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06-27-12
04:59 PM

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Continue Implementation and Administration of California Renewables Portfolio Standard Program. (U 39 E)	Rulemaking 11-05-005 (Filed May 5, 2011)

DRAFT 2012 TRANSMISSION RANKING COST REPORT OF PACIFIC GAS AND ELECTRIC COMPANY (U 39-E) FOR RENEWABLES PORTFOLIO STANDARD PROCUREMENT

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June 27, 2012

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PACIFIC GAS AND ELECTRIC COMPANY (U 39-E)
FOR RENEWABLES PORTFOLIO STANDARD PROCUREMENT

Pacific Gas and Electric Company ("PG&E") files the attached report, entitled "2012 Draft Transmission Ranking Cost Report Of Pacific Gas and Electric Company," in compliance with the Assigned Commissioner's Ruling Identifying Issues and Schedule of Review for 2012 Renewables Portfolio Standard Procurement Plans Pursuant to Public Utilities Code Sections 399.11 Et Seq. and Requesting Comments on New Proposals, filed April 5, 2012.

Respectfully submitted,

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By: */s/ M. Grady Mathai-Jackson*
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I. INTRODUCTION

In support of California's Renewables Portfolio Standard ("RPS") Program, PG&E has initiated its renewable resource procurement process for 2012. This effort included sending a letter on April 11, 2012, requesting initial information for its 2012 RPS solicitation process. Following the general practice used for prior Transmission Ranking Cost Reports ("TRCR"), PG&E used the information it received in response to its April 11, 2012 letter to guide its selection of the clusters[1/] to be studied in the development of its 2012 TRCR.

This 2012 TRCR is based on the methodology adopted in Decision (D.) 04-06-013 and further addressed in D.05-07-040 for the development and consideration of transmission costs considered in the selection of resources to meet the RPS.[2/]

The TRCR estimates the capital costs of upgrades to transmission facilities that would be needed to deliver power from potential renewable energy areas, and thus estimates the transmission cost for ranking bids submitted in response to PG&E's planned 2012 RPS procurement solicitation.

A. The Purpose of the TRCR is to Support the RPS Solicitation Process.

The TRCR is intended solely to provide information used in ranking RPS bids in the RPS procurement solicitation process. The TRCR estimates the cost of accepting deliveries from renewable resource projects over the utility transmission system. This cost estimate is used only as one factor in the comparison of solicited bids. The estimates in the 2012 TRCR, as with prior TRCRs, are neither intended nor calculated for any other purpose and must not be relied upon for any other purpose.

- Potential RPS bidders should consider the information regarding expected transmission network upgrades contained in the TRCR in developing their bids in response to the 2012 RPS procurement solicitation from PG&E.
- PG&E may use the transmission cost estimates in the 2012 TRCR as a factor in evaluating and ranking the bids it receives through the 2012 RPS solicitation.

1/ Please note that the "clusters" referred to in this report are not the same as the generation clusters that CAISO uses for generation interconnection studies. For more information about the selection and use of clusters, please refer to section II of this report.

2/ Initially, the RPS required certain retail sellers of electricity to increase their sales of electricity from renewable energy by at least 1% per year, so that renewable resources would serve at least 20% of retail sales by 2017 at the latest. In SB 107, enacted by the California Legislature in 2006, that goal was accelerated to 20% of retail sales from renewable energy deliveries by 2010. SB 2 1X made a number of changes to the RPS Program. Most notably, SB 2 1X extended the RPS procurement goal from 20% of retail sales of all California electrical corporations, Electric Service Providers ("ESPs"), and Community Choice Aggregators (CCAs) by the end of 2010, to 33% of retail sales of electrical corporations, ESPs, CCAs and publicly-owned utilities by the end of 2021.

This evaluation and ranking process will include calculation of transmission cost bid adders and the assignment of these adders to specific RPS projects, to allow PG&E to determine the combination of projects that will meet its approved renewable procurement goals in a least-cost, best-fit manner.[3/] As discussed in PG&E's draft 2012 RPS Solicitation Protocol, PG&E expects to use results from Participants' interconnection studies to evaluate the transmission-related costs of each Offer. However, depending on the timing and results of these studies, PG&E may use the TRCR results if they are more appropriate.

B. Additional Information Is Needed to Determine Project-Specific Costs.

The estimates of transmission costs in this TRCR will not be definitive, and will not establish the ultimate cost of connecting any given renewable resource to the transmission grid. Generation developers seeking to interconnect to the PG&E transmission system must apply for interconnection with the CAISO, in accordance with the requirements of the CAISO tariff (the "CAISO Tariff"), as approved by the Federal Energy Regulatory Commission ("FERC").

PG&E expects that some potential renewable resource projects submitting bids into the 2012 RPS solicitation process will not have completed the interconnection study process, and therefore will not have definitive projected cost information. In the absence of complete interconnection cost information for each bid, the TRCR may provide an acceptable basis for comparing the relative interconnection costs associated with bids. That is, although the TRCR does not provide final interconnection cost data, it does provide sufficient information to allow PG&E to consider the *relative* transmission cost of each resource being evaluated, as part of the least-cost best-fit analysis needed to *rank* and select renewable resources for development.

C. Inputs to the Report.

This TRCR identifies and provides estimated cost information regarding transmission network upgrades needed for potential RPS projects, based on the following inputs:

- Conceptual transmission studies submitted previously pursuant to D.04-06-010 and D.05-07-040;
- Other conceptual transmission studies; and
- System Impact Studies and Facilities Studies prepared for projects that have initiated the CAISO interconnection process.

D. Methodological Parameters of the TRCR.

As in past TRCRs, the cost estimates presented in the 2012 TRCR are the result of best efforts to estimate strategies that would be used to accommodate the interconnection of potential renewable resources. These strategies are based on reconnaissance-type information and rely extensively on engineering judgment, which in turn is tempered by experience and informed by

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3/ Other commercial arrangements may be used in bid evaluation, as specified in PG&E's draft 2012 RPS Solicitation Protocol. However, such alternative arrangements are beyond the scope of the TRCR.

limited, focused usage of a power flow program. This TRCR is based on the following considerations:

Scope.

- The assessment covers proxy transmission Network Upgrades from the first point of interconnection of the renewable resources to PG&E's existing transmission system towards the load. Direct Assignment Facilities[4/] or "Gen-ties" - are not covered.

Proxy Facilities.

- As in the previous TRCRs, transmission cost estimates are based on proxy facilities that could mitigate potential congestion due to the addition of potential renewable resources.

Base Cases.

- For the 2012 TRCR, the 2017 Summer Peak and Summer Off Peak base cases were developed from the power flow cases that were prepared for the CAISO 2012-2013 Transmission Planning Process (TPP) and represent the transmission network (including transmission projects approved by CAISO), load forecast (1-in-5 year adverse weather system peak load for the Summer Peak base case and the summer off peak load for the Summer Off Peak base case), and generation dispatch assumption consistent with CAISO TPP. These base cases were reviewed and approved by the CAISO. These base cases were then modified to reflect new generation projects that have an interconnection agreement and the associated transmission projects. The Path 15, Path 26, and Path 66 flows in both summer peak and off-peak cases were consistent with the assumptions in the CAISO Annual Assessment Study base cases for 2017 summer peak and summer off-peak conditions.

Renewable Resource Potential.

- The potential renewable resources assumed in the study are consistent with the results of the Renewable Resources Development Report ("RRDR") published by the California Energy Commission ("CEC") on September 30, 2003, and augmented based on the draft result of the CEC's Strategic Value Analysis, published in 2005. These CEC results have been further augmented based on data received by PG&E from potential renewables developers in response to PG&E's solicitations for information conducted in 2003 through 2012.

4/ "Direct Assignment Facilities" are transmission facilities necessary to physically and electrically interconnect a new facility to the CAISO Controlled Grid. CAISO Tariff § 5.7.5.

Clusters.

- The term "clusters" used in this report is not the same as the generation clusters that CAISO uses for generation interconnection studies. For more information about the selection and use of clusters, please refer to section II of this report.

  The PG&E study performed to develop the TRCR assumed that energy from the potential renewable resources would be delivered to locations close to one of the following "clusters": Bellota, Caribou, Carrizo Plains, Contra Costa, Cortina, Cottonwood, Delta Metering Station, Fulton, Gates, Gregg, Helm, Humboldt, Los Banos, Metcalf, Midway, Morro Bay, Moss Landing, Newark, Panoche, Pit 1, Rio Oso, Round Mountain, Stagg, Summit Metering Station, Table Mountain, Tesla, Vaca Dixon, and Wilson Substations. Each of these clusters is depicted geographically in Exhibit 1, which is appended to this report.

Renewable Resources Scenarios.

- In accordance with D. 04-06-013, PG&E's application of the Methodology investigated the proxy transmission network upgrades needed assuming multiple renewable resources locations within and outside PG&E's systems.
- For renewable resources located north of PG&E's service territory, the associated potential cluster would be PG&E's Round Mountain Substation. For generation projects located east of PG&E's service territory, the associated potential cluster would be PG&E's side of Summit Metering Station. For projects located south of PG&E's service territory, the associated potential cluster would be PG&E's Midway Substation.

Associated Clusters Assumed When PG&E, SCE, or SDG&E is the Assumed Purchaser.

- If PG&E, Southern California Edison ("SCE"), or San Diego Gas & Electric Company ("SDG&E") are the purchasers of renewable resources located north of PG&E's service territory, the associated potential cluster would be PG&E's Round Mountain Substation. For generation projects located east of PG&E's service territory, the associated potential cluster would be PG&E's side of Summit Metering Station. For projects located within PG&E's territory, a proxy location closest to the renewable interconnection location would be the associated renewable cluster. This assumption utilizes the principles of the current CAISO market design and takes into account the delivery of generator output into the CAISO grid for the purpose of identifying the associated proxy transmission network upgrade costs.

Reactive Support.

- Voltage (reactive) support is required to reliably transmit energy from generation resources to load. The reactive support needed is in addition to the reactive power produced by the generators. To be effective, voltage support devices would be installed at various strategic locations, which are generally at or near the load centers. The estimated levels of voltage support used in the TRCR are based on results of past studies, and are technology-neutral, assuming that all renewable

generators are capable of producing reactive power typical of synchronous generators.

System Reliability.

- The PG&E study performed to develop the TRCR assumes that each renewable resource connected in response to PG&E's resource solicitation would do its share to maintain existing system reliability and by operating within applicable nomograms, such as the California-Oregon Interconnection ("COI") Nomogram, and by participating in existing special protection schemes, such as the Path 15 Remedial Action Scheme.

E. Application of the Transmission Ranking Cost Study to RPS Bid Selection.

1. Use of Clusters.

The PG&E study performed to develop the TRCR uses clusters to provide a basis for grouping RPS bids solely for purposes of comparison. Any given resource may ultimately be physically connected to points near, but not necessarily at, the cluster assumed by the study. Consistent with Attachment A of D.04-06-013, PG&E has developed Transmission Ranking Costs based on potential transmission congestion, the associated proxy transmission network upgrades, and the associated capital costs that may be expected to accommodate each cluster of renewable resources. For each cluster, PG&E has identified various levels of possible additional transmission capacity and a projected estimate of related costs.[5/] Level 1 reflects the available transmission capacity, taking into account all approved reliability and economic transmission projects, as well as transmission network upgrades approved for generation projects in the CAISO interconnection queue, based on completed SIS/FS processes. The next Level and subsequent Levels reflect the next most cost-effective proxy network upgrade(s). The number of Levels depends on the number of proxy network upgrades reasonably expected to be necessary to accommodate the anticipated total amount of renewable resources in each cluster.

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5/ Costs are equal to the total capital cost of the proxy transmission network upgrade project and are stated in 2012 constant dollars. Net present value ("NPV") amounts of each alternative would differ.

2. Overview of the TRCR Table.

The Transmission Ranking Costs are summarized in Table 1. In Table 1, the Transmission Ranking Costs have been separated into sections that would broadly correspond to system conditions in peak and off-peak periods, so they can be used in least cost-best fit bid evaluation for super-peak, peak and shoulder periods and off-peak periods.[6/] The separation of transmission costs into these periods may allow a potential bidder to take into account potential transmission congestion, and accordingly structure the optimal generation profile for its bid or reflect any potential curtailment it might want to include in its bid. Tables 3 and 4, both found in the Appendix, provide supporting information for the Transmission Ranking Costs (TRC) in Table 1. Tables 3 and 4 show the limiting transmission facilities and the associated proxy transmission facilities that produced the costs TCRs in Table 1.

As expected, a number of network facilities requiring upgrades are common to several clusters, depending on the levels of generation added. These common proxy Network Upgrades provide some opportunity for refining the bid ranking, once the bids have been received and analyzed.

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6/ Definitions:

Super-Peak (5x8) = HE (Hours Ending) 13 - 20, Monday - Friday (*except* North American Electric Reliability Corporation ("NERC") holidays).

Shoulder = HE 7 - 12, 21 and 22, Monday - Friday (*except* NERC holidays); and HE 7 - 22 Saturday, Sunday and *all* NERC holidays.

Off Peak (7x8) = HE 1 - 6, 23 and 24 all days *(including* NERC holidays).

NERC (Additional Off-Peak) Holidays include: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day. Three of these days, Memorial Day, Labor Day, and Thanksgiving Day occur on the same day each year. Memorial Day is the last Monday in May; Labor Day is the first Monday in September; and Thanksgiving Day is the last Thursday in November. New Year's Day, Independence Day, and Christmas Day, by definition, are predetermined dates each year. However, in the event they occur on a Sunday, the "NERC Additional Off-Peak Holiday" is celebrated on the Monday immediately following that Sunday. However, if any of these days occur on a Saturday, the "NERC Additional Off-Peak Holiday" remains on that Saturday.

Table 1
2012 Transmission Ranking Cost for Study Year 2017 for Potential Generation

Substation Associated With Cluster Of Potential Generation	Level	Peak and Shoulder Year Round: Maximum MW of Potential Generation In each Level	Peak and Shoulder Year Round: Cost of Proxy Network Upgrades to accommodate MW Level of Potential Generation ($ millions in 2012 dollars): Proxy Voltage Support Devices*	Peak and Shoulder Year Round: Cost of Proxy Network Upgrades to accommodate MW Level of Potential Generation ($ millions in 2012 dollars): Other Proxy Transmission upgrades	Peak and Shoulder Year Round: Annual Carrying Charges ($ millions in 2012 dollars)**: Based on 10 year contract life	Peak and Shoulder Year Round: Annual Carrying Charges ($ millions in 2012 dollars)**: Based on 20 year contract life	Off Peak Year Round: Maximum MW of Potential Generation In each Level	Off Peak Year Round: Cost of Proxy Network Upgrades to accommodate MW Level of Potential Generation ($ millions in 2012 dollars): Proxy Voltage Support Devices*	Off Peak Year Round: Cost of Proxy Network Upgrades to accommodate MW Level of Potential Generation ($ millions in 2012 dollars): Other Proxy Transmission upgrades	Off Peak Year Round: Annual Carrying Charges ($ millions in 2012 dollars)**: Based on 10 year contract life	Off Peak Year Round: Annual Carrying Charges ($ millions in 2012 dollars)**: Based on 20 year contract life
Bellota 230 kV	1	1000	70	0	14	10	1000	70	0	14	10
Caribou 230 kV	1	100	7	0	1	1	100	7	0	1	1
	2	500	35	131	33	24	500	35	131	33	24
	3	400	28	654	136	97	400	28	46	15	11
Carrizo Plains 115 kV	1	0	0	0	0	0	0	0	0	0	0
	2	500	35	173	41	30	200	14	173	37	27
	3						300	21	356	75	54
Contra Costa Sub 230 kV	1	0	0	0	0	0	650	46	0	9	7
	2	100	7	189	39	28	350	25	42	13	9
	3	550	39	78	23	17					
	4	350	25	236	52	37					
Cortina 230 kV	1	0	0	0	0	0	450	32	0	6	5
	2	600	42	169	42	30	550	39	139	35	25
	3	400	28	220	49	35					

* Static VAR Compensator (SVC) is used as a proxy for voltage support devices required. The size of the SVC at each Level assumes the capacity in each level will be fully utilized. However, since addition of voltage support devices is less "lumpy" than other transmission facilities, it is separately listed so that the size, and hence, cost can be prorated based on the size of the resource bid.

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Cottonwood 230 kV	1	0	0	0	0	0	0	0	0	0	0
	2	500	35	703	147	105	1000	70	46	23	17
	3	500	35	220	51	36					
Delta Metering Station 115 kV	1	0	0	0	0	0	0	0	0	0	0
	2	500	35	1049	216	155	500	35	346	76	54
Fulton 230 kV	1	900	63	0	13	9	300	21	0	4	3
	2	100	7	151	31	23	300	21	82	21	15
	3						400	28	151	36	26
Gates 230 kV	1	0	0	0	0	0	200	14	0	3	2
	2	1000	70	15	17	12	100	7	59	13	9
	3						450	32	189	44	32
	4						750	53	620	134	96
	5										
Gregg 230 kV	1	0	0	0	0	0	200	14	0	3	2
	2	400	28	15	9	6	300	21	59	16	11
	3	300	21	42	13	9	250	18	189	41	30
	4	200	14	18	6	5	750	53	620	134	96
	5	100	7	137	29	21					

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Helm	1	0	0	0	0	0	150	11	0	2	2
230 kV	2	1000	70	15	17	12	400	28	59	17	12
	3						200	14	189	41	29
	4						750	53	620	134	96
	5										
Humboldt	1	0	0	0	0	0	0	0	0	0	0
115 kV	2	100	7	369	75	54	500	35	369	81	58
	3	400	28	703	146	104					
Los Banos	1	0	0	0	0	0	100	7	0	1	1
230 kV	2	1000	70	15	17	12	650	46	59	21	15
	3						750	53	324	75	54
	4										
Metcalf	1	1000	70	0	14	10	1000	70	0	14	10
230 kV											
Midway	1	0	0	0	0	0	0	0	0	0	0
230 kV	2	1400	98	15	23	16	300	21	59	16	11
	3	1100	77	46	24	18	450	32	297	65	47
	4	500	35	88	25	18	750	53	1403	290	208
	5						1000	70	765	167	119

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Morro	1	0	0	0	0	0	0	0	0	0	0
230 kV	2	600	42	15	11	8	250	18	59	15	11
	3	200	14	218	46	33	200	14	189	41	29
	4	700	49	330	76	54	550	39	218	51	37
	5						500	35	845	176	126
Moss Landing	1	1000	70	0	14	10	350	25	0	5	4
230 kV	2						650	46	88	27	19
Newark	1	1000	70	0	14	10	1000	70	0	14	10
230 kV											
Panoche	1	0	0	0	0	0	100	7	0	1	1
230 kV	2	1000	70	15	17	12	250	18	59	15	11
	3						400	28	40	14	10
	4						750	53	809	172	123
	5										
Pit1	1	0	0	0	0	0	50	4	0	1	1
230 kV	2	150	11	693	140	101	250	18	72	18	13
	3	450	32	62	19	13	350	25	46	14	10
	4	400	28	220	49	35	350	25	82	21	15

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Rio Oso	1	0	0	0	0	0	1000	70	0	14	10
230 kV	2	375	26	6	6	5					
	3	225	16	134	30	21					
	4	400	28	635	132	95					
Round Mt	1	0	0	0	0	0	400	28	0	6	4
230 kV	2	500	35	693	145	104	600	42	46	17	13
	2	500	35	220	51	36					
Stagg	1	0	0	0	0	0	1000	70	0	14	10
230 kV	2	750	53	32	17	12					
	3	250	18	21	8	6					
Summit	1	0	0	0	0	0	0	0	0	0	0
115 kV	2	400	28	263	58	42	500	35	263	59	43
	3	100	7	134	28	20					
Table Mt	1	100	7	0	1	1	500	35	0	7	5
230 kV	2	200	14	435	90	64	500	35	46	16	12
	3	700	49	220	54	38					

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2012 Transmission Ranking Cost for Study Year 2017 for Potential Generation

Substation Associated With Cluster Of Potential Generation	Level	Peak and Shoulder Year Round: Maximum MW of Potential Generation In each Level	Peak and Shoulder Year Round: Cost of Proxy Network Upgrades to accommodate MW Level of Potential Generation ($ millions in 2012 dollars): Proxy Voltage Support Devices*	Peak and Shoulder Year Round: Cost of Proxy Network Upgrades to accommodate MW Level of Potential Generation ($ millions in 2012 dollars): Other Proxy Transmission upgrades	Peak and Shoulder Year Round: Annual Carrying Charges ($ millions in 2012 dollars)**: Based on 10 year contract life	Peak and Shoulder Year Round: Annual Carrying Charges ($ millions in 2012 dollars)**: Based on 20 year contract life	Off Peak Year Round: Maximum MW of Potential Generation In each Level	Off Peak Year Round: Cost of Proxy Network Upgrades to accommodate MW Level of Potential Generation ($ millions in 2012 dollars): Proxy Voltage Support Devices*	Off Peak Year Round: Cost of Proxy Network Upgrades to accommodate MW Level of Potential Generation ($ millions in 2012 dollars): Other Proxy Transmission upgrades	Off Peak Year Round: Annual Carrying Charges ($ millions in 2012 dollars)**: Based on 10 year contract life	Off Peak Year Round: Annual Carrying Charges ($ millions in 2012 dollars)**: Based on 20 year contract life
Tesla	1	1000	70	0	14	10	1000	70	0	14	10
230 kV											
Vaca Dixon	1	0	0	0	0	0	1000	70	0	14	10
	2	100	7	95	20	15					
230 kV	3	900	63	220	56	40					
Wilson	1	750	53	0	10	8	0	0	0	0	0
	2	250	18	64	16	12	350	25	59	17	12
	3						350	25	112	27	20
	4						300	21	189	42	30

* Static VAR Compensator (SVC) is used as a proxy for voltage support devices required. The size of the SVC at each Level assumes the capacity in each level will be fully utilized. However, since addition of voltage support devices is less "lumpy" than other transmission facilities, it is separately listed so that the size, and hence, cost can be prorated based on the size of the resource bid.

** Carrying charges in this table are for illustrative purposes only. The actual carrying charge for an individual offer will depend on specifics in the offer submitted.

II. DEVELOPMENT OF THE TRANSMISSION RANKING COST REPORT

A. RPS History

SB 1078 established the California Renewables Portfolio Standard Program and the objective that 20% of electricity sold to California customers would be procured from eligible renewable energy resources by 2017. In 2006, SB 107 was enacted, accelerating the procurement objective to 20% of retail sales from eligible renewable resources by 2010.

Most recently, Senate Bill 2 (1X) made a number of changes to the RPS Program. Most notably, SB 2 1X extended the RPS procurement goal from 20% of retail sales of all California electrical corporations, ESPs, and CCAs by the end of 2010, to 33% of retail sales of electrical corporations, ESPs, CCAs and publicly-owned utilities by the end of 2021.

B. History of TRCR Development

A key element in PG&E's TRCR methodology is the identification of clusters with renewable generation potential. This section describes the various data PG&E has relied upon in the past, leading to the current TRCR, to identify twenty-eight renewable resource clusters for the 2012 TRCR and the amount of generation expected in each of those clusters.

1. Studies Completed as of July 30, 2003.

Pursuant to the January 29, 2003, Administrative Law Judge's ("ALJ's") Ruling and Notice of Evidentiary Hearings on Tehachapi Transmission Project in the Commission's Investigation (I.) 00-11-001, PG&E invited developers who might wish to interconnect eligible renewable energy projects to the PG&E-owned transmission system to apply for and fund transmission conceptual studies, including project cost estimates. PG&E's solicitation noted that project-specific information from such studies might be included in the renewables transmission plan report that the Commission was required to submit to the Legislature by December 1, 2003. (Public Utilities Code § 383.6).

Five potential renewable resource developers responded to PG&E's March 2003 solicitations, describing a total of twelve projects representing 2,562 MW. Of these, seven projects representing 1102 MW were located within PG&E's service territory. Three projects representing 220 MW were located in PacifiCorp's service territory, with proposed interconnection points at Bonneville Power Administration-owned substations. Two projects representing 1240 MW were located outside California and were excluded from the Screening Level Evaluation.

2. CEC Renewable Resource Assessment Reported Dated July 1, 2003.

The February 26, 2003, ALJ's Ruling in I.00-11-001 determined that the CEC's Preliminary Renewable Resource Assessment ("PRRA") would assess a level of renewable development in 2005 and 2008 sufficient to allow PG&E, SCE, SDG&E, and any other "obligated entities" to achieve the incremental RPS goals embodied in Senate Bill 1078. This CEC assessment was intended to provide the basis for a reconnaissance level analysis of current and potential transmission The CEC published its PRRA on July 1, 2003. The PRRA resource

assessment identified renewable megawatt additions for the transmission plan's target years (2005, 2008 and 2017) by technology type and by county where renewable resources are deemed most likely to locate. PG&E relied on the PRRA as the basis of its reconnaissance level analysis of current and potential transmission congestion due to the interconnection of potential renewable resources. PG&E filed its Screening Level Study required by SB 1038 on August 29, 2003.

3. Administrative Law Judge Rulings Dated July 21, 2003 and August 1, 2003 - Revised Scope of Study Based on CEC PRRA.

The ALJ's rulings of July 21, 2003, and August 1, 2003, further required utilities to develop a conceptual renewables transmission plan for 2017 (similar to the conceptual transmission plans developed for 2005 and 2008), to address the effect of accelerating realization of the 20% RPS Goal from 2017 to 2010, and to report on the transmission needs for potential renewable resources that would still exist after attainment of the RPS Goal.

4. CEC Renewable Resource Development Report Dated September 30, 2003.

The CEC's draft Renewable Resource Development Report ("RRDR") provided the Commission with an update to the PRRA on September 30, 2003. This RRDR expanded the scope to include the energy needs of the rest of the state (publicly owned electric utilities, other IOUs, and other electric service providers). By comparison, the original PRRA had focused on the energy needs of the investor owned utilities ("IOUs") and electric service providers ("ESPs") for transmission planning purposes. The RRDR also included a plausible RPS compliance scenario for the entire state, using data from existing and proposed projects.[7/] Adjustments were made to the estimates of renewable energy resources needed to meet RPS obligations, the amount of proposed renewable projects, and the installed renewable capacity within California and the WECC. The CEC's estimate of renewable resource capacity required to meet the RPS of 20% by 2010 on a statewide level and remaining potential renewable resources are summarized in Table 2:

7/ The RRDR states "The data for the proposed projects date back as far as June 1998 from the Energy Commission's first New Account auction to as recent as projects participating in the 2003 Interim Procurement. A limited amount of projects were filtered out if they did not appear to be plausible or 'real' projects. Most of the proposed projects do not have contracts and are not yet under construction. Data on proposed projects were gathered from solicitations for new electric providers to IOU and/or municipal electric utilities. The following data sources were used: the Energy Commission's New Renewable Resources Account database, California Power Authority Letters of Intent, Southern California Public Power Authority (SCPPA) Request for Proposals (RFP) and the 2003 Northern California Power Association (NCPA) RFP." As such, there is not sufficient information in the RRDR to ascertain the amounts and number of "proposed" renewable resource projects that may have initiated the interconnection or permit application process.

Table 2
Plausible Renewable Energy Supply Scenario to meet Estimated Statewide 20% RPS Demand by 2010 with Resources Located in California (MW)

	2005 (MW)	2008 (MW)	2010 (MW)	2017 (MW)	Total (MW)
PG&E	420	355	50	200	1,025
SCE	875	2,452	1,645	1,110	6,082
IID	120	140	150	40	450
SDG&E	220	210	-	-	430
TOTAL	1,635	3,157	1,845	1,350	7,987

In the PG&E service territory, compared to the PRRA, the RRDR scenario assumed that the development of renewable resources in Solano and Alameda Counties would accelerate, and the renewable resource development in Modoc and Siskiyou Counties would be slower.

5. Commission Administrative Law Judge Rulings Dated October 15, 2003—Revised Schedule and Approach of Study Based on CEC RRDR.

The ALJ Ruling of October 15, 2003, modified the schedule and approach to be used for the Commission Renewables Transmission Report. Accordingly, PG&E prepared and filed its Supplemental Screening Level Study Required by SB 1038 on October 29, 2003.

6. Commission Administrative Law Judge Rulings Dated March 18, 2004 on Renewable Resource Information to Prepare the Transmission Ranking Cost Report.

Pursuant to ALJ Ruling dated March 18, 2004, PG&E undertook a supplemental solicitation for information from developers of eligible renewable energy projects. In response to this supplemental solicitation, PG&E received information from nine developers, proposing a total of forty-one projects representing 4,313.5 MW. Of these, fourteen projects representing 736 MW were located within PG&E's service territory. Twenty-five projects representing 3477.5 MW were located in Southern California. Two projects representing 100 MW were located in PacificCorp's service territory, with proposed interconnection points at Bonneville Power Administration owned substations. PG&E used this information to supplement the information available earlier in developing the clusters for the 2004 Transmission Ranking Cost Report.

On March 18, 2005, PG&E sent another letter of solicitation for information to developers regarding eligible renewable energy projects expected to commence delivery to the PG&E-owned transmission system by January 2010. PG&E received responses from four developers by the closing date of March 28, 2005, for sixteen generation projects totaling 2,905 MW. Of these, six projects, totaling 671 MW, are expected to be in the PG&E service area, three projects, totaling 732 MW, are expected to be located north of the PG&E service area but within California, and seven projects, totaling 1,502 MW, are expected to be located in Southern California. PG&E used this information to supplement the information available earlier in

developing the clusters for the 2004 Transmission Ranking Cost Report.

7. Commission Decision 05-07-040 directed the utilities to apply the same Methodology, as modified by that decision, in preparing their 2005 Transmission Ranking Cost Reports

In D.05-07-040, the Commission directed the utilities to apply the same methodology, as modified by that decision, in preparing their 2005 Transmission Ranking Cost Reports. In addition, it directed the utilities to specify and explain the carrying costs, in addition to capital costs, of transmission network upgrades identified in the reports. Accordingly, PG&E calculates the carrying costs -- or costs of ownership -- for proposed capital expenditures. These costs are then discounted to a present value using a discount rate that takes into account the time value of money over the anticipated life of the project. The components used in the determination of the carrying cost typically include capital investment, operation and maintenance expenses, taxes, insurance, and depreciation.

8. CEC Strategic Value Analysis Draft Consultant Report published in July 2005

The CEC Strategic Value Analysis showed the possible locations by county and magnitudes of the economic potential of the renewable resources. This served as another data point considered when PG&E selected the clusters investigated in the 2006 TRCR.

9. Commission Assigned Commissioner and Administrative Law Judge's Ruling in OIR. 04-04-026, dated November 9, 2005, directed the utilities to apply the Methodology in D.04-06-010 and D.05-07-040 in preparing their 2006 Transmission Ranking Cost Reports

Pursuant to Assigned Commissioner and Administrative Law Judge's Ruling, dated November 9, 2005, on January 31, 2006, PG&E issued a letter soliciting information from developers regarding eligible renewable energy projects expected to commence delivery to the PG&E-owned transmission system by January 2010. By the closing date of February 7, 2006, PG&E received only one response, which came from a single developer; that response representing two generation projects, totaling 70 MW. Both projects were expected to be located north of PG&E's service area, with one of these two projects expected in California. PG&E used this information to supplement the information available earlier in developing the clusters for the 2006 TRCR.

10. Assigned Commissioner Ruling and Scoping Memo, dated August 21, 2006, as modified by the subsequent Administrative Law Judge's Ruling on Filing of Draft 2007 RPS Procurement Plans, dated September 14, 2006, in R.06-05-027

Pursuant to Assigned Commissioner Ruling and Scoping Memo, dated August 21, 2006, as modified by the subsequent Administrative Law Judge's Ruling on Filing of Draft 2007 RPS Procurement Plans, dated September 14, PG&E issued a letter on October 2, 2006, soliciting information from developers regarding eligible renewable energy projects expected to commence delivery to the PG&E-owned transmission system by January 2011. By the closing date of

October 10, 2006, PG&E received responses from five developers, representing twenty-one generation projects totaling up to 3,039 MW. Of these, four projects, totaling 462 MW, were expected to be in the Pacific Northwest, one project representing 500 MW was expected to locate in Mexico, seven projects, totaling 1,212 MW, were expected to be in northern California, and 8 projects, totaling 865 MW, were expected to be in southern California. PG&E used this information to supplement information available earlier in developing the clusters for the 2007 Transmission Ranking Cost Report.

11. Assigned Commissioner Ruling and Scoping Memo, dated June 15, 2007, as modified by the subsequent revised schedules provided via Administrative Law Judge's Rulings on July 16, 2007, August 7th, 2007 and August 23, 2007, and the Assigned Commissioner's Ruling on July 31st, 2007.

Pursuant to Assigned Commissioner Ruling and Scoping Memo, dated June 15, 2007, as modified by the aforementioned rulings, PG&E issued a letter on August 1, 2007, soliciting information from developers regarding eligible renewable energy projects expected to commence delivery to the PG&E-owned transmission system by January 2012. By the closing date of August 9, 2007, PG&E received responses from three developers, representing six generation projects totaling up to 1,139 MW. Of these, two projects, totaling 499 MW, were expected to be in the Pacific Northwest, one project representing 400 MW is expected to locate in Mexico, and three projects, totaling 240 MW, were expected to be in Central and Southern California. PG&E used this information to supplement information available earlier in developing the clusters for the 2008 Transmission Ranking Cost Report.

12. The Amended Scoping Memo and Ruling of Assigned Commissioner Regarding 2009 RPS Procurement Plans dated June 20, 2008.

Pursuant to Assigned Commissioner Ruling and Scoping Memo, dated June 20, 2008, PG&E issued a letter on August 6, 2008, soliciting information from developers regarding eligible renewable energy projects expected to commence delivery to the PG&E-owned transmission system by January 2013. By the closing date of August 13, 2008 and subsequent late submittals, PG&E received responses from three developers, representing seventeen generation projects totaling up to 4,126 MW. Of these, two projects, totaling 40 MW, were expected to be in PG&E's Service Area in Central California, twelve projects, totaling 2,806 MW, were expected to be outside PG&E Service Area in Central and Southern California, and three projects, totaling 1,280 MW, were expected to be located in the Desert Southwest. PG&E used this information to supplement information available earlier in developing the clusters for the 2009 Transmission Ranking Cost Report.

13. CPUC Decision 09-06-018 and the Amended Scoping Memo and Ruling of the Assigned Commissioner Regarding 2010 RPS Procurement Plans dated November 2, 2009 in CPUC Rulemaking ("R.")08-08-009.

Pursuant to Assigned Commissioner Ruling and Scoping Memo, dated November 2, 2009, PG&E issued a letter on November 13, 2009 soliciting information from developers

regarding eligible renewable energy projects expected to commence delivery to the PG&E-owned transmission system by January 2014. By the closing date of November 20, 2009 and subsequent late submittals, PG&E received responses from 2 developers, representing 19 generation projects totaling up to 1639 MW. Of these, 1 project, totaling 51 MW, was expected to be in PG&E's Service Area; 15 projects, totaling 910 MW, were expected to be outside PG&E Service Area in Southern California; 4 projects, totaling 228 MW, were expected to be located in the Pacific Northwest; and 2 projects, totaling 450 MW, were expected to be located in the Desert Southwest. PG&E used this information to supplement information available earlier in developing the clusters for the 2010 Transmission Ranking Cost Report.

14. Assigned Commissioner's Ruling Identifying Issues and Schedule of Review for 2012 Renewables Portfolio Standard Procurement Plans Pursuant to Public Utilities Code Sections 399.11 Et Seq. and Requesting Comments on New Proposals, filed April 5, 2012 in R. 11-05-005.

Pursuant to Assigned Commissioner's Ruling, dated April 05, 2012, PG&E issued a letter on April 11, 2012 soliciting information from developers regarding eligible renewable energy projects expected to commence delivery to the PG&E-owned transmission system by January 2017. By the closing date of April 24, 2012, PG&E received responses from 15 developers representing 66 generation projects totaling up to 13,603 MW. Of these, 10 projects, totaling 823 MW, are expected to be in PG&E's Service Area; 30 projects, totaling 7,166 MW, are expected to be outside PG&E Service Area in Southern California; 13 projects, totaling 5,202 MW, are expected to be located in the Pacific Northwest; and 13 projects, totaling 412 MW, are expected to be located in the Desert Southwest. PG&E used this information to supplement information available earlier in developing the clusters for the 2012 TRCR.

III. PG&E'S TRANSMISSION RANKING COST STUDY FOR USE IN THE 2012 RPS SOLICITATION

On June 9, 2004, the Commission issued D. 04-06-013, adopting the "Methodology for Development and Consideration of Transmission Costs in Initial Renewable Portfolio Standard Procurement" (the "Methodology"). D.04-06-013 requires:

> In its Transmission Ranking Cost Report, each utility should identify and provide cost information regarding transmission network upgrades needed for potential RPS projects, based on conceptual transmission studies submitted previously in this proceeding, other conceptual transmission studies, and System Impact Studies and Facilities Studies prepared for projects that have initiated the California Independent System Operator (ISO) interconnection process.[8/]

8/ D.04-06-013 at 3.

To be consistent with D. 04-06-013, the study undertaken by PG&E investigated the proxy facilities needed for renewable clusters identified through the process described in the previous section.

A. Limitations, Assumptions and Methodology Underlying PG&E's 2012 Transmission Ranking Cost Study.

PG&E uses the same methodology as it did in prior versions of its TRCR. The 2012 Transmission Ranking Costs developed herein involve the same methodology, limitations and uncertainties as the conceptual transmission plans in the earlier studies.

1. Power Flow Base Cases.

PG&E used the Summer Peak and Summer Off Peak base cases developed in PG&E's 2012 base case series.

These base cases were updated to reflect the current (as of March 2012) projects:

- New generation projects that have a signed interconnection agreement, and the associated transmission projects approved by CAISO through completed generation interconnection processes.
- Approved reliability and economic transmission network upgrades.

2. Substation Associated With Cluster of Potential Generation.

Based on information received from the developers and the CEC's PRRA and RRDR, as well as the CEC's draft Strategic Value Analysis Report, published in July 2005, PG&E has selected Bellota, Contra Costa Sub, Caribou, Carrizo Plains, Cortina, Cottonwood, Delta Metering Station, Fulton, Gates, Gregg, Helm, Humboldt, Los Banos, Metcalf, Midway, Morro Bay, Moss Landing, Newark, Panoche, Pit 1, Rio Oso, Round Mountain, Stagg, Summit Metering Station, Table Mountain, Tesla, Vaca-Dixon, and Wilson Substations (see Exhibit 1) as the cluster locations from which the transmission impact of the renewable resources identified are analyzed. For the renewable resources located north of PG&E's service territory, the associated potential cluster will be PG&E's Round Mountain Substation. For projects located south of PG&E's service territory, the associated potential cluster will be PG&E's Midway Substation. For projects located east of PG&E's service territory, the associated potential cluster will be PG&E's side of Summit Metering Station.

3. Potential Network Upgrades and Proxy Facilities.

PG&E ran the 2017 Summer Peak and 2017 Summer Off Peak cases using the assumptions described in the previous sections. As in the earlier TRCR studies, because of the limited time and data available for this evaluation, only power flow (steady state) cases representing normal (all facilities in service) operating conditions were run. For each cluster, PG&E tested the need for network upgrades based on the same criteria used in the earlier TRCR studies. Transmission facilities that may experience transmission problems during single contingencies were identified by comparing the normal loadings to a loading threshold of 80% of

normal facility rating. That is, if a transmission facility under normal operating conditions is loaded to 80% or more of its normal rating, then it is an indication that overload may exist during single contingency conditions, and transmission network upgrades could be needed.

To develop the proxy transmission upgrades needed to correct potential transmission congestion, the location of the renewable cluster, the results of power flow solutions, and the available transmission network near the cluster was reviewed to identify the transmission network upgrades. In addition, the following was also used as a guideline to help evaluate reasonable upgrade options:

115 kV line for renewable resources approximately between 100 and 200 MW

230 kV line for renewable resources approximately between 200 and 600-750 MW

500 kV line for renewable resources approximately 600-750 MW and higher

Consideration would also be given also to the existing system configuration where the potential congestion is identified, and future development expected. For example, if a large amount of renewable resources is expected beyond the present solicitation, a 500 kV line initially operated as two 230 kV circuits will be chosen over a 230 kV double circuit tower line (DCTL). In addition, the knowledge of and PG&E's system combined with a sound engineering judgment would be used to identify proxy upgrades for clusters that impact several transmission lines in the vicinity of the cluster.

PG&E also augments the information thus developed with information from other transmission planning studies to the extent they are available. If no transmission facility in the impacted area[9/] would be loaded to at or above 80% of normal rating in the scenario, the renewable generation in the cluster would be increased to a point where loading on at least one transmission facility would reach 80% of normal rating or when the resource addition in a cluster would reach 1,000 MW unless other information is available. Using 1,000 MW as the cut off is reasonable, since the maximum amounts in any cluster are determined based on a simplified methodology, and thus there could be other limits that could have been reached (such as voltage stability) that have not been identified. In any case, addition of over 600-750 MW in a cluster would require a proxy 500 kV line, which could trigger impacts and costs beyond California; such impacts cannot be addressed using this simplified methodology.

4. Reactive Support and other Operational Considerations.

The study performed for the TRCR assumes that the renewable resources connecting to each cluster would exhibit the reactive capability of synchronous generators. Experience from past studies shows that voltage (reactive) support is required to reliably transmit the renewable resources to the load centers with the addition of any resources, including synchronous generators, located away from the load centers. These voltage support devices are typically

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9/ For renewable projects where PG&E is the purchaser, an impacted area is defined by identifying all transmission facilities in the same transmission planning area and/or adjacent neighboring Transmission Planning Areas where the cluster is located (i.e., electrically close to the cluster) . For Renewables bidding to deliver to southern California, the impacted area will include the system going to the point of delivery (in this case, PG&E's Midway Substation).

installed at various strategic locations, which are generally at or near the load centers. The levels of voltage support are estimated based on proxy devices and the results of past studies, and are technology neutral. Because the voltage support devices are not as "lumpy" as the other transmission facilities, they can be estimated *pro rata* with the renewable resource bids.

Due to the lack of specific detailed information associated with all the potential renewable projects that may respond to PG&E's RPS solicitation, this TRCR study employed very simplified methodologies. To avoid unnecessary addition of transmission network upgrades, PG&E assumes that each renewable project that is successful in winning the bid solicitation will do its share to maintain existing reliability of the system and by participating in the applicable nomograms and existing special protection schemes, such as the Path 15 Remedial Action Scheme.

IV. CONCLUSION

PG&E has developed its 2012 TRCR in accordance with the Methodology laid out in Attachment A of D. 04-06-013 and in D.05-7-040. The Transmission Ranking Costs developed in this report, along with the results of the Phase I (or equivalent) studies required of bidders, will allow PG&E to perform the needed least-cost best-fit analysis to rank and select renewable resources for development considering the transmission cost adder for the resource being bid.

APPENDIX TO
DRAFT 2012 TRANSMISSION RANKING COST REPORT OF
PACIFIC GAS AND ELECTRIC COMPANY

Table 3: 2012 TRCR
2017 Super Peak, Peak and Shoulder Periods

Substation Associated With Cluster of Potential Generation	Level	Maximum MW of Potential Generation In each Level	Limiting facility	Proxy Upgrade Facilities[1/]		
				Proxy Voltage Support Devices		
				SVC Qmax (MVAR)	SVC Qmin (MVAR)	Other Proxy Transmission network upgrades
Bellota	1	1,000		500	-333	
230 kV						
Caribou	1	100		50	-33	
230 kV	2	500	CARIBOU 230- BELDENTP 230 , BELDENTP 230 - TBL MT D 230	250	-167	Reconductor Caribou-Beldon-Table Mt 230 DCTL
	3	400	TABLE MT 500 - VACA-DIX 500	200	-133	Build new Table Mt-Vaca Dixon 230 DCTL (230 kV config)
	3	400	TABLE MT 500 - TESLA 500	200	-133	Build new Vaca Dixon-Tesla 230 DCTL
Carrizo	1	0				
115 kV	2	500	Several (Between Carrizo-Midway)	250	-167	Build new Midway-Carizo 230
	2	500	Several (Between Carrizo-Midway)	250	-167	Build new 230/115 xformer
Contra Costa Sub	1	0				
230 kV	2	100	Several (between Contra Costa and Los Pasitas)	50	-33	Reconductor Contra Costa-Cayetano/Los Positas 230 DCTL (Lone Tree, USWP-JRW and Doolan in between)
	2	100	CC SUB 230 - C.COSTA 230	50	-33	Build new CCSub-C.Costa 230 DCTL
	3	550	NDUBLIN 230 - VINEYD_D 230 & CAYETANO 230 - NDUBLIN 230	275	-183	Reconductor Cayetano/Los Positas - Vineyard 230 DCTL
	4	350	C.COSTA 230 - BRENTWOD 230	175	-117	Reconductor Contra Costa - Brentwood 230 DCTL
	4	350	ALTM MDW 230 - TESLA D 230	175	-117	Build new Contra Costa-Tesla 230 DCTL

1/ The proxy upgrades identified in this table are only for the purpose of calculating transmission ranking cost for use in ranking the renewable resources bids. For determining the actual network upgrades required to interconnect a renewable generator, the developer should reply upon the CAISO interconnection study results.

Table 3: 2012 TRCR
2017 Super Peak, Peak and Shoulder Periods

Substation Associated With Cluster of Potential Generation	Level	Maximum MW of Potential Generation In each Level	Limiting facility	Proxy Upgrade Facilities[1/]		
				Proxy Voltage Support Devices		
				SVC Qmax (MVAR)	SVC Qmin (MVAR)	Other Proxy Transmission network upgrades
Cortina	1	0				
230 kV	2	600	Several (Between Cortina and Vaca Dixon)	300	-200	Build new Cortina-Vaca Dixon 230 DCTL
	3	400	Several (Between Cortina and Vaca Dixon)	200	-133	Build new Vaca Dixon-Tesla 230 DCTL
Cottonwood	1	0	Several (between Cottonwood and Vaca Dixon)			
230 kV	2	500	Several (between Cottonwood and Vaca Dixon)	250	-167	Build new Cottonwood-CPVSta 230 DCTL
	2	500	Several (between Cottonwood and Vaca Dixon)	250	-167	Build new CPVSta-Cortina 230 DCTL
	2	500	Several (between Cottonwood and Vaca Dixon)	250	-167	Build new Cortina-Vaca Dixon 230 DCTL
	3	500	TABLE MT 500 - VACA-DIX 500 , ROUND MT 500 - TABLE MT 500 , TABLE MT 500 - TESLA 500	250	-167	Build new Vaca Dixon-Tesla 230 DCTL
Delta	1	0				
230 kV	2	500	Several (near Delta)	250	-167	Build new Delta-Cottonwood 230 DCTL
	2	500	TABLE MT 500 - VACA-DIX 500	250	-167	Build new Cottonwood-CPVSta 230 DCTL
	2	500	ROUND MT 500 - TABLE MT 500	250	-167	Build new CPVSta-Cortina 230 DCTL
	2	500	ROUND MT 500 - TABLE MT 500	250	-167	Build new Cortina-Vaca Dixon 230 DCTL
	2	500	Several (near Delta)	250	-167	Build new 500/230 xformer at Delta
Fulton	1	900		450	-300	
230 kV	2	100	FULTON 230 - IGNACIO 230	50	-33	Reconductor Fulton-Ignacio 230
Gates	1	0	BORDEN 230 - GREGG 230			
230 kV	2	1,000	BORDEN 230 - GREGG 230	500	-333	Reconductor Borden-Gregg 230kV DCTL

Table 3: 2012 TRCR
2017 Super Peak, Peak and Shoulder Periods

Substation Associated With Cluster of Potential Generation	Level	Maximum MW of Potential Generation In each Level	Limiting facility	Proxy Upgrade Facilities[1/]		
				Proxy Voltage Support Devices		
				SVC Qmax (MVAR)	SVC Qmin (MVAR)	Other Proxy Transmission network upgrades
Gregg	1	0				
230 kV	2	400	BORDEN230 - GREGG 230	200	-133	Reconductor Borden-Gregg 230kV DCTL
	3	300	BARTON 115 - HERNDON 115	150	-100	Reconductro Herndon-Barton 115kV DCTL
	4	200	STOREY 230 - BORDEN230	100	-67	Reconductor Borden-Storey 230kV DCTL
	4	200	GREGG 230 - HERNDON 230	100	-67	Recondcutor Gregg-Herndon 230kV line
	5	100	STOREY 2 230 - WILSON 230	50	-33	Reconductor Storey-Wilson 230kV DCTL
	5	100	KEARNEY 230 - HERNDON 230	50	-33	Reconductor Kearney-Herndon 230kV line
Helm	1	0				
230 kV	2	1,000	Borden-Gregg 230kV	500	-333	Reconductor Borden-Gregg 230kV DCTL
Humboldt	1	0				
115 kV	2	100	Several near Humboldt	50	-33	Build new Cottonwood-Humboldt 230 kV DCTL
	2	100	Several near Humboldt	50	-33	Build new 230/115 xformer at Humboldt
	3	400	ROUND MT 500 - TABLE MT 500	200	-133	Build new Cottonwood-CPVSta 230 DCTL
	3	400	TABLE MT 500 - VACA-DIX 500	200	-133	Build new CPVSta-Cortina 230 DCTL
	3	400		200	-133	Build new Cortina-Vaca Dixon 230 DCTL
Los Banos	1	0				
230 kV	2	1,000	BORDEN 230 - GREGG 230 #1	500	-333	Reconductor Borden-Gregg 230 DCTL
Metcalf	1	1,000	none	500	-333	
230 kV						
Midway	1	0				

Table 3: 2012 TRCR
2017 Super Peak, Peak and Shoulder Periods

Substation Associated With Cluster of Potential Generation	Level	Maximum MW of Potential Generation In each Level	Limiting facility	Proxy Upgrade Facilities[1/]		
				Proxy Voltage Support Devices		
				SVC Qmax (MVAR)	SVC Qmin (MVAR)	Other Proxy Transmission network upgrades
230 kV	2	1,400	Borden-Gregg 230kV	700	-467	Reconductor Borden-Gregg 230kV DCTL
	3	1,100	Midway 500/230kV Transformer	550	-367	Install a new 500/230kV transformer
	4	500	Los Banos-Westley 230kV DCTL	250	-167	Build new Los Banos-Westley 230 DCTL
Morro		0				
230 kV	2	600	Borden-Gregg 230kV	300	-200	Reconductor Borden-Gregg 230kV DCTL
	3	200	TEMPLETN 230 - MORROBAY 230 #1	100	-67	Reconductor Morro Bay-Gates DCTL (Templeton in between)
	4	700	Several between Gates and tesla	350	-233	Build new Los-Banos-Gates 230 SCTL (500 kV config)
	4	700		350	-233	Build new Tesla - Los Banos 230 SCTL (500 kV Config)
Moss Landing	1	1,000	none	500	-333	
230 kV						
Newark	1	1,000	none	500	-333	
230 kV						
Panoche	1	0				
230 kV	2	1,000	Borden-Gregg 230kV	500	-333	Reconductor Borden-Gregg 230kV DCTL
Pit1	1	0	Several			
230 kV	2	150	ROUND MT 500 - TABLE MT 500	75	-50	Build new Round Mt-Table Mt 230 DCTL
	2	150	TABLE MT 500 - VACA-DIX 500	75	-50	Build new Table Mt-Vaca Dixon 230 DCTL (230 kV config)
	3	450	Pit3-RM	225	-150	Build new Pit 3-Round Mt 230 DCTL

Table 3: 2012 TRCR
2017 Super Peak, Peak and Shoulder Periods

Substation Associated With Cluster of Potential Generation	Level	Maximum MW of Potential Generation In each Level	Limiting facility	Proxy Upgrade Facilities[1/]		
				Proxy Voltage Support Devices		
				SVC Qmax (MVAR)	SVC Qmin (MVAR)	Other Proxy Transmission network upgrades
	4	400	TABLE MT 500 - TESLA 500	200	-133	Build new Vaca Dixon-Tesla 230 DCTL
Rio Oso	1	0				
230 kV	2	375	EIGHT MI 230 - LODI 230	188	-125	Reconductor Lodi-8m 230 DCTL
	3	225	RIO OSO 230 - BRIGHTON 230	113	-75	Reconductor Rio Oso-Brighton 230 DCTL
	4	400	STAGG 230 - EIGHT MI 230	200	-133	Reconductor Stagg-8Mile 230 DCTL
	4	400	ATLANTC 230 - GOLDHILL 230	200	-133	Reconductor Atlantic-Goldhill 230 DCTL
	4	400	TABLE MT 500 - VACA-DIX 500	200	-133	Build new Table Mt-Vaca Dixon 230 DCTL (230 kV config)
	4	400	TABLE MT 500 - TESLA 500	200	-133	Build new Vaca Dixon-Tesla 230 DCTL
Round Mt	1	0				
230 kV	2	500	TABLE MT 500 - VACA-DIX 500	250	-167	Build new Table Mt-Vaca Dixon 230 DCTL (230 kV config)
	2	500	ROUND MT 500 - TABLE MT 500	250	-167	Build new Round Mt-Table Mt 230 DCTL
	3	500	TABLE MT 500 - TESLA 500	250	-167	Build new Vaca Dixon-Tesla 230 DCTL
Stagg	1	0	no upgrades			
230 kV	2	750	STAGG 230 - EIGHT MI 230	375	-250	Build new Stagg-8Mile 230 DCTL
	3	250	EIGHT MI 230 - TESLA E 230	125	-83	Reconductor Tesla-8Mile 230 DCTL
Summit	1	0				
115 kV	2	400	Several near Summit	200	-133	Build new Summit-Placer 230 DCTL
	3	100	RIO OSO 230 - BRIGHTON 230	50	-33	Reconductor Rio Oso-Brighton 230 DCTL
Table Mt	1	100	none	50	-33	
230 kV	2	200	TABLE MT 500 - VACA-DIX 500	100	-67	Build new Table Mt-Vaca Dixon 230 DCTL (230 kV config)

Table 3: 2012 TRCR
2017 Super Peak, Peak and Shoulder Periods

Substation Associated With Cluster of Potential Generation	Level	Maximum MW of Potential Generation In each Level	Limiting facility	Proxy Upgrade Facilities[1/]		
				Proxy Voltage Support Devices		
				SVC Qmax (MVAR)	SVC Qmin (MVAR)	Other Proxy Transmission network upgrades
	3	700	TABLE MT 500 - TESLA 500	350	-233	Build new Vaca Dixon-Tesla 230 DCTL
Tesla	1	1,000	none	500	-333	
230 kV						
Vaca Dixon	1	0				
230 kV	2	100	LONETREE 230 - USWP-JRW 230	50	-33	Reconductor Lone Tree to USWP-JRW
	2	100	CC SUB 230 - C.COSTA 230	50	-33	Build new CCSub-C.Costa 230 DCTL
	3	900	VACA-DIX 500 - TESLA 500	450	-300	Build new Vaca Dixon-Tesla 230 DCTL
Wilson	1	750	N/A	375	-250	
230 kV	2	250	Melone-Cottle 230kV	125	-83	Reconductor Melone-Cottle 230

Table 4: 2012 TRCR
2017 Off Peak Periods

Substation Associated With Cluster of Potential Generation	Level	Maximum MW of Potential Generation In each Level	Limiting Facility	Proxy Upgrade Facilities[1/]		
				Proxy Voltage Support Devices		
				SVC Qmax (MVAR)	SVC Qmin (MVAR)	Other Proxy Transmission network upgrades
Bellota	1	1,000		500		
230 kV						
Caribou	1	100		50	-33	
230 kV	2	500	CARIBOU 230- BELDENTP 230 , BELDENTP 230 - TBL MT D 230	250	-167	Reconductor Caribou-Beldon-Table Mt 230 DCTL
	3	400	TABLE MT 500 - VACA-DIX 500	200	-133	Build new 500/230 xformer
		0				
Carizo	1	0				
115 kV	2	200	Several (Between Carrizo-Midway)	100	-67	Build new Midway-Carizo 230
	2	200	Several (Between Carrizo-Midway)	100	-67	Build new 230/115 xformer
	3	300	WESTLEY 230 - LOSBANOS 230			Reconductor Los Banos-Westley 230 DCTL
	3	300	LOSBANOS 500 - GATES 500			Build new Los Banos-Midway 230 SCTL (500 kV config)
Contra Costa Sub	1	650		325	-217	
230 kV	2	350		175	-117	Build new CCSub-C.Costa 230 DCTL
Cortina	1	450		225	-150	
230 kV	2	550	Several	275	-183	Reconductor Cortina-Vaca Dixon 230 DCTL

1/ The proxy upgrades identified in this table are only for the purpose of calculating transmission ranking cost for use in ranking the renewable resources bids. For determining the actual network upgrades required to interconnect a renewable generator, the developer should reply upon the CAISO interconnection study results.

Table 4: 2012 TRCR
2017 Off Peak Periods

Substation Associated With Cluster of Potential Generation	Level	Maximum MW of Potential Generation In each Level	Limiting Facility	Proxy Upgrade Facilities[1/]		
				Proxy Voltage Support Devices		
				SVC Qmax (MVAR)	SVC Qmin (MVAR)	Other Proxy Transmission network upgrades
Cottonwood	1	0				
230 kV	2	1,000	Round Mountain 230 kV Transformer	500	-333	Build new 500/230 xformer
Delta	1	0				
230 kV	2	500	Several (near Delta)	250	-167	Build new Delta-Cottonwood 230 DCTL
	2	500	Several (near Delta)	250	-167	Build new 500/230 xformer at Delta
Fulton	1	300		150	-100	
230 kV	2	300	FULTON 230 - Lakeville 230	150	-100	Reconductor Fulton-Lakeville 230
	3	400	FULTON 230 - IGNACIO 230	200	-133	Reconductor Fulton-Ignacio 230
Gates	1	200	none	100	-67	
230 kV	2	100	WESTLEY 230 - LOSBANOS 230	50	-33	Reconductor Los Banos-Westley 230 DCTL
	3	450	LOSBANOS 500 - GATES 500	225	-150	Build new Los-Banos-Gates 230 SCTL (500 kV config)
	4	750	TESLA 500-LOSBANOS 500 and HENTAP1 230-GATES 230	375	-250	Build new Gates-Tesla 500 kV Transmission Line
Gregg		0				
230 kV	1	200		100	-67	
	2	300	WESTLEY 230 - LOSBANOS 230	150	-100	Reconductor Los Banos-Westley 230 DCTL
	3	250	LOSBANOS 500 - GATES 500	125	-83	Build new Los-Banos-Gates 230 SCTL (500 kV config)
	4	750	TESLA 500 - LOSBANOS 500	375	-250	Build new Gates-Tesla 500 kV Transmission Line
Helm	1	150		75	-50	
230 kV	2	400	WESTLEY 230 - LOSBANOS 230	200	-133	Reconductor Los Banos-Westley 230 DCTL

Table 4: 2012 TRCR
2017 Off Peak Periods

Substation Associated With Cluster of Potential Generation	Level	Maximum MW of Potential Generation In each Level	Limiting Facility	Proxy Upgrade Facilities[1/]		
				Proxy Voltage Support Devices		
				SVC Qmax (MVAR)	SVC Qmin (MVAR)	Other Proxy Transmission network upgrades
	3	200	LOSBANOS 500 - GATES 500	100	-67	Build new Los-Banos-Gates 230 SCTL (500 kV config)
	4	750	TESLA 500 - LOSBANOS 500	375	-250	Build new Gates-Tesla 500 kV Transmission Line
Humboldt 115 kV	1	0				
	2	500	Several near Humboldt	250	-167	Build new Cottonwood-Humboldt 230 kV DCTL
	2	500		250	-167	Build new 230/115 xformer at Humboldt
Los Banos 230 kV	1	100		50	-33	
	2	650	WESTLEY 230 kV - LOSBANOS 230 kV	325	-217	Reconductor Los Banos-Westley 230 DCTL
	3	750	KEARNEY 230 kV - HERNDON 230 kV	375	-250	Reconductor Herndon-Kearney 230 DCTL
Metcalf 230 kV	1	1,000		500	-333	
Midway 230 kV	1	0	Several			
	2	300	Los Banos-Westley 230kV DCTL	150	-100	Reconductor Los Banos-Westley 230 DCTL
	3	450	LOSBANOS 500 - MIDWAY 500	225	-150	Build new Los Banos-Midway 230 SCTL (500 kV config)
	4	750	TESLA 500 - LOSBANOS 500 #1	375	-250	Build new Midway-Tesla 500 kV Transmission Line
	5	1,000	Several	500	-333	Convert Midway-Tesla 500 kV SCTL to DCTL
Morro 230 kV						
	1	0	Several			
	2	250	WESTLEY 230 - LOSBANOS 230 #1	125	-83	Reconductor Los Banos-Westley 230 DCTL

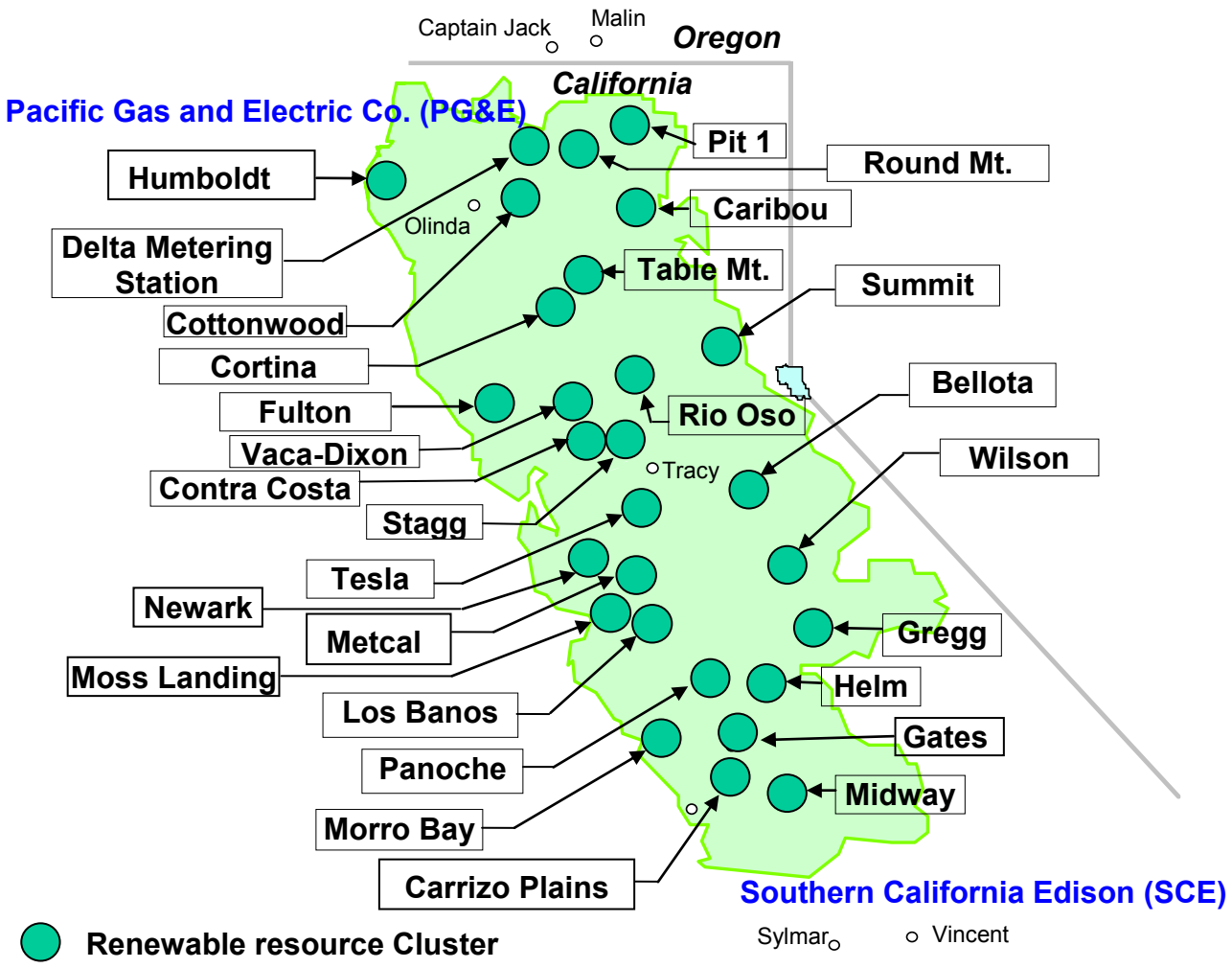
Table 4: 2012 TRCR
2017 Off Peak Periods

Substation Associated With Cluster of Potential Generation	Level	Maximum MW of Potential Generation In each Level	Limiting Facility	Proxy Upgrade Facilities[1/]		
				Proxy Voltage Support Devices		
				SVC Qmax (MVAR)	SVC Qmin (MVAR)	Other Proxy Transmission network upgrades
	3	200	LOSBANOS 500 - GATES 500 #1	100	-67	Build new Los-Banos-Gates 230 SCTL (500 kV config)
		0				
	4	550	GATES 230 - MORROBAY 230 #1	275	-183	Reconductor Morro Bay-Gates DCTL (Templeton in between)
	5	500	TESLA 500 - LOSBANOS 500 #1	250	-167	Build new Gates-Tesla 500 kV Transmission Line
	5	500	Gates 230 - Henreitta 230	250	-167	Build new Gates-Henreitta 230
Moss Landing 230 kV	1	350		175	-117	
	2	650	WESTLEY 230 - LOSBANOS 230	325	-217	Build new Los Banos-Westley 230 DCTL
Newark 230 kV	1	1,000		500	-333	
Panoche 230 kV	1	100	none	50	-33	
	2	250	WESTLEY 230 - LOSBANOS 230 #1	125	-83	Reconductor Los Banos-Westley 230 DCTL
	3	400	KEARNEY 230 - HERNDON 230 #1	200	-133	Reconductor Herndon-Kearney 230 DCTL
	4	750	LOSBANOS 500 - GATES 500 #1 , TESLA 500 - LOSBANOS 500 #1	375	-250	Build new Gates-Tesla 500 kV SCTL
Pit1 230 kV	1	50	None	25	-17	
	2	250	Several	125	-83	Reconductor Pit 3-Round Mt 230 DCTL
	2	250	Several	125	-83	Reconductor Pit 1-Pit 3 230 DCTL
	3	350	RD MT 1M 500 - ROUND MT 230 Transformer	175	-117	Build new 500/230 xformer
	4	350	Several	175	-117	Reconductor Cottonwood-Round Mt 230 kV DCTL

Table 4: 2012 TRCR
2017 Off Peak Periods

Substation Associated With Cluster of Potential Generation	Level	Maximum MW of Potential Generation In each Level	Proxy Upgrade Facilities[1/]			
				Proxy Voltage Support Devices		
			Limiting Facility	SVC Qmax (MVAR)	SVC Qmin (MVAR)	Other Proxy Transmission network upgrades
Rio Oso	1	1,000		500	-333	
230 kV						
Round Mt	1	400		200	-133	
230 kV	2	600	Round Mountain 230 kV Transformer	300	-200	Build new 500/230 xformer
Stagg	1	1,000		500	-333	
230 kV	2	0				
Summit	1	0				
115 kV	2	500		250	-167	Build new Summit-Placer 230 DCTL
Table Mt	1	500		250	-167	
230 kV	2	500		250	-167	Build new 500/230 xformer
Tesla	1	1,000	none	500	-333	
230 kV						
Vaca Dixon	1	1,000		500	-333	
230 kV						
Wilson	1	0				
230 kV	2	350	WESTLEY 230 - LOSBANOS 230 #1	175	-117	Reconductor Los Banos-Westley 230 DCTL
	3	350	STOREY 2 230 - WILSON 230 #1	175	-117	Reconductor Wilson-Storey 230 DCTL
	3	350	STOREY 2 230 - BORDEN 230 #1	175	-117	Reconductor Storey-Borden 230 DCTL
	4	300	LOSBANOS 500 - GATES 500 #1	150	-100	Build new Los-Banos-Gates 230 SCTL (500 kV config)

Exhibit 1
PG&E Substations Associated with Renewable Resource Clusters for 2012 TRCR



VERIFICATION

I, Bangalore Vijayraghavan, am an employee of PACIFIC GAS AND ELECTRIC COMPANY, a corporation, and am authorized to make this verification on its behalf. I have read the foregoing **DRAFT 2012 TRANSMISSION RANKING COST REPORT OF PACIFIC GAS AND ELECTRIC COMPANY (U 39-E) FOR RENEWABLES PORTFOLIO STANDARD PROCUREMENT**, dated June 27, 2012.

The statements in the foregoing document are true of my own knowledge, except as to matters which are therein stated on information and belief, and as to those matters I believe them to be true.

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

Executed on this 27th day of June 2012 at San Francisco, California.

/s/ Bangalore Vijayraghavan

Bangalore Vijayraghavan
Manager, Transmission System Planning
Pacific Gas and Electric Company