SOUTHERN CALIFORNIA EDISON
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Manuel Alvarez
Manager, Regulatory Policy and Affairs

June 27, 2014

California Energy Commission
Re: *Estimated Cost of New Renewable and Fossil Generation in California*
CEC-200-2014-003-SD
Publications, MS-5
1516 Ninth Street
Sacramento, CA 95814-5512
Ivin.Rhyne@energy.ca.gov

Re: Southern California Edison Company's Comments on the California Energy Commission's *Estimated Cost of New Renewable and Fossil Generation in California*, Publication Number: CEC 200-2014-003-SD

Dear Mr. Rhyne:

The California Energy Commission (Energy Commission) released the *Estimated Cost of New Renewable and Fossil Generation in California* Draft Staff Report ("the Report") in May, 2014. Southern California Edison (SCE) has reviewed the Report and appreciates the opportunity to provide these written comments.

The Report is an important tool for ensuring that cost assumptions for new generation are used consistently in a variety of regulatory energy policy decision-making forums. Due to the Report's broad influence, it is essential that its underlying inputs and assumptions are accurate. In these comments, SCE (1) requests clarification about specific issues and statements within the report (*see* Appendix A), and (2) reiterates some of its previous comments recommending improvements regarding the Report's approach for calculating levelized costs (see Appendix B).

With specific regard to levelized costs, SCE notes that the Report continues to only estimate developer costs and does not account for differences in value among the resources studied. In addition to modeling differences in developer costs (e.g., cost of capital, component costs, operation and maintenance) among technologies studied, the Report should properly account for the following differences in value:

- **Capacity value** – The generation technologies studied in the Report have varying levels of availability during times of system stress. Excluding these differences will underestimate the cost of energy from resources, such as wind and solar, with relatively lower availability during times of system stress.

- **Energy value** – Without any associated storage technology, wind and solar resources cannot optimize energy production relative to market prices. Excluding these differences will overestimate the cost of energy from dispatchable resources, such as simple cycle and combined cycle combustion turbines.

- **Asset life** – Longer-lived assets provide economic value over a longer period of time than shorter-lived assets. Excluding these differences will underestimate the value of longer-lived assets relative to shorter-lived assets.

- **Integration costs** - Intermittent, must-take resources require additional balancing services (i.e. regulation and following) to ensure that system load and generation are balanced at all times. Excluding these differences will underestimate the cost of energy from intermittent resources, such as wind and solar.

As SCE demonstrated in a May 16, 2011[1] presentation to the Energy Commission on this topic, without quantitative estimates for these values, users of the Report may develop a fundamental misunderstanding of the costs associated with generation, which may, in turn, ultimately diminish the value of the Report. Correcting the Report will enhance its usefulness by providing its users with a better understanding of the resource selection process, enabling a more sophisticated and thoughtful dialogue regarding energy policy, and enhancing the ability of regulators to make sound decisions.

For further detail on SCE's recommended changes to the Report, please review the previously submitted comment letters in Appendix B, as well as SCE's previous presentation and supporting analysis, which is posted on the Energy Commission's 2011 Integrated Energy Policy Report website.[2]

In conclusion, SCE appreciates the Energy Commission's consideration of these comments and looks forward to its continuing collaboration with the Energy Commission. Please do not hesitate to contact me at (916) 441-2369 with any questions or concerns you may have. I am available to discuss these matters further at your convenience.

Very truly yours,

/s/ Manuel Alvarez

Manuel Alvarez

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1 *See:* SCE Presentation on Cost of Generation IEPR Workshop, available at: http://www.energy.ca.gov/2011_energypolicy/documents/2011-05-16_workshop/presentations/Southern_California_Edison_2011-05-03.pdf

2 *See* SCE Analysis, Comments, and Presentation, May 16, 2011, available at: http://www.energy.ca.gov/2011_energypolicy/documents/index.html#05162011

Appendix A

APPENDIX A

Section	Sub-Section	Issue / Statement	Comment	Suggestion / Question
Chapter 6 – Wind Technology	Current Costs and Plant Characteristics, p. 97 at ¶¶ 1, 2.	"Costs that include these ancillary costs can be found in Table 25" (and 26 in the following paragraph)	No defined or implied definition of "ancillary costs"	Explain what "ancillary costs," what they include, and the source cost figures
Chapter 7 – Geothermal Technology	Geothermal-*Binary* – Current Costs & Plant Characteristics	"Instant costs are for equipment and construction only and do not include costs such as land and permitting costs, which would increase mid costs by about 2 percent."	No supporting reference for the 2% figure.	Explain the basis for the stated 2% increase
Chapter 7 – Geothermal Technology	Geothermal-*Flash* – Current Costs & Plant Characteristics	"Capital costs are for equipment and construction only and do not include costs such as land and permitting costs, which would increase mid costs by about 3 percent. This accounts for the differences with the Table 30 values"	No supporting citation for the 3% figure.	Explain basis for the stated 3% increase. What is the difference in the table value?
Appendix B – Gas Fired Plants	Table B-3	"Water treatment facilities cost (ZLD?)"	Costs between the two treatment systems can vary significantly	Was the requested cost for process water treatment or a ZLD system?
		"Total Capital Cost of Facility" (TCCF)	No mention of major electrical systems (GSU, electrical breakers, switchgear, switchyard), HRSG, Catalyst, or Balance of Plant, which represent significant project costs.	Explain if this equipment cost is included in the TCCF.
	Table B-4/B-5	Avg. Capacity Factor (CF)	Average CF calculated as a simple average of the annual CF's.	A weighted average will reflect the variances between respective years CF.
	Table B-8	Avg. Heat Rate (HR)	Average HR calculated as a simple average of the annual HR	A weighted average will reflect the variances between respective years CF.
	Table B-14	The paragraph above the Table references three combined cycle cases	The correct reference should be to simple cycle cases.	Delete cite to combined cycle cases and cite simple cycle cases.
Appendix D Description of Models	Page D-1, Instant Costs, at ¶ 2.	"The COG Model will then add ancillary costs as necessary, such a land costs and licensing costs, to get the complete instant cost."	Meaning of "ancillary" and "complete instant" costs is unclear.	What are "ancillary costs" and "complete instant cost?"

Appendix B

SOUTHERN CALIFORNIA EDISON
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June 1, 2011

California Energy Commission
Docket Office, MS-4
Re: Docket #11-IEP-1D Reliability
1516 Ninth Street
Sacramento, CA 95814-5512
docket@energy.state.ca.us

Re: California Energy Commission Docket No. 11-IEP-1D: Comments Related to Staff Workshop on Improving Techniques for Estimating Costs of California Generation Resources

To Whom It May Concern:

On May 16, 2011, the California Energy Commission ("Energy Commission") held a Staff Workshop on Improving Techniques for Estimating Costs of California Generation Resources (the "Workshop") in connection with the 2011 Integrated Energy Policy Report ("2011 IEPR"). Southern California Edison Company ("SCE") presented at that Workshop.

SCE found the Workshop to be very informative and appreciates the Staff efforts to organize the presentation panels and to conduct a review of how the Energy Commission evaluates generation resource costs. As indicated in its presentation, SCE is supportive of changes to the *Comparative Costs of California Central Station Electricity Generation* report ("Cost of Generation Report") that increase the Cost of Generation Report's relevance by including implicit economic costs in addition to explicit accounting costs as part of its levelized cost metric. The inclusion of implicit costs allows for the comparison of levelized costs across different types of resources and can provide users of the Cost of Generation Report with more accurate insight into the relative costs of different generation technologies.

At the Workshop, some participants suggested that including implicit costs required a system simulation. SCE does not believe that a system-wide simulation analysis is necessary to estimate the implicit costs identified in its presentation. Sufficient sources exist to provide useful estimates for these costs. For example, SCE has prepared a modified version of the Cost of Generation model that uses a market price curve based on historic data and renewable integration costs based on a

$/MWh cost metric. The revised model was included on the Energy Commission's website as a part of SCE's presentation.[1]

Further comments on the cost of generation model are attached as Appendix A hereto, including an in-depth discussion of the recommendations that SCE made at the Workshop.

Finally, SCE concurs with the presenters from Energy and Environmental Economics ("E3") and Black & Veatch that resources with widely varying capacity factors should not be compared on an all-in dollar per megawatt-hour ("$/MWh") basis. SCE recommends that the Energy Commission either use the screening curve approach outlined in SCE's presentation or simply group together resources with similar capacity factors.

As always, SCE appreciates having the opportunity to submit comments to the Workshop and to work with the Energy Commission to resolve outstanding issues. Feel free to contact me regarding any questions or concerns.

Sincerely,

/s/ Manuel Alvarez

Manuel Alvarez, Manager
Regulatory Policy and Affairs
Southern California Edison Company
1201 K Street, Ste. 735
Sacramento, California 95814
(916) 441-2369

[1] *See* SCE Calculations for CEC Cost of Generation Report, May 16, 2011, available at: http://www.energy.ca.gov/2011_energypolicy/documents/2011-05-16_workshop/2011-05-16_SCE_Calculations_for_CEC_Cost%20of_Generation.xlsx

Appendix A
SCE Recommendations on Improving Techniques
for Estimating Costs of California Generation Resources

Since 2003, the California Energy Commission ("the Energy Commission") has released *Comparative Costs of California Central Station Electricity Generation* ("Cost of Generation Report") as part of the bi-annual *Integrated Energy Policy Report* ("IEPR"). The report calculates the "total costs of building and operating a power plant over its economic life converted to equal annual payments, in dollars per megawatt-hour ("$/MWh") and dollars per kilowatt-year ("$/kW-year")."[2] These values are referred to as an asset's "levelized" cost.

SCE appreciates the Energy Commission's efforts to publish transparent estimates of different resource costs. From the Energy Commission staff's presentation, it is clear that a considerable amount of time and effort goes into developing reasonable and unbiased cost estimates for a significant number of different California generating technologies. Such estimates are not readily available publicly and can be valuable to industry professionals. Furthermore, they help to ensure that consistent cost assumptions are used across various regulatory forums.

Another key finding of the Workshop was that the Cost of Generation Report in its current form does not provide an accurate rank-ordering of resource levelized costs for two primary reasons. First, the Cost of Generation Report only captures explicit, accounting costs. For instance, Black & Veatch noted this issue in their presentation on the use of levelized cost as part of the Renewable Energy Transmission Initiative ("RETI"). The Cost of Generation model does not capture implicit, economic costs such as differences in economic life, capacity dependability, time of delivery flexibility, and integration requirements. Also, it compares resources with different capacity factors on a single metric. As highlighted in the presentation by Energy and Environmental Economics ("E3"), this metric varies widely depending on capacity factor assumption and may lead to inappropriate conclusions regarding cost-effectiveness when comparing resources with different capacity factors.[3] As a result of the Workshop, it is clear that the Energy Commission must decide how the next iteration of the Cost of Generation Report can be used.

If the Energy Commission wants to provide comparable estimates of levelized cost for different resources, the analysis must include implicit economic costs in addition to explicit accounting costs, and it must remove the all-in $/MWh comparison of resources with differing capacity assumptions. Though some of these costs are sometimes estimated using system-wide simulation using production cost software and a system perspective, it is possible to estimate these costs using historical data or research studies.[4] To incorporate these implicit costs, SCE makes the following recommendations.

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[2] http://www.energy.ca.gov/2010publications/CEC-200-2010-002/index.html
[3] http://www.energy.ca.gov/2011_energypolicy/documents/2011-05-16_workshop/presentations/Michele_Chait_E3_Cost_of_Generation.pdf (page 23)
[4] Appendix A provides a detailed example of the calculations that SCE presented during the Workshop.

First, compare levelized cost on a real basis. Calculating levelized cost on a nominal basis (i.e. equal values for all years in nominal dollars) will distort reported cost when comparing resources with different asset lives. To illustrate this, consider two resources (see Figure 1) with the same levelized real cost[5] but differing economic lives. Resource 1 will have a lower levelized nominal value despite providing the same value from year to year as Resource 2. If comparing resources on a levelized nominal basis only, a decision maker will mistakenly believe that Resource 1 is a better value when in fact he or she should be indifferent between the two assets because he or she will have to build a new Resource 1 in year 20. The fundamental issue with levelized nominal values is that they do not consider replacement energy and capacity costs. Two possible solutions are to assume generic replacement energy and capacity cost and evaluate all resources on an equal to time frame or to assume that resources will be replaced with the same resource (see Figure 2). The analysis presented by SCE at the Workshop assumed the latter by calculating a levelized real value (i.e. equal values for all years in constant dollars). Using this metric, resources with differing economic lives can be accurately compared.

Second, compare resources on an equal capacity value basis. Comparing resources on a $/kW-year basis, where kW-year is equal to nameplate capacity, makes the implicit assumption that each resource's nameplate capacity is approximately equal to what can be provided to the system at any given moment throughout the year. In other words, a kW of one resource is equivalent to a kW of another resource in terms of value to system reliability. This assumption may not be reasonable in the case of intermittent resources. When comparing two resources with differing capacity value, an unadjusted $/kW-year metric will overvalue the resource with a lower capacity value because it is not responsible for providing the same value as the alternative resource (see Figure 3). Hence, a decision maker will incur an additional capacity cost by choosing Resource 1 that is not reflected in the fixed costs of this resource. To accurately compare Resource 1 to Resource 2, the levelized cost of Resource 1 should reflect the cost of the additional capacity necessary to provide the same reliability to the system.

Third, the levelized cost of intermittent, must-take resources should consider the interaction between their expected generation profiles and associated market prices. The differential between the prices an intermittent resource would optimally choose to dispatch against and its actual generation profile are an opportunity cost associated with owning and operating that resource (see Figure 5). Currently, the Cost of Generation report does not consider this cost when comparing the levelized costs of intermittent resources to those of dispatchable resources. As Paul Joskow noted in his paper presented at a Berkeley Energy Institute Electricity Policy Conference, comparing traditional levelized cost "is seriously flawed because it effectively treats all MWhs supplied as a homogeneous product governed by the law of one price."[6] In the analysis presented at the

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[5] This is also known as a real economic carry charge.

[6] Joskow, Paul. 2010. "Comparing the Costs of Intermittent and Dispatchable Electricity Generating Technologies." Massachusetts Institute of Technology, Center for Energy and Environmental Policy Research Working Paper 1013. http://tisiphone.mit.edu/RePEc/mee/wpaper/2010-013.pdf

Workshop, SCE used an historical market heat rate curve for Southern California Edison's Default Load Aggregation Point ("DLAP") and the CEC's levelized gas price from the Cost of Generation Model to create a forecasted market price curve. Then using historical generation profiles, SCE calculated the differential between the average price a wind and solar resource would face to the optimal price for a given capacity factor. This differential is then added to the levelized cost of the intermittent resource.

Fourth, the levelized cost of intermittent resources should consider integration costs. Intermittent resources require additional ancillary services in order to ensure that load and generation are always in balance. Figure 6 is an example of how variable wind generation can be throughout a month. This variability requires the procurement of additional regulation, ramping, and following resources for integration. Estimates for these additional costs are very rough and are contingent upon technology, location, and the amount of intermittent resources already on the system. There are a number of public sources for wind integration costs that can be relied upon by the Energy Commission, however. For instance, an evaluation of a Pacific Gas & Electric ("PG&E") renewable integration model conducted by Lawrence Berkeley National Laboratory found scenarios in which the model produced results from $13 to $46/MWh. In contrast, the study authors noted outside-of-California analyses generally below $10/MWh.[7] SCE's presentation assumed $15/MWh as an interim value, with the expectation that more refined values will be available in the future.

Finally, the Energy Commission should compare resources on a $/kW-year basis and using a screening curve that controls for the impact of capacity factor levelized cost. Figure 6 and 7 show the results of the analysis presented by SCE at the workshop and are consistent with each other. Figure 6 shows the $/MWh impact of each of the four implicit costs noted above as well as an estimate of greenhouse gas emissions compliance costs. Figure 7 shows the same analysis using SCE's recommended screening curve approach. Levelized $/kW-year is displayed on the y-axis and capacity factor is displayed on the x-axis. Dispatchable resources are represented by a line from zero to one hundred percent capacity factor. Non-dispatchable resources are represented by a single point. This approach more clearly reflects the underlying economics of resource planning. For instance, it is now clear why CTs are often constructed when a resource is only needed to run a few hours out of the year. The cheapest conventional resources create a "screening curve" by which all other resources are benchmarked. Both solar and wind resources should be benchmarked to a CCGT with an equivalent capacity factor according to the screening curve, and both resource technologies are slightly more expensive than a CCGT.

If the Energy Commission decides to keep the scope of the Cost of Generation Report narrow, then the Energy Commission should reconsider the purpose of the report as "comparative." For instance, the current title of report claims to provide comparative costs and the report's abstract states that

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[7] See Andrew Mills, Erik Ela, Bri-Mathia Hode, Brendan Kirby and Michael Milligan, "DRAFT: Review of PG&E Renewable Integration Model and CAISO 33% RPS Analysis," December 21, 2010. Available at http://docs.cpuc.ca.gov/efile/Rulings/128790.pdf

"levelized costs provide a basis for comparing the total costs of one power plant against another."[8] Making changes to the Cost of Generation Report's scope will help to prevent some of the common misconceptions surrounding the appropriate uses for levelized costs that SCE often encounters. The Cost of Generation report will continue to be a useful document, but it is important for users of the report to understand that the levelized costs presented in the Cost of Generation report do not reflect all of the underlying economics that drive resource choices.

Regardless of scope, SCE makes the following recommendations.

- Modify summary tables to isolate the impact of capacity factor on levelized cost. This would address concerns raised by E3, Black and Veatch, and SCE.
- For technologies that have a variety of nameplate capacities, consider multiple categories to account for economies of scale.
- For technologies incorporating energy storage in the design (e.g., solar thermal, pumped storage hydroelectric), identify a process for excluding these capital and O&M costs from the generation technology costs, or provide separate categories for technologies that include energy storage.
- Consider issuing interim partial updates to the report for technologies with the potential for significant changes in any of the cost components (e.g., solar and wind).
- Consider including a section in the report that provides emerging data for new technologies, such as new generation nuclear and fuel cells.

[8] Ibid.

Finally, SCE thanks the Energy Commission for engaging stakeholders in a thoughtful process aimed at gaining a deeper understanding of what information the Cost of Generation Report currently does and does not provide. SCE encourages the Energy Commission to think carefully about how the next iteration of the Cost of Generation will be conducted and looks forward to commenting on the draft report.

Example Calculation: On-Shore Wind Class 3/4

Economic Life Adjustment

A)	Total Levelized Revenue Requirement ($/kW)	$2,469.2	
B)	Nominal Discount Rate	7.70%	
C)	Economic Life (years)	30.0	
D)	Levelized Nominal Cost ($/kW-yr)	$213.07	=-PMT(C, B, A)
E)	Real Discount Rate	6.04%	
F)	Levelized Real Cost ($/kW-yr)	$180.1	
G)	Economic Life Adjustment ($/kW-yr)	($32.9)	=-PMT(C, E, A)

Capacity Adjustment

I)	Levelized Real Capacity Cost ($/kW-yr)	$192.1	
	CEC Levelized Fixed Costs of Combustion Turbine - 49.9 MW		
H)	Net Qualifying Capacity	11.40%	
J)	Capacity Adjustment ($/kW-yr)	$170.2	= I * (1 - H)

Intermittent Opportunity Cost

K)	Capacity Factor	37%	
L)	Average $/MWh above 37th Percentile	$82.5	
M)	Average $/MWh below 37th Percentile	$58.3	
	Based on SCE Day-Ahead DLAP Market Heat Rate and CEC Levelized Gas Forecast		
N)	Percent Production above 37th Percentile	38%	
O)	Percent Production below 37th Percentile	62%	
P)	Weighted Average Price ($/MWh)	$67.4	
Q)	Opportunity Cost ($/MWh)	$15.1	= L - P

List of Figures

Figure 1

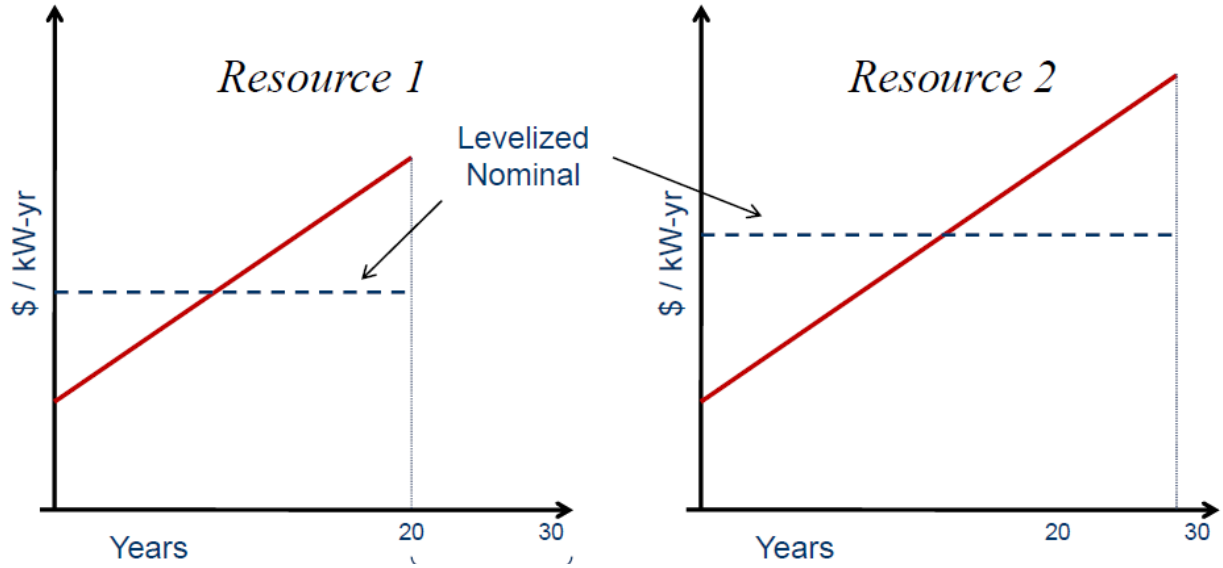


Figure 2

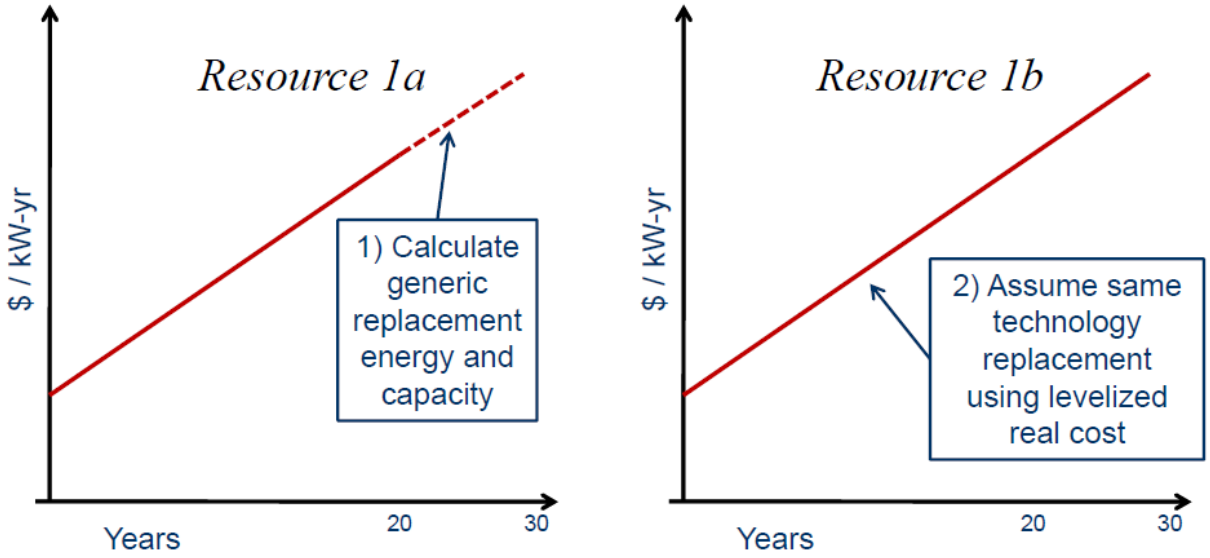


Figure 3

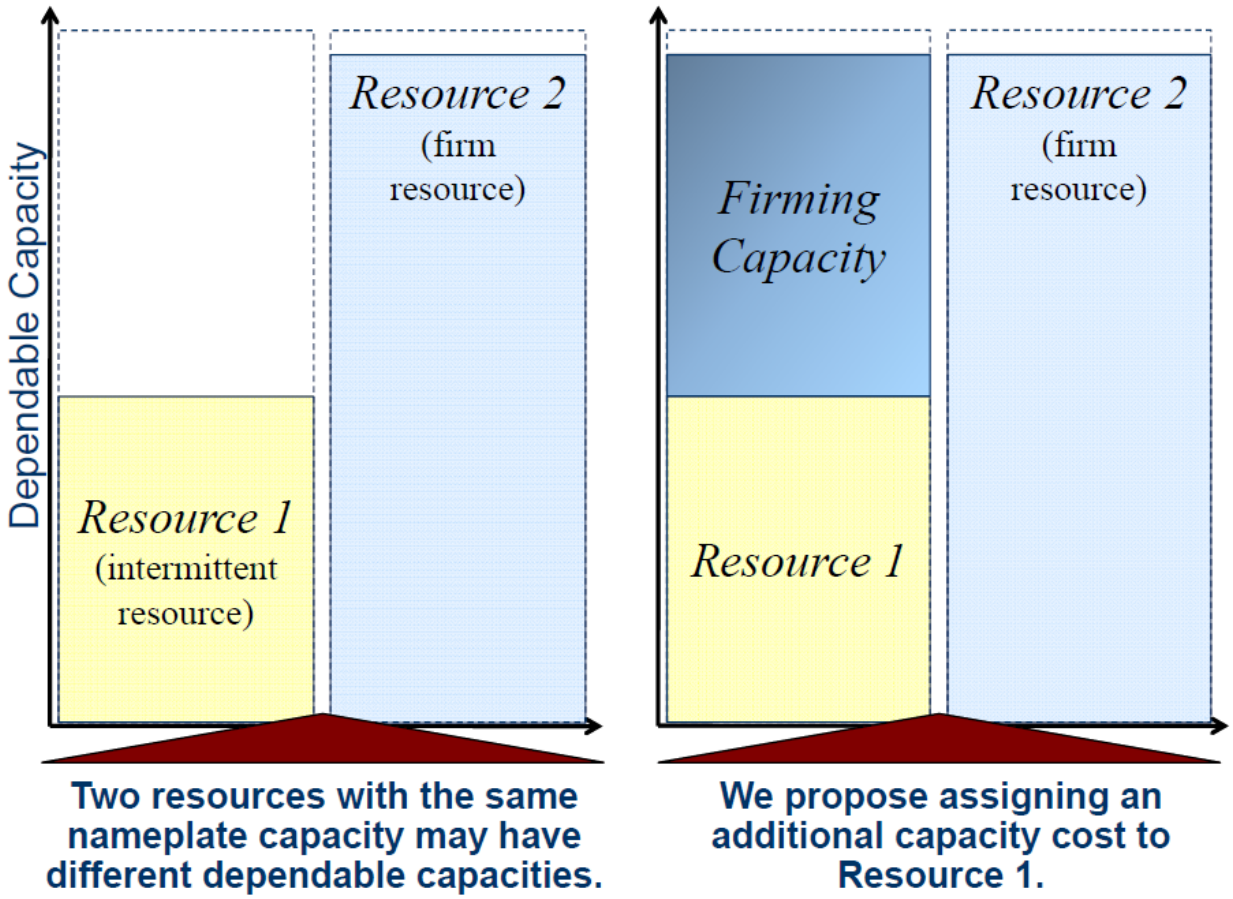

Dependable Capacity
Resource 2
(firm
resource)
Resource 1
(intermittent
resource)
Two resources with the same nameplate capacity may have different dependable capacities.
Firming Capacity
Resource 2
(firm
resource)
Resource 1
We propose assigning an additional capacity cost to Resource 1.

Figure 4

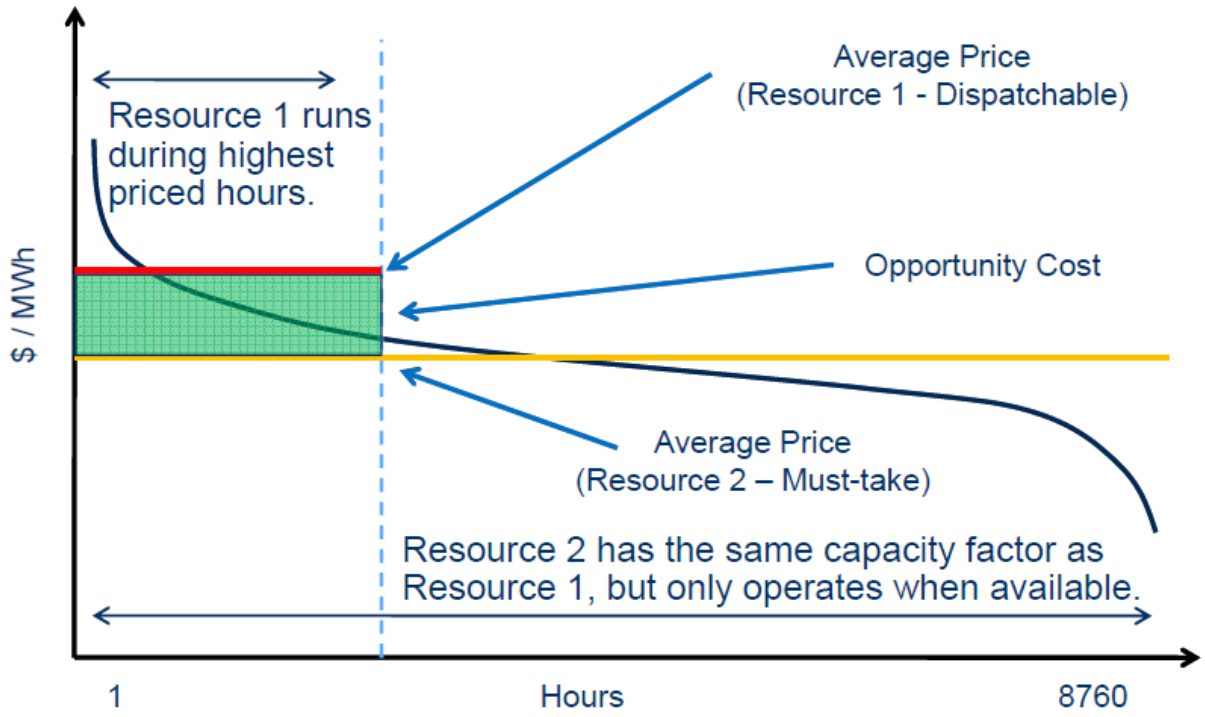


Figure 5

Example

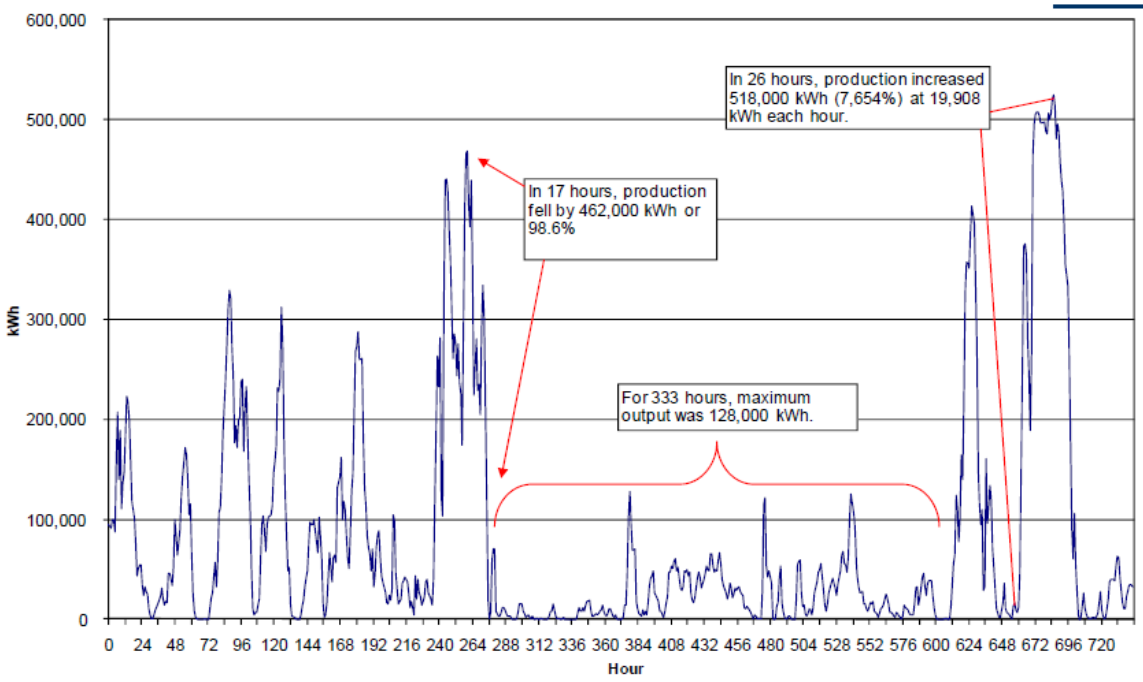

Tehachapi Hourly Generation January 2005
600,000
500,000
400,000
300,000
200,000
100,000
0
kWh
0 24 48 72 96 120 144 168 192 216 240 264 288 312 336 360 384 408 432 456 480 504 528 552 576 600 624 648 672 696 720
Hour
In 26 hours, production increased 518,000 kWh (7,654%) at 19,908 kWh each hour.
In 17 hours, production fell by 462,000 kWh or 98.6%
For 333 hours, maximum output was 128,000 kWh.

Figure 6

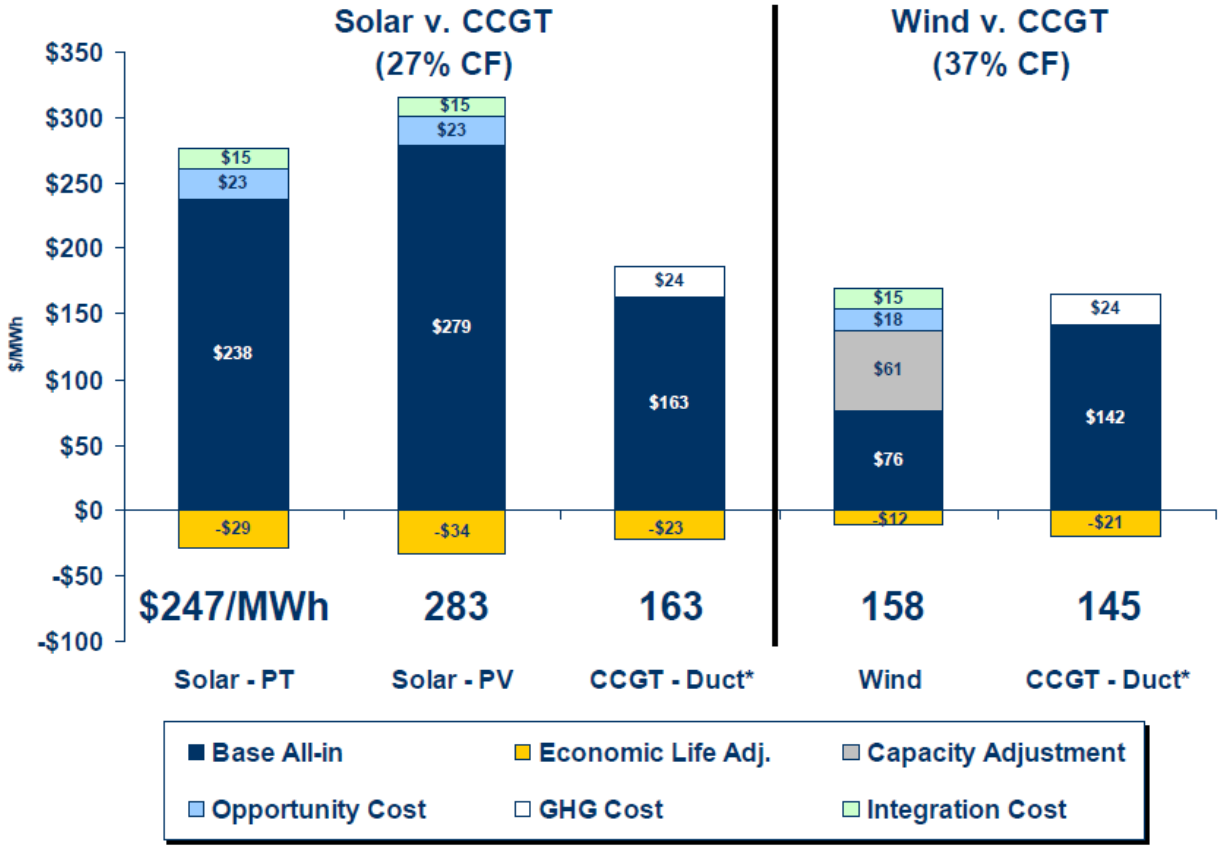
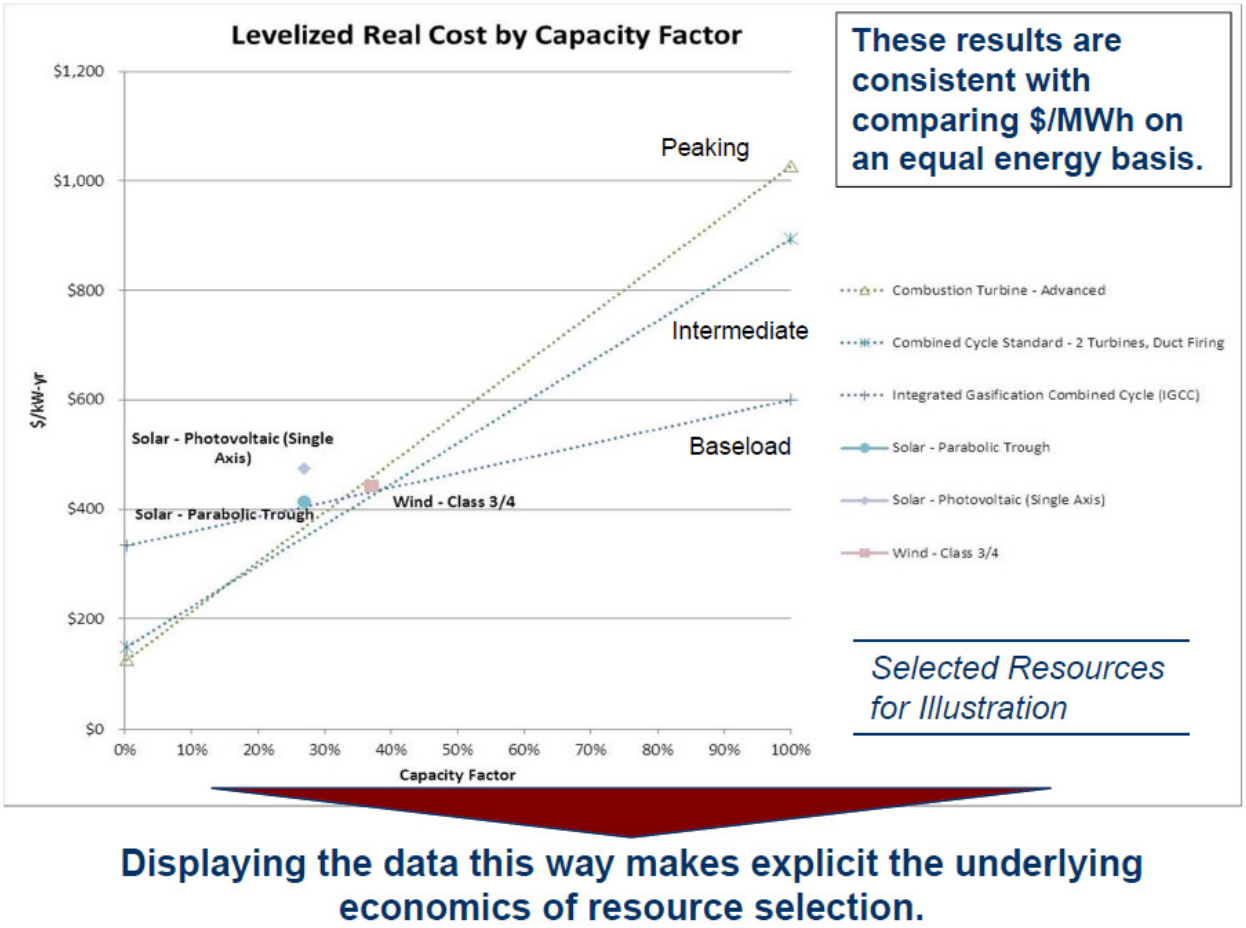

Solar v. CCGT
(27% CF)
Wind v. CCGT
(37% CF)
$350
$300
$250
$200
$150
$100
$50
$0
-$50
-$100
$/MWh
$15
$23
$238
-$29
$15
$23
$279
-$34
$24
$163
-$23
$15
$18
$61
$76
-$12
$24
$142
-$21
$247/MWh
283
163
158
145
Solar - PT
Solar - PV
CCGT - Duct*
Wind
CCGT - Duct*
Base All-in
Economic Life Adj.
Capacity Adjustment
Opportunity Cost
GHG Cost
Integration Cost

Figure 7


Levelized Real Cost by Capacity Factor
These results are consistent with comparing $/MWh on an equal energy basis.
$1,200
$1,000
$800
$600
$400
$200
$0
$/kW-yr
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Capacity Factor
Peaking
Intermediate
Baseload
Solar - Photovoltaic (Single Axis)
Solar - Parabolic Trough
Wind - Class 3/4
Combustion Turbine - Advanced
Combined Cycle Standard - 2 Turbines, Duct Firing
Integrated Gasification Combined Cycle (IGCC)
Solar - Parabolic Trough
Solar - Photovoltaic (Single Axis)
Wind - Class 3/4
Selected Resources for Illustration
Displaying the data this way makes explicit the underlying economics of resource selection.

SOUTHERN CALIFORNIA EDISON
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Manuel Alvarez
Manager, Regulatory Policy and Affairs

March 21, 2013

California Energy Commission
Docket Office, MS-4
Sacramento, CA 95814-5512
docket@energy.state.ca.us

Re: California Energy Commission Docket No. 13-IEPR-1B Cost of New Renewable and Fossil-Fueled Generation in California

To Whom It May Concern:

On March 7, 2013, the California Energy Commission ("Energy Commission") held a Staff Workshop on the Cost of New Renewable and Fossil-Fueled Generation in California ("the Workshop"). The Workshop was part of the Energy Commission's 2013 Integrated Energy Policy Report ("2013 IEPR") process. Southern California Edison Company ("SCE") participated in the Workshop and appreciates the opportunity to provide these written comments.

SCE appreciates the Energy Commission's decision to undertake this effort to update the 2009 Cost of Generation Model and Report ("the Report"). The Report, which is one of the few public sources of estimates for the cost of central station generation in California, helps to ensure that consistent cost assumptions are used across the various regulatory energy policy decision making forums in the state. In light of the Report's broad impact, its accuracy is essential, particularly with respect to the Report's approach to reporting levelized costs. SCE also recommends that the Energy Commission expand the scope of the Report to include costs associated with emerging resource planning issues. Finally, the Energy Commission should revisit some specific cost and operating assumptions in the Report.

With respect to levelized costs, SCE noted several issues with the Report's current approach that can lead users to inaccurate conclusions. Specifically, the Report only estimates developer costs and does not account for differences in value among the resources studied. In addition to modeling differences in developer costs (e.g. cost of capital, component costs, operation and maintenance) among the technologies studied, the Report should properly account for the following differences in value:

1. Capacity value - The generation technologies studied in the Report have varying levels of availability during times of system stress. Excluding these differences will underestimate the cost of energy from resources, such as wind and solar, with relatively lower availability during times of system stress.

2. Energy value - Without any associated storage technology, wind and solar resources cannot optimize energy production relative to market prices. Excluding these differences will overestimate the cost of energy from dispatchable resources, such as simple cycle and combined cycle combustion turbines.

3. Asset life - Longer-lived assets provide economic value over a longer period of time than shorter-lived assets. Excluding these differences will underestimate the value of longer-lived assets relative to shorter-lived assets.

4. Integration costs - Intermittent, must-take resources require additional balancing services (i.e. regulation and following) to ensure that system load and generation are balanced at all times. Excluding these differences will underestimate the cost of energy from intermittent resources, such as wind and solar.

As SCE demonstrated in its May 16, 2011 presentation to the Energy Commission, without quantitative estimates for these values, users of the Report may have a fundamental misunderstanding of the costs associated with generation, which may, in turn, ultimately diminish the value of the Report. Correcting the Report will enhance its usefulness by providing its users with a better understanding of the resource selection process, enabling a more sophisticated and thoughtful dialogue regarding energy policy, and enhancing the ability of regulators to make sound decisions.

Accordingly, during its May 16, 2011 presentation, SCE provided the Energy Commission with a straightforward methodology for addressing all of these items.[1] Energy and Environmental Economics ("E3") utilized a similar approach to SCE's for adjusting levelized costs to account for differences in capacity value in its modeling work for the California Public Utilities Commission.[2] SCE recommends that the Energy Commission adopt E3's or SCE's approach or another similar approach for incorporating value differences in its updated Report.

SCE also suggests that the Energy Commission expand the scope of the Report to explore two emerging resource planning issues. First, the Energy Commission should study how costs differ between gas-fired systems with varying ramp rates and start up times. Going forward, potential resource plans may require varying degrees of flexibility from the natural gas generation fleet. For instance, advanced storage applications could be used to provide balancing services to intermittent generation and therefore, reduce the amount of investment needed in highly flexible natural gas generation. The Long-Term Procurement Plan proceeding, which is exploring the total cost of various resource portfolios, is one forum in which such information would be useful. A public source of natural gas system costs that considers differences in flexible attributes will enable policymakers and stakeholders to more completely evaluate variations in cost among different resource plans.

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1 http://energy.ca.gov/2011_energypolicy/documents/2011-05-16_workshop/presentations/Southern_California_Edison_2011-05-03.pdf

2 http://ethree.com/documents/GHG%203.11.10/GHG%20Calculator_v3b_Appendix%20A%20and%20B_March2010.pdf

Second, the Energy Commission should expand beyond central station generation and address distributed solar applications in both urban and rural environments. In SCE's experience, the cost to construct, including interconnection and land acquisition, can vary substantially depending on location. Given the State's interest in exploring distributed generation, a public source for solar photovoltaic costs that considers these differences will help policymakers and stakeholders evaluate the cost implications of various decisions in this area.

Finally, SCE suggests that the Energy Commission revisit some specific cost calculations and operating assumptions presented at the Workshop. With respect to cost calculations, based on SCE's perception of industry knowledge, the Energy Commission's survey average instant and fixed operation and maintenance costs for the simple cycle and combined cycle gas turbines[3] may be high. SCE's understanding, which is based on information generated by reputable external consultants who are presently engaged in the development, engineering, and cost estimation of power generation facilities within California, is more closely correlated with Aspen's Low Cost Case.[4] It is possible that in some cases the survey averages may neither capture nor reflect the declines in plant capital costs for the period since the first quarter of 2008.[5] Without further disclosure of how Aspen Consulting and the Energy Commission used the survey numbers to develop their estimates, SCE cannot explain these differences but is willing to work with Staff to refine these figures.

Likewise, SCE cautions that the Energy Commission may want to revisit its zero variable operation and maintenance estimated cost for geothermal because SCE expected that the value be between 25 and 30 $/MWh.[6]

SCE also believes that the Energy Commission should use the utility incremental cost of capital unadjusted for the tax impacts of debt, as opposed to the developer weighted average cost of capital adjusted for the tax impacts of debt, as the discount rate. SCE's current incremental cost of capital is 10%. The utility incremental cost of capital, in this case 10%, is the rate a utility must pay to obtain funds in the capital markets for its long-term investments. As such, it represents the opportunity cost for deploying capital. This discount rate is also consistent with the 7% real social discount rate that the United States government uses for benefit-to-cost evaluation of projects when adjusted for inflation.[7] If the Energy Commission uses the incremental cost of capital as the discount rate, the Report's discount rate will reflect a customer or system perspective in its levelized cost estimates and ensure that project cash flows are discounted appropriately.

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3 http://energy.ca.gov/2013_energypolicy/documents/2013-03-07_workshop/presentations/Gas-Fired_Plants_Costs_Survey_Section_for_CEC_Workshop_2013-03-05.pdf

4 *Ibid.*

5 http://press.ihs.com/press-release/energy-power/power-plant-construction-costs-cost-pressures-returning

6 http://energy.ca.gov/2013_energypolicy/documents/2013-03-07_workshop/presentations/Gas-Fired_Plants_Costs_Survey_Section_for_CEC_Workshop_2013-03-05.pdf

7 See *Office of Management and Budget Circular A-94*, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs"

As for operating assumptions, the "Cost of Generation Model Worksheet"[8] assumes a 1% capacity factor for the Investor-Owned Utility ("IOU") combustion turbines, but conversely assumes a range of 2.5 to 7 % for Merchant-Owned combustion turbines. There is no basis for making this distinction between IOU and merchant generators. Ownership is irrelevant because both IOU and merchant generators dispatch generation units in response to market prices. This assumption is also inconsistent with the survey results provided by Aspen Consulting in its workshop presentation materials and should be changed to reflect the same capacity factors as the merchant-owned combustion turbines.

In conclusion, SCE appreciates the Energy Commission's consideration of these comments and looks forward to collaborating with the Energy Commission to develop a Cost of Generation Model and Report that remains a relevant and useful report for industry stakeholders and policymakers in California. Please do not hesitate to contact me at (916) 441-2369 regarding any questions or concerns you may have.

Very truly yours,

/S/ Manuel Alvarez

Manuel Alvarez

[8] http://www.energy.ca.gov/2013_energypolicy/documents/2013-03-07_workshop/CEC_COG_Model_Version_3_62_Workshop.xlsm