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PG&E Data Request No.:	Energy Division Data Request on RA valuation methodology		
PG&E File Name:			
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PG&E Witness:		Requester:	Sean Simon

MARKET VALUATION OF PENDING RPS POWER PURCHASE AGREEMENTS

QUESTION 1

a) For the 35 power purchase agreements—as calculated and submitted by PG&E in recent advice letters—please provide the methodology and inputs used to calculate the

(i) Net Qualifying Capacity and

(ii) RA value as a \$/MWh, for each project.

For both calculations PG&E must document and justify the methodology and inputs used.

b) Either input the necessary data into the spreadsheet attached to the data request, or submit the relevant work papers associated with each advice letter.

c) Include the annual \$/kw-yr price, throughout the contract term, used to calculate the \$/MWh RA value and document and justify the inputs for each year or range of years.

d) PG&E's response should clearly identify and explain the methodology and inputs used to calculate the Net Qualifying Capacity and RA value as a \$/MWh, for each project.

ANSWER 1

- a) Following are the methodology and inputs used to calculate Net Qualifying Capacity and RA value as a \$/MWh, for each project.

(i) Net Qualifying Capacity—Methodology and Inputs

Pursuant to D.09-06-028, for intermittent energy (e.g., wind and solar) products, the qualifying capacity for each month is determined by the capacity that has an exceedance factor of 70% for the five on-peak hours. That is, for 70% of the time, per hour energy generation for the five peak hours (HE14-HE18 for April through October, and HE17-HE21 for the rest of the year) is greater than or equal to the qualifying capacity. For other types of products, the qualifying capacity is determined by the monthly average of the hourly (noon to 6 pm, weekdays only) generation profile of the offer. Combination products will be considered accordingly. A unit must be online for sixty days before it can count for RA and hence for capacity benefit. No RA value is assigned for an out-of-state intermittent energy offer if firming and shaping is not associated with the offer.

For PPAs, energy generation profile of twelve months by twenty-four hours is provided by bidders. For non-intermittent energy offer, the monthly qualifying capacity is determined by taking the average MW generation between 12 noon to 6 pm, weekdays. For intermittent energy offer, energy generation during the five hours (HE14-HE18 for April through October, and HE17-HE21 for the rest of the year) is sorted from high to low for each month. The average of the lowest two hourly energy generation is then the qualifying capacity for this month, since this is the closest approximation of the 70% exceedance level one can estimate from the available data. For example, if the expected April energy generation for HE14-HE18 are 35.53, 37.05, 39.77, 40.96, and 40.80 MWh/h, respectively, the qualifying capacity for April is then calculated as 36.29 MW.

Average Qualifying Capacity, as shown in the attached spreadsheet represents the Net Qualifying Capacity.

(ii) RA value as a \$/MWh—Methodology and Inputs

The same set of market price information used for calculation of energy benefits is used to calculate PG&E's capacity value curve in \$/kW-yr, using PG&E's avoided generation capacity cost (ACC) model..

The capacity benefit for RA, for each year of availability, is the monthly quantity of qualifying capacity multiplied by the monthly capacity value, discounted to 2010 dollars and summed across years. The total discounted capacity benefit is then divided by total discounted MWh of energy, expressed in terms of present value per MWh.

The RA value for this data request is the RA value used in each Advice Letter.

- b) As requested, the necessary data has been input into the spreadsheet attached to the data request.
- c) The annual \$/kW-yr price of RA—modeled as avoided generation capacity cost (ACC)—throughout the contract term, used to calculate the \$/MWh RA value is shown in the tab labeled, “RA value \$kW-yr”, in the attached spreadsheet. These ACC values are shown for eight forward price quote dates. This is because the ACC is a function of energy and gas forward prices that vary over time. These eight vintages of ACC were used to evaluate the 35 PPAs in question.

The economic concept of ACC is an equilibrium in the capacity market in a particular year. That is, the ACC is the minimum amount of capacity payment a developer would have to receive to break even on his or her investment to operate in that particular year. Prior to a year when new capacity is needed, capacity for RA can be purchased from existing resources. These tend to be less expensive than new resources. However, in a year when new capacity is needed—and thereafter—the value of capacity needed for RA would be the cost of a new resource. PG&E uses the ACC approach in many resource planning and rate design applications.

The ACC model calculates the net capacity costs, in \$/kw-year, for existing steam generation, a new combustion turbine (CT) and a new combined cycle plant (CCGT). The parameter inputs for the new CT and the new CCGT are largely derived from the most recently available Market Price Referent (MPR) resolution from the CPUC or generation cost report from the CEC. The parameter inputs for the existing steam are currently based on data similar to Pittsburgh 5's generation unit. Input data includes heat rates, operating and maintenance (O&M) costs, cost escalation rates, taxes, insurance, debt and other financial inputs.

The ACC model calculates avoided generation capacity costs as fixed real annual payments, that when escalated at the inflation rate, are sufficient for investors to recover the return on investment that is not covered by the energy sales made over the operating life of the unit. This represents the unit's fixed costs less the gross margins from energy sales.

In preparing its ACC, PG&E uses forward price curves for electricity and natural gas as of an indicated date. These prices are for power delivered at the transmission voltage level at the NP-15 delivery point or natural gas delivered at a plant's burnertip. These forward prices are used to calculate the gross margin as explained below.

To estimate the ACC, PG&E first calculates the real economic carrying charge for a generating unit to determine the annual, nominal dollar, fixed costs of the generating unit for each subsequent year. Then, PG&E calculates and subtracts the marginal resource's "gross margin"—achieved by selling firm energy—from the annual fixed cost of the resource in that year.

PG&E uses a Black option valuation model to estimate the value of the generating unit's future net energy benefits. The inputs that PG&E used in these calculations include:

- Monthly forward NP-15 firm energy market prices and their respective volatilities.
 - Monthly forward natural gas prices and their respective volatilities.
 - The expected monthly correlations between the forward firm energy prices and forward natural gas prices.
 - The variable cost of the generating unit based on its heat rate and the variable O&M costs that would be incurred to produce energy."
- d) PG&E's explanation of the methodology and inputs used to calculate the Net Qualifying Capacity and RA value as a \$/MWh, for each project, are given in part a) above.