Docket No. 09-IEP-1G and No. 03-RPS-1078
***2009 IEPR* - Feed-in Tariffs**

Quantifying the Effect of Natural Gas Price Elasticity on the Cost of a Feed-In Tariff

December 10, 2008

California Energy Commission
1516 9th Street, MS-29
Sacramento, CA 95814-5512

Commissioners:
Karen Douglas
Jackalyne Pfannensteil
Jeffrey D. Byron

Dear Commissioners,

We are writing in support of a California Renewable Energy Feed-In Tariff (FIT) currently being considered by the California Energy Commission and which, we believe, will boost the goals of the Renewable Portfolio Standard (RPS) as required by SB 1969.

The CEC has put a great deal of time and effort into investigating all aspects of a potential statewide FIT, and deserves praise for putting California, once again, in a defining position with regards to energy policy in the United States. Now it is time to make the final step in instituting a program that will make a success of the RPS: A well-crafted FIT including a must-take contract available to projects of an installed capacity of 20 MW and under.

The current California FIT is being discussed, in part, as a means to provide the time-sensitive RPS with the support needed to make up the 8% difference by the now-adjusted 2013 date and can assist with Governor Schwarzenegger's newest goal of 33% renewables by 2020. Much of the opposition to bringing a FIT online is the cost premium for renewable energy that is levied onto ratepayers. We have studied one way in which this effect is mitigated – the depression of natural gas prices due to reduced natural gas demand from renewable deployment.

In this analysis, we explore the effect of bringing the necessary 8% of California renewable electricity online through photovoltaic (PV) generation increasing over four years (2% per year) starting in 2009. We assume a FIT contract length of 20 years and a price of 22¢/kWh, decreasing by 1¢/kWh per year over the four years. For example, in 2011 a 20¢/kWh, 20 year contract would be offered to PV electricity producers.

Installing this large volume of PV generation will displace electricity currently produced using natural gas during peak load and therefore reduce demand for natural gas. Due to the inverse price elasticity of supply, natural gas prices will be depressed nationally and regionally, resulting in significant ratepayer savings. National Energy Modeling System (NEMS) calculations show the national inverse price elasticity factor (% change in price / % change in demand) for natural gas to be approximately 1.2. Due to local supply constraints that cause a tight regional market in California, the impact of this national inverse elasticity factor is amplified to an average inverse elasticity factor of 2.8 over a 20 year period. This means that in California, a reduction in natural gas demand will more strongly affect the local natural gas price, especially in the short term. Ratepayer savings were derived using the methodology of Ryan Wiser and Mark Bollinger from Lawrence Berkeley National Laboratory and based on natural gas projections from the California

Energy Commission and the US Energy Information Agency.

It should be noted that our analysis of natural gas price depression will hold for any renewable or mix of renewables that displace large fractions of electricity produced by natural gas – photovoltaics are used here simply as an important example. We assume that 85% of the PV electricity generated translates into natural gas displacement.

Our results show that a FIT replacing 8% of California electricity consumption with photovoltaic electricity over four years would have a present-value impact (7% real discount rate) of at least $2.7 bn cumulative savings to utility ratepayers on natural gas costs over the course the FIT program (based on 20 year fixed rate FIT contracts). **This mitigates the cost of photovoltaic electricity brought on by the FIT in California by approximately 1.11¢/kWh.** Figure 1 shows this effect graphically for the first year of electricity production.

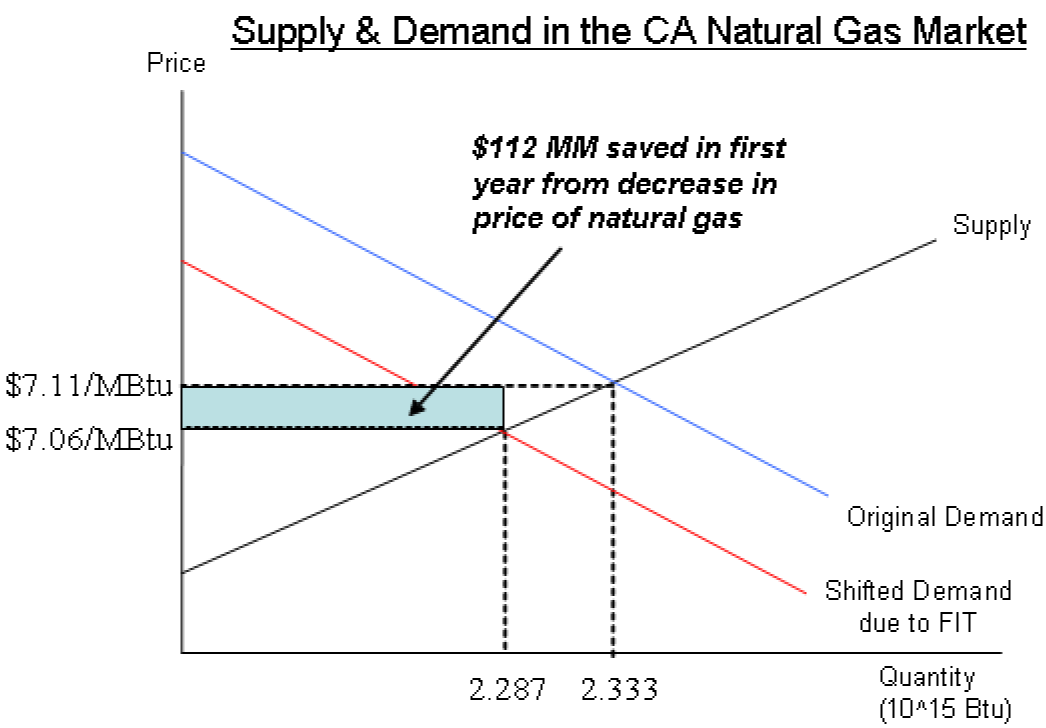

Figure 1: The effect on electricity prices of decreasing natural gas demand, depicted for the first year of FIT electricity production.

This mitigation of ratepayer cost due to natural gas price elasticity should be considered alongside other value adders for photovoltaics such as time of delivery (TOD) and locational benefits (LB), as shown in Figure 2.

Time of Delivery: As solar energy generally offsets peak or near-peak loads, electricity produced by photovoltaics is on average more valuable than that of their baseload counterparts. This is quantified in a TOD multiplier to the base Market Price Referent (MPR), as suggested in the California Public Utilities Committee (CPUC) resolution E-4214 to the MPR. For solar we standardized this number from several service areas and varying times of delivery multipliers to approximately 1.3.

Locational Benefits: For photovoltaic installations of 20 MW and under, renewable electricity can be produced on the distribution side of the grid, thereby alleviating distribution and transmission losses, as well as reducing the necessarily to build new transmission. As shown by the CPUC-commissioned E3 Cost-Effectiveness Model and subsequent analysis by GreenVolts, this effect adds 35% value to the base MPR for photovoltaics.

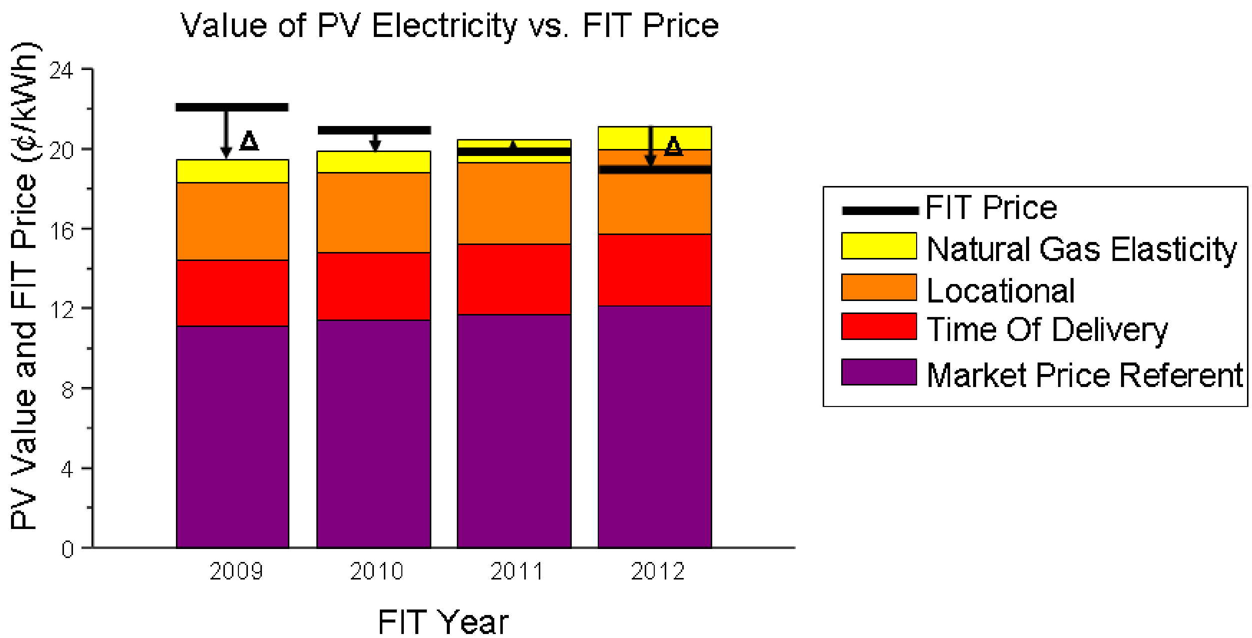

Figure 2: Cost breakdown over the four years of FIT introduction. Note: values are not discounted. Natural gas elasticity, locational, and time of delivery benefits all add to the base MPR value for the value of new generation capacity. The difference between the price of the FIT and the MPR plus these three benefits is the premium (Δ) paid by ratepayers to install photovoltaics. A negative value of Δ, as is shown in 2011 and 2012, indicates that photovoltaic electricity can pay for itself – it can have a net zero or slightly positive *benefit* to ratepayers!

The FIT structure in this paper has been suggested by concentrated solar power company GreenVolts as a fair structure to encourage photovoltaic deployment while not overburdening ratepayers with undue producer profits. It has been shown here that this FIT structure can reduce the premium paid for photovoltaic electricity to values less than zero, thereby making photovoltaics cost effective and grid competitive.

Thank you for your consideration,

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We would like to give special thanks to Craig Lewis from GreenVolts for much help and advice throughout the process of this analysis.

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