Miguel substations.

All three Imperial Valley area clusters degrade voltages in the SDG&E area. Specifically, transferring large amounts of generation across a long transmission line, Imperial Valley-New Wind Sub-Miguel 500 kV, depresses the voltage at Miguel, which is the receiving end. Considerable diligence was required to maintain the power flow case voltages to the minimally acceptable voltage levels at Miguel substation. Detailed power flow and stability studies in the CAISO process could show the need for additional VAR support for any amount of new generation connected to the Imperial Valley area.

Cluster 2A - Imperial Valley 500 kV

Total Cluster Size: 1,960 MW

Cluster 2A represents five projects of solar generation totaling 1,960 MW. All projects are external to SDG&E's service territory and are located at a 500 kV bus east of Imperial Valley. All Cluster 2A projects are proposed to be in service by 2012.

Plan of Interconnection

Cluster 2A generation was modeled at the Imperial Valley 500 kV substation. It was assumed that this generation would not displace existing generation within SDG&E's transmission system and SDG&E's import level would not be changed. However import flows would shift, with less import south from SCE and higher import from the east to SDG&E.

Power Flow Results

The addition of 200 MW in 2012 caused no violations and required no upgrades, however increasing the generation to 201 MW to 2000 MW caused one new facility overload requiring an upgrade, which would be a 500/230 kV bank.

Table 6 - Transmission Cost Ranking Summary[5] for Cluster 2A

Cluster	Level	MW	Upgrades	Cost (Million)	Carrying Charge* (Million)
C2A IV 500 kV	1	0 - 200	None	$0.0	$0.0
	2	201-2000	Add 500/230kV transformer	$72.5	$8.3

* Carrying Charge assumed 11.43% estimated LACC

Clusters show stand-alone costs based on studies with proposed generation within its respective cluster. Clusters 2A and 2B have one common upgrade beyond the initial substation where the clusters were modeled. This upgrade is an additional 500/230 kV bank. Depending on the sequencing of generator additions at clusters 2A and 2B, this upgrade will be attributed to generators at one cluster or the other, but not at both.

5 All costs are based on conceptual estimates in year-of-expenditure dollars without AFUDC.

Limitations

Without the Sunrise Powerlink levels of dispatchable MW in Table 6 are dependent on an existing SPS that trips up to 1150 MW of Imperial Valley area generation for a single contingency (N-1). Any studies to modify/reconfigure the existing SPS' are conducted as part of the CAISO operational studies.

Potential voltage violations in detailed transient and post transient studies as discussed in Cluster 2, may also limit Cluster 2A generation.

Cluster 2B - Imperial Valley 230 kV (at Imperial Valley)

Total Cluster Size: 1,206 MW

Cluster 2B represents five projects of solar (706 MW) and wind (500 MW) generation totaling 1,206 MW. All projects are external to SDG&E's service territory and are interconnected at the Imperial Valley 230 kV bus. Four Cluster 2B projects are proposed to be in service by 2012 and one 92 MW project by 2013. No significant upgrades are planned in 2013 so all generation was modeled in 2012 for the best fit/least cost comparison.

Plan of Interconnection

Cluster 2B generation was modeled at the Imperial Valley 230 kV substation bus and this study assumed up to 450 MW of generation for each gen-tie position at the 230 kV bus. It was also assumed that this generation would not displace existing generation within SDG&E's transmission system and SDG&E's import level would not be changed. However import flows would shift, with less import south from SCE and higher import from the east to SDG&E.

Power Flow Results

The addition of 200 MW in 2012 caused no violations and required no upgrades beyond the new Imperial Valley 230 kV bus. Increasing the generation to 201 MW to 1,206 MW caused one new facility overload requiring an upgrade, which would be a 500/230 kV bank. The scope of this TRCR cannot determine how many of the five generators will interconnect or if the individual generator owner will share gen-tie positions at the Imperial Valley substation. This study assumed up to 450 MW of generation for each gen-tie position at the 230 kV bus.

Table 7 - Transmission Cost Ranking Summary[6] for Cluster 2B

Cluster	Level	MW	Upgrades	Cost (Million)	Carrying Charge* (Million)
C2B IV 230 kV (IV sub)	1	0 - 200	Bay position for 1st 230kV gen-tie	$2.9	$0.3
	2	201-450	Add 500/230kV transformer	$72.5	$8.3
	3	451-900	Bay position for 2nd 230kV gen-tie	$2.6	$0.3
	4	901-1250	Bay position for 3rd 230kV gen-tie	$10.5	$1.2

* Carrying Charge assumed 11.43% estimated LACC

Clusters show stand-alone costs based on studies with proposed generation within its respective cluster. Clusters 2A and 2B have one common upgrade beyond the initial substation where the clusters were modeled. This upgrade is an additional 500/230 kV bank. Depending on the sequencing of generator additions at clusters 2A and 2B, this upgrade will be attributed to generators at one cluster or the other, but not at both.

6 All costs are based on conceptual estimates in year-of-expenditure dollars without AFUDC.

Limitations

Without the Sunrise Powerlink levels of dispatchable MW in Table 7 are dependent on an existing SPS that trips up to 1150 MW of Imperial Valley area generation for a single contingency. Studies to modify/reconfigure existing SPS' are conducted as part of CAISO operational studies.

Potential voltage violations in detailed transient and post transient studies as discussed in Cluster 2 may also limit Cluster 2B generation.

Cluster 2C - Imperial Valley 230 kV (from IID)

Total Cluster Size: 170 MW

Cluster 2C represents 3 projects of solar (20 MW) and geothermal (150 MW) generation totaling 170 MW. All projects are external to SDG&E's service territory and are located in the Imperial Irrigation District (IID) area. All Cluster 2C projects are proposed to be in service by 2012.

Plan of Interconnection

Cluster 2C generation was modeled at the Imperial Valley 230 kV substation bus. It was assumed that this generation would not displace existing generation within SDG&E's transmission system and SDG&E's import level would not be changed. However import flows would shift, with less import south from SCE and higher import from the east to SDG&E.

Power Flow Results

The addition of 170 MW in 2012 does not cause any facility overloads in SDG&E's transmission system. Therefore, no facility upgrades are required.

Table 8 - Transmission Cost Ranking Summary[7] for Cluster 2C

Cluster	Level	MW	Upgrades	Cost (Million)	Carrying Charge* (Million)
C2C IV 230 kV (from IID)	1	0 - 200	None	$0.0	$0.0

* Carrying Charge assumed 11.43% estimated LACC

Limitations

Without the Sunrise Powerlink levels of dispatchable MW in Table 8 are dependent on an existing SPS that trips up to 1150 MW of Imperial Valley area generation for a single contingency (N-1). Studies to modify/reconfigure existing SPS' are being conducted as part of operational studies in coordination with the CAISO. Potential voltage violations in detailed transient and post transient studies as discussed in Cluster 2 may also limit Cluster 2C generation.

7 All costs are based on conceptual estimates in year-of-expenditure dollars without AFUDC.

Cluster 3 – Border Substation

Total Cluster Size: 15 MW

Cluster 3 represents 1 project of solar generation totaling 15 MW. This project is internal to SDG&E's service territory and connects to the Border 69 kV substation bus. This project is proposed to be in service by 2012.

Plan of Interconnection

Cluster 3 generation was modeled at the Border 69 kV substation bus and this study assumed a gen-tie position at that bus is needed. It was assumed that this generation would displace existing generation within SDG&E's transmission system and SDG&E's import level would not be changed.

All planned generation in SDG&E's territory that have power purchase agreements were modeled, but not necessarily dispatched in the cases including 27 MW at Border 69 kV with upgrades for transmission line TL 649 and inclusion of possible tripping as part of the Border 69 kV generation SPS.

Power Flow Results

The addition of 15 MW in 2012 caused no violations and required no upgrades beyond the new 69 kV bay position for the gen-tie.

Table 9 - Transmission Cost Ranking Summary[8] for Cluster 3

Cluster	Level	MW	Upgrades	Cost (Million)	Carrying Charge* (Million)
C3 Border Sub	1	0-15	Bay position for 1st 69 kV gen-tie	$5.3	$0.6

* Carrying Charge assumed 11.43% estimated LACC

Limitations

If the 27 MW CAISO queued generation project does not upgrade transmission line TL 649, then Cluster 3 could be responsible for the upgrade of this line.

It is possible that the CAISO may include Cluster 3 generation as part of the Border 69 kV generation SPS.

8 All costs are based on conceptual estimates in year-of-expenditure dollars without AFUDC.

Cluster 4 - Cameron Substation

Total Cluster Size: 20 MW

Cluster 4 represents one 20 MW solar generation project. This project is internal to SDG&E's service territory and connects to the Cameron 69 kV substation bus. The project is proposed to be in service by 2012.

Plan of Interconnection

Cluster 4 generation was modeled at the Cameron 69 kV substation bus and this study assumed a gen-tie position at the 69 kV bus is needed. It was assumed that this generation would displace existing generation within SDG&E's transmission system and SDG&E's import level would not be changed.

Power Flow Results

The addition of 20 MW in 2012 caused no violations and required no upgrades beyond the new 69 kV bay position for the gen-tie.

Table 10 - Transmission Cost Ranking Summary[9] for Cluster 4

Cluster	Level	MW	Upgrades	Cost (Million)	Carrying Charge* (Million)
C4 Cameron Sub	1	0-20	Bay position for 1st 69 kV gen-tie	$0.8	$0.1

* Carrying Charge assumed 11.43% estimated LACC

Limitations

No limitations are expected.

9 All costs are based on conceptual estimates in year-of-expenditure dollars without AFUDC.

Cluster 5 - Warners Substation

Total Cluster Size: 20 MW

Cluster 5 also represents one 20 MW solar generation project. This project is internal to SDG&E's service territory and connects to the Warners 69 kV substation bus. The project is proposed to be in service by 2012.

Plan of Interconnection

Cluster 5 generation was modeled at the Warners 69 kV substation bus and this study assumed a gen-tie position at the 69 kV bus is needed. It was assumed that this generation would displace existing generation within SDG&E's transmission system and SDG&E's import level would not be changed.

Power Flow Results

The addition of 20 MW in 2012 caused no violations and required no upgrades beyond the new 69 kV bay position for the gen-tie.

Table 11 - Transmission Cost Ranking Summary[10] for Cluster 5

Cluster	Level	MW	Upgrades	Cost (Million)	Carrying Charge* (Million)
C5 Warners Sub	1	0-20	Bay position for 1st 69 kV gen-tie	$1.2	$0.1

* Carrying Charge assumed 11.43% estimated LACC

Limitations

No limitations are expected.

10 All costs are based on conceptual estimates in year-of-expenditure dollars without AFUDC.

Cluster 6 - Borrego Substation

Total Cluster Size: 75 MW

Cluster 6 represents one 75 MW solar generation project. This project is internal to SDG&E's service territory and connects at Borrego substation. The project is proposed to be in service by 2012.

Plan of Interconnection

Cluster 6 generation was modeled at the 69 kV Borrego substation but Borrego is a radially fed 69/12 kV substation and does not have a 69 kV bus. Therefore, the substation would need to be expanded and a new 69 kV bus would be required to interconnect the gen-tie. It was assumed that this generation would displace existing generation within SDG&E's transmission system and SDG&E's import level would not be changed.

Power Flow Results

The addition of 26 MW in 2012 caused no violations and required no upgrades beyond the new Borrego 69 kV bus. Increasing the amount of generation to 27 MW to 75 MW caused new facility overloads requiring upgrades.

Table 12 - Transmission Cost Ranking Summary[11] for Cluster 6

Cluster	Level	MW	Upgrades	Cost (Million)	Carrying Charge* (Million)
C6 Borrego Sub	1	0-26	Bay position for 1st 69 kV gen-tie	$6.6	$0.8
	2	27-75	Upgrade 69 kV transmission lines	$125.5	$14.3

* Carrying Charge assumed 11.43% estimated LACC

Limitations

No limitations are expected.

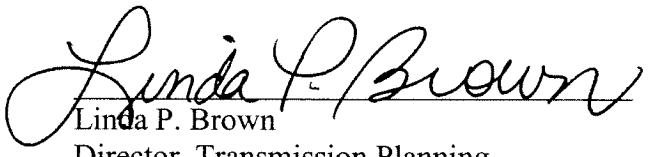
11 All costs are based on conceptual estimates in year-of-expenditure dollars without AFUDC.

VERIFICATION

I am an employee of San Diego Gas & Electric Company and am authorized to make this verification on its behalf. The matters stated in the foregoing 2009 DRAFT TRANSMISSION RANKING COST REPORT are true to my own knowledge, except as to matters which are stated therein on information and belief, and as to those matters I believe them to be true.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this 1st day of October, 2008, at San Diego, California.



Linda P. Brown
Director, Transmission Planning

CERTIFICATE OF SERVICE

I hereby certify that a copy of **DRAFT TRANSMISSION RANKING COST REPORT OF SAN DIEGO GAS & ELECTRIC COMPANY (U 902 E) FOR RENEWABLE PORTFOLIO STANDARD PROCUREMENT** has been electronically mailed to each party of record on the service list in R.08-08-009 and R.06-02-012. Any party on the service list who has not provided an electronic mail address was served by placing copies in properly addressed and sealed envelopes and depositing such envelopes in the United States Mail with first-class postage prepaid.

Copies were also sent via Federal Express to Commissioner Michael R. Peevey and the Assigned Administrative Law Judges Burton Mattson and Anne E. Simon.

Executed this 1st day of October 2008 at San Diego, California

/s/ Jodi Ostrander
Jodi Ostrander