BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Implement the Commission's Procurement Incentive Framework and to Examine the Integration of Greenhouse Gas Emissions Standards into Procurement Policies.	Rulemaking 06-04-009 (Filed April 13, 2006)

OPENING COMMENTS OF THE CENTER FOR ENERGY EFFICIENCY AND RENEWABLE TECHNOLOGIES ON E3 MODELING METHODOLOGY AND STAFF WORKPAPER ON EMISSION REDUCTION MEASURES

January 7, 2008

SARA STECK MYERS
Attorney for the
Center for Energy Efficiency and
Renewable Technologies

122 – 28th Avenue
San Francisco, CA 94121
(415) 387-1904 (Telephone)
(415) 387-4708 (FAX)
ssmyers@att.net (e-mail)

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The Center for Energy Efficiency and Renewable Technologies (CEERT) respectfully submits these Opening Comments on the Energy and Environmental Economics, Inc. (E3) greenhouse gas (GHG) modeling methodology and a Commission Staff Workpaper (Staff Workpaper) on available emission reduction measures. These Opening Comments are filed and served pursuant to the Commission's Rules of Practice and Procedure and the Administrative Law Judges' (ALJs') Rulings of November 9 and 30, 2007, and January 4, 2008, including filing of these comments in both this proceeding and California Energy Commission Docket No. 07-OIIP-01.

On January 4, 2008, by telephone conversation, ALJ TerKeurst orally granted CEERT's request for an extension of time to file its comments on January 7, 2008, because of widespread, storm-related power outages in Northern California on January 4 (the due date established by the November 30 ALJs' Ruling).[1] This extension of time was authorized for all parties by e-mail sent to the service list by ALJ TerKeurst on January 4, 2008.

[1] Rule 11.6, Commission's Rules of Practice and Procedure.

I.
INTRODUCTION AND SUMMARY OF RECOMMENDATIONS

According to the ALJs' Ruling of November 9, 2007 (November 9 ALJs' Ruling), E3 is the prime contractor to develop, as part of a multi-agency effort, "a tool by which the impact of alternate policy means to achieving emissions reductions within the electricity sector under Assembly Bill (AB) 32 may be quantified."[2] This modeling effort is intended to "provide insights about the relative cost-effectiveness of GHG abatement measures available within the electricity sector as well as the overall cost impacts of achieving GHG targets of varying stringency within the 2020 timeframe."[3]

The November 9 ALJs' Ruling makes clear that stakeholder input is important to this effort, especially as "E3 is still in the process of finalizing" the numerical input and assumptions for its Stage 1 analysis, which is focused on the costs of reducing greenhouse gases in the electricity and natural gas sectors.[4] The ruling also encourages comment on an attached Staff Workpaper, which is intended to build consensus among parties regarding the principal opportunities for direct emission reductions consistent with relevant policy efforts. To facilitate this input, the November 9 ALJs' Ruling identifies separate sets of questions to be answered in comments on the E3 modeling approach and data sources and the Staff Workpaper.

CEERT answers these questions in the final section of these comments. However, CEERT also requests that the Commission take the following actions, in addition to those recommended by CEERT in response to questions posed by the November 9 ALJs' Ruling: (1) incorporate the Commission's most recent policy statements and directions on GHG emissions reduction planning and AB 32 implementation in Decision (D.) 07-12-052 (December 20, 2007)

[2] November 9 ALJs' Ruling, at p. 2.
[3] November 9 ALJs' Ruling, at p. 2.
[4] November 9 ALJs' Ruling, at p. 2; see also, Attachment B, at p. 1.

in this AB 32 implementation process and (2) adopt CEERT's proposed scenario framework, recommended and described herein, to enhance the "cost and supply estimates" of the clean energy resources that are part of E-3's "cost-based analysis" and are certainly required to achieve emissions reductions.[5]

CEERT's Opening Comments are, therefore, organized to address in the following order: (1) the required incorporation of D.07-12-052 policies, findings, and directions on GHG modeling and emissions reduction measures, (2) CEERT's proposed scenario framework for use in the modeling process, and (3) responses to the questions posed by the November 9 ALJs' Ruling, cross-referenced to the previous sections as appropriate. In each section, CEERT recommends specific Commission action. In summary, CEERT asks that, in any ruling or decision following these comments and in formulating its recommendations to CARB and other state agencies, the Commission do all of the following:

- Fully incorporate all of the policies and direction in D.07-12-052 on GHG emissions reduction modeling and measures in modeling, evaluating, and comparing GHG emissions reduction measures.
- Adopt CEERT's electricity base case and reference case scenario framework, proposed herein, as the Commission's recommended approach for the Commission, California Air Resources Board (CARB), and other state agencies to evaluate and compare emissions reduction scenarios proposed by parties, and, in adopting this framework, provide, among other things, that: (a) the base case and reference case scenarios be reviewed and adjusted annually as appropriate, (b) generation from renewable energy resources in the base case scenario increase to 20% by 2013 and remain at 20% through 2020, (c) generation from renewable energy resources in the reference case scenario increase from 20% in 2013 to 33% by 2020, (d) development of new GHG-free technologies be aggressively pursued, but not incorporated into planning scenarios until their efficacy has been demonstrated in annual reviews; and (e) stakeholders participating in the Renewable Energy Transmission Initiative

[5] November 9 ALJs' Ruling, Attachment B, at p. 1.

(RETI) be requested to complete conceptual plans for transmission facilities needed in the base case by the end of 2008 and those needed in the reference case by the end of 2009.

- Identify, expand and modify current policies, as necessary, to achieve GHG emissions reductions in the electric and natural gas sectors; identify measures that can further reduce per capita consumption of electricity; and designate RETI for developing, coordinating, and integrating transmission and resource planning required to meet current Renewable Portfolio Standard (RPS) Program targets and future renewables procurement to decrease GHG emissions to 1990 levels by 2020 and to achieve additional emission reductions beyond 2020.
- Direct E3 to (a) replace its estimate of wind integration costs with an analysis specific to the California electric system and (b) apply an Effective Load Carrying Capability (ELCC) - based approach to comparing the capacity provided by variable output and conventional resources and eliminate application of a firming penalty for this purpose.
- Direct that the E3 calculator use wind capacity factors used in the DOE-AWEA 2007 Wind Vision report and employ the renewables transmission costs found by the Intermittency Analysis Project, distinguishing as appropriate between transmission needed to connect renewables and transmission needed to meet load growth.

II.
REQUIRED INCORPORATION OF D.07-12-052 POLICIES AND DIRECTION

At the time of the November 9 and November 30 ALJs' Rulings requesting comments on the E3 modeling methodology (Attachment B) and the Staff Workpaper on available emission reduction measures (Attachment A), the Commission had not yet issued its final decision on the investor-owned utilities' (IOUs') 2006 long term procurement plans (LTPPs) in R.06-02-013. On December 20, 2007, however, that decision (Decision (D.) 07-12-052) was issued on a unanimous vote of the Commission.

D.07-12-052 is of critical importance to, and must be fully integrated and reflected in, the modeling and planning methodology and policies at issue in the November 9 and November 30 ALJs' Rulings in this proceeding. In this regard, the Commission has determined that "[e]ach

LTPP proceeding [including R.06-02-013] serves as the umbrella proceeding for the Commission to consider, in an integrated fashion, all of the Commission's electric resource procurement policies and programs, including implementation of directives from other procurement-related proceedings," including R.06-04-009.[6] In fact, the "primary focus" of D.07-12-052 is a determination of whether the LTPPs will ensure that the IOUs are "procuring preferred resources as set forth in the Energy Action Plan" and are appropriately responding to "policies that promote the reduction of greenhouse gases (GHG), especially in the production and delivery of electric resources by the [regulated] utilities."[7]

In making this determination, the Commission in D.07-12-052 found that the LTPPs of all three IOUs (Southern California Edison Company (SCE), Pacific Gas and Electric Company (PG&E), and San Diego Gas and Electric Company (SDG&E)) "were deficient and spotty in regards to addressing filling their net short position with preferred resources from the EAP loading order and particularly inadequate in accounting for GHG emission reductions."[8] In reaching this conclusion, the Commission confirmed its ongoing, firm commitment to pursuing a path toward reduced GHG emissions and meeting the state's GHG emission reduction goals identified in, among other things, Assembly Bill (AB) 32 and the Governor's Executive Order (EO) S-3-05. [9]

The Commission further insisted that LTPP filings "for our regulated utilities" must "not only conform to the energy and environmental policies in place, but aim for even higher levels of performance."[10] CEERT agrees that such direction is essential not only to meet AB 32 targets, but also to put the electric system on a path to increasing sustainability and achievement of 80%

[6] D.07-12-052, at pp. 5, 9.
[7] D.07-12-052, at p. 2.
[8] D.07-12-052, at p. 3.
[9] D.07-12-052, at pp. 4, 230-232.
[10] D.07-12-052, at p. 4.

GHG emission reductions below 1990 levels by 2050, as articulated in the Governor's EO S-3-05.

In D.07-12-052, the Commission acknowledged that details regarding AB 32 implementation "are still under consideration in [R.] 06-04-009,"[11] but nevertheless concluded:

- "The overarching problem in all three LTPPs is the absence of any scenario analysis regarding what types of resources the IOUs should use to fill their net short positions to best transition to the inevitably GHG-constrained world we are moving towards."[12]
- "[I]t would be prudent for the IOUs to make reasonable assumptions and/or develop reasonable scenarios regarding different mixes of preferred resources and the operational characteristics of additional fossil generation that the IOUs will need to reduce their carbon emissions from electric generation resources back to, at a minimum 1990 levels."[13]
- "Informed decision-making depends on robust analysis," and "[w]hile we recognize that electric resource planning is inherently uncertain, perhaps now more than ever before, we expect the IOUs to integrate the best, most recent planning methodologies and analytical techniques."[14]
- "We agree with parties that find areas that could be improved on throughout the IOUs' planning process from planning assumptions and scenario development, to candidate portfolios and portfolio analysis, and ultimately, evaluation and final selection of a preferred portfolio."[15]

CEERT was among those parties that submitted testimony on the IOUs' LTPPs identifying serious shortcomings in those plans with respect to achieving the expected GHG emissions reductions. D.07-12-052 appropriately summarizes that testimony, including CEERT's central recommendation "that the Commission find [that] the IOUs 2006 LTPPs do not comply with the GHG emission reductions mandated in AB 32 nor do they plan for

[11] D.07-12-052, at p. 5.
[12] D.07-12-052, at p. 5.
[13] D.07-12-052, at pp. 5-6.
[14] D.07-12-052, at p. 6.
[15] D.07-12-052, at pp. 6-7.

'uncertainties' in AB 32 GHG regulations."[16] D.07-12-052 also focuses on CEERT's recommendation that the Commission "direct the IOUs to analyze and include…three basic supply scenarios that can be expected to achieve AB 32 goals and targets to be established by the Commission and/or CARB (using portfolio analysis)."[17] These three scenarios, aimed at "(1) providing projections on the flexibility allowed in meeting targets, and (2) producing an energy resource mix that results in emissions at or below required levels and includes realistic assessments of generation projected to be procured from existing, commercially available technologies," are specifically listed in D.07-12-052. [18]

Following review of this testimony, the Commission concluded that "[w]hile the implementation details are still under consideration in R.06-04-009, it appears improbable that the IOUs can reduce their carbon emissions from electric generation resources back to 1990 levels without a focused reliance on preferred resources."[19] Further, the Commission "agree[d] with CEERT that while utilities were mandated to plan for uncertainties with the implementation of AB 32, Commission policy also mandates that the IOUs submit LTPPs that are on course for reducing GHG emissions."[20] The Commission also found that "[p]rocurement of zero- or low-GHG resources should be given preference over other resources since these are the types of

[16] D.07-12-052, at p. 238.
[17] D.07-12-052, at p. 240.
[18] D.07-12-052, at p. 240. CEERT's recommended scenarios included the following: (1) "A least-cost scenario that increases renewable energy content on a trajectory that could reasonably be expected to result in increasing the utility's renewable energy content to 33% by 2020," (2) "A least-cost scenario that reduce[s] GHG emissions on a trajectory that could reasonable be expected to reduce the utility's GHG emissions to the utility's 1990 levels by the year 2020," and (3) "A least-cost scenario that reduces GHG emissions on a trajectory that could reasonably be expected to reduce the utility's GHG emissions to 90% of the utility's 1990 levels by the year 2020." (D.07-12-052, at p. 240.)
[19] D.07-12-052, at p. 243.
[20] D.07-12-052, at p. 244.

resources that AB 32 regulations will favor" and that "uncertainty" in the LTPPs would be eliminated by application of "established scenario analysis going forward."[21]

For next steps, consistent with these findings, the Commission concluded that "analyses presented by IOUs should be detailed enough to enable adequate analysis of fuel mix under various scenarios, overall cost to customers, risks faced by customers, and environmental impact."[22] Specifically:

> "To further flesh out IOU plans for GHG reductions, we will provide directions in upcoming LTPP proceedings concerning the development of a consistent evaluation of the costs and risks of GHG-reduction to be included in the subsequent LTPPs. *These analyses will be based on the recommendations provided by CEERT in this proceeding, modified based on the results of Phase II of D.06-04-009*."[23]

In furtherance of, and consistent with, this direction by the Commission and to ensure the proper integration of D.07-12-052 into the current Stage 1 modeling effort, CEERT requests that the Commission adopt, and recommend the use of, the following proposed scenario framework by the Commission, CARB and other state agencies to evaluate all emission reduction measures and proposals. This framework, which is based on two scenarios, builds on the recommendations made by CEERT in R.06-02-013 and adopted in D.07-12-052 and ensures an appropriate starting point for this analysis that can be applied in this proceeding as well as upcoming LTPP proceedings, consistent with the Commission's directions in D.07-12-052.

[21] D.07-12-052, at pp .75, 244.
[22] D.07-12-052, at p. 245.
[23] D.07-12-052, at pp. 244-245; emphasis added.

III.

RECOMMENDED SCENARIO FRAMEWORK FOR EVALUATING AND COMPARING EMISSION REDUCTION MEASURES AND PROPOSALS

A. OVERVIEW

Building on its recommendations in R.06-02-013 and the Commission's directions in D.07-12-052, CEERT strongly urges the Commission to start the current modeling effort by establishing a recommended framework for the Commission, California Air Resources Board (CARB) and other state agencies to evaluate various proposals for reducing GHG emissions. This framework should be based on effective scenario analysis placed in the context of the Commission's and the state's comprehensive energy procurement and planning vision for 2020 and beyond. To this end, CEERT asks that two scenarios, a "base case" and a "reference case," as described below, be established and adopted as the Commission's recommended framework for the planning process.[24]

1. FRAMEWORK ASSUMPTIONS

The starting point for CEERT's recommended framework is to clearly establish and define the basic assumptions used. Variations in these assumptions and definitions can be suggested, but should be considered as sensitivity cases.

a. Terminology Defined

The following terminology, as used in CEERT's recommended scenario framework, means:

Emissions: References to carbon emissions and/or emissions reductions identified in the CEERT scenarios refer to emissions from generators supported financially by California

[24] While CEERT is under contract to the California Energy Commission (CEC) and is providing facilitation services to the Renewable Energy Transmission Initiative (RETI), CEERT's comments and recommended base case and reference case scenarios herein are offered on behalf of CEERT alone and not any other party or agency participating in RETI.

consumers. That is, the emissions of interest are those released in the process of supplying electricity for California consumers, regardless of the state of origin.[25]

Commercially Available Technologies: CEERT assumes that useful scenarios will be based on supply- and demand-side technologies that are available commercially to meet California demand at present or are likely to be available commercially well before 2020. Speculative technologies that are not commercially available at present should not be considered for planning purposes. As these technologies become viable, however, plans can be updated based on an annual review by the Commission and other agencies

Market Transformation: The cost of measures to be included in scenarios should be based on current costs in current dollars in the absence of compelling evidence that future costs will be significantly different. In particular, assumptions that larger scale deployment of a measure or particular technology will result in significantly lower costs should be avoided unless solid evidence supports such an assumption. In this regard, CEERT recommends that, rather than assuming that markets will be "transformed" and future prices will be significantly lower than current prices, planning scenarios should be reviewed annually and adjusted to reflect changes in costs and/or benefits as they occur.

Cost Effectiveness: AB 32 requires that mandates imposed by CARB be achievable with measures that are "cost effective," but that term is not defined beyond dollars per ton investment. While the estimated cost of realistic planning scenarios should not create hardships for California consumers, those scenarios should not be required to be the least expensive scenarios, but rather should have estimated cost effectiveness assumptions updated annually. In particular, one technology should not be excluded from scenarios simply because energy from another technology is currently available at lower cost. Portfolios of technologies should be acceptable in planning scenarios if they accomplish other policy goals and do not unreasonably increase costs. Examples of other policy goals

[25] One of the major issues that must be resolved is how California policies interact with similar nascent activities throughout the Western States. CEERT is observing, and plans to actively participate in, the discussions surrounding the development of a West-wide greenhouse gas reduction system in the Western Climate Initiative. CEERT notes, however, that those discussions are just beginning and are not likely to produce anything definitive for purposes of the design of California's program until well after the AB 32 Scoping Plan is adopted by the CARB. As CEERT looks forward to the development of enforceable, West-wide interstate agreements on allocation of emissions reductions and associated policy interactions, CEERT believes that a strong focus by California regulators on emissions related to electricity consumed in California is appropriate.

that can be achieved by various technologies include, but are not limited to, local air quality benefits, resource diversity, and fuel price hedging.

b. Other Scenario Framework Assumptions

Consumption of electric energy in CEERT's recommended base and reference cases is assumed to increase due to population growth. Projected consumption in these cases assumes that the historical trend in per capita consumption continues throughout the 2020 timeframe, a trend in which per capita consumption decreases slightly every year. CEERT notes that actual future consumption may be lowered by more aggressive conservation measures, but may also be increased due to large scale adoption of, for example, plug-in hybrid vehicles or truck stop and port electrification, both of which are under consideration as GHG reduction measures by CARB. Such changes can be modeled as sensitivities to the recommended cases.

CEERT has not attempted to estimate the amount that per capita consumption may be decreased by additional aggressive measures on the customers' side of the meter. CEERT wholeheartedly supports all cost-effective conservation and efficiency measures and notes that, in addition to decreasing energy requirements and GHG emissions, these measures would also reduce somewhat the amounts of renewable generation required in these scenarios. CEERT recommends that changes in per capita consumption from historical trends be treated as sensitivities to the scenarios recommended here.

CEERT has not attempted to estimate the change in GHG emissions associated with these scenarios, since those changes depend heavily on the mix of fossil resources used for generation. CEERT believes, however, that if additional renewable generation displaces coal-fired power, emission reductions will be significantly larger than if gas-fired power is displaced. CEERT, therefore, recommends that further policies be adopted to minimize the state's use of coal as a generation fuel.

CEERT emphasizes that meaningful choices of base and reference cases are not mere numerical exercises. Implementation of these scenarios will require substantial construction of new renewable generation and transmission facilities—the proverbial 'steel in the ground'—within 12 years. The base case, for example, requires that electricity from renewable energy resources more than double by 2020. The reference case requires a nearly four-fold increase.

Despite this circumstance, CEERT believes that these very challenging goals are nevertheless feasible and will result in significant and cost-effective GHG emission reductions. Implementation, however, must begin immediately and will require unprecedented cooperation in the electricity sector.

2. SUMMARY OF SCENARIO FRAMEWORK CASES

CEERT's recommended scenario framework consists of two cases: a base case scenario and a reference case scenario. These cases are described briefly below and examined in more detail in the following section.

a. Base Case Scenario: 20% Renewable Energy by 2013

The base case scenario depicts the electricity system as it is assumed to develop between now and 2020 in the absence of additional legislation or policy mandates. The base case scenario is the standard scenario. The importance of the base case scenario cannot be overstated because it describes the minimal expectations for the electricity system. Whatever additional mandates CARB may adopt, it is absolutely necessary to achieve the base case, especially since failure to do so would be a direct violation of state law.

CEERT's base case scenario assumes that the current RPS requirement of 20% renewable energy by 2010 will be met by the year 2013 and that the renewable percentage will remain constant thereafter to 2020. Adherence to this goal by CARB and other state agencies will

ensure compliance with state law and policy. In this regard, CEERT certainly agrees with and supports the conclusion reached by the Commission in D.07-12-052:

> "The State of California has taken an aggressive position toward achieving energy independence and reduced GHG emissions. The development of renewable energy is an important component to achieving these goals and has further environmental, economic, and public health benefits enumerated in the Legislation establishing the RPS program. Achievement of California's ambitious renewable energy goals is thus of great importance to the Governor, the State of California, and the Commission."[26]

b. Reference Case Scenario: 33% Renewable Energy by 2020

A reference case scenario depicts the electricity system as it might develop between now and 2020 in response to reasonable policy mandates to reduce carbon emissions below those in the base case scenario. CEERT's proposed reference case scenario assumes that by 2020, 33% of California's electricity will be generated from renewable energy resources. Other scenarios that might be proposed should be considered "sensitivities" from the reference case.

B. THE BASE CASE SCENARIO

1. SUMMARY

Although current law requires that RPS-obligated load-serving entities (LSEs) meet 20% of their retail energy needs with renewable generation by 2010, flexible compliance rules effectively extend that date to 2013. CEERT's recommended base case (20% renewables by 2013) satisfies the current RPS mandate, as shown in the following table, but also recognizes that immediate action is required to meet this challenging goal. Even then, additional fossil generation will still be required by 2020 to meet increasing consumption in the base case, assuming that nuclear and hydroelectric generation remain constant at 2004 levels.

[26] D.07-12-052, at p. 74. The Commission further found that "development of renewable energy will likely be a key component in achieving GHG reduction goals as defined in AB 32." (D.07-12-052, at p. 64.)

CEERT RECOMMENDED BASE CASE SCENARIO: 20% RPS [a] Electric energy in terawatt-hours [b]			
Year	2004	2013	2020
Total Generation [c]	289	317	339
Inc. Total Generation [d]		+28	+50
Renewable Generation	30 [e]	63 [f]	68 [f]
Inc. Renewable Generation		**+33**	**+38**
Δ Fossil Generation [g]		**-5**	**+12**
[a] Assumes 20% of California generation is from renewable resources by the end of 2013 and that percentage continues through 2020.			
[b] One terawatt equals one billion kilowatts.			
[c] Assumes per capita consumption follows historical trend. See text for discussion of recommended changes in consumption.			
[d] Differences from 2004 values			
[e] Data from CEC Gross System Power, 2004.			
[f] 20% of total generation.			
[g] Change in fossil generation from 2004 levels equals increase in total generation minus increase in renewable generation, assuming that nuclear and hydroelectric generation remain at 2004 levels.			

2. SPECIFIC FEATURES

Some of the specific features of CEERT's recommended base case include the following:

Total Generation: Assuming that historical trends in per capita consumption continue and population projections are accurate, total generation would be about 317 TWh in 2013 and 339 TWh in 2020. These are increases of about 28 and 50 TWh, respectively. CEERT's base case does not assume any major additional reductions in per capita consumption in the 2013 timeframe.[27]

Renewable Generation: On this basis, renewable generation would be 20% x 317 = 63 TWh in 2013 compared to 30 TWh in 2004, an increase of 33 TWh. This increase is larger than the increase in total consumption, indicating that fossil generation would decline compared to 2004 levels if nuclear generation and hydroelectricity remain at 2004 levels. In 2020, 20% renewables would require a total of 68 TWh, an increase of 38 TWh over 2004. Since this is less than the increase in consumption, fossil-fueled generation in 2020 would increase over 2004 levels in this base case.

[27]See discussion of additional demand-side measures in CEERT's recommended reference case infra.

Emissions Reductions: The base case shows fossil generation declining in 2013 compared to 2004. Carbon emission would therefore be expected to decline unless the use of coal-fired generation increases substantially. Although fossil-fueled generation would increase by 2020 over 2004 levels in this base case, carbon emissions could decline if enough coal-fired generation is displaced by gas-fired generation. Emission reductions depend on how declines in fossil generation are divided between coal and gas.

Feasibility: CEERT believes that the base case scenario is feasible. Achieving the base case 20% renewables by 2020 will require on the order of 15,000 MW of wind and solar, assuming that energy from biomass and geothermal by 2013 will be minimal. For comparison, the Tehachapi transmission project will be able to connect about 4,500 MW of wind generation by 2013. In other words, transmission projects comparable to a total of two more Tehachapi projects must be on line by 2013 in the base case. For the base case to be realized, it is essential that needed transmission be identified, planned, approved, and constructed before the end of 2013, a challenging set of tasks. The Renewable Energy Transmission Initiative (RETI) should, therefore, be requested to address these tasks as quickly as possible.

C. THE REFERENCE CASE SCENARIO

1. SUMMARY

In CEERT's recommended reference case scenario, shown below, electricity generated from renewable energy resources increases from 20% in 2013 to 33% in 2020. This goal has been incorporated in the Energy Action Plan and Commission decisions.

CEERT RECOMMENDED REFERENCE CASE SCENARIO [a] Electric energy in terawatt-hours			
Year	2004	2013	2020
Total Generation	289	317	339
Inc. Total Generation		+28	+50
Renewable Generation [a]	30	63	112
Inc. Renewable Generation		**+33**	**+82**
Δ Fossil Generation		**-5**	**-32**
[a] Generation from renewable resources increases to 33% of total generation by 2020			

2. SPECIFIC FEATURES

Some of the specific features of the CEERT recommended reference case include the following:

Total Generation: Total generation assumed in the reference case is the same as in the base case. However, additional demand-side measures, such as distributed generation and non-generation technologies, as noted in the Staff Workpaper and CEERT's responses to the questions posed by the November 9 ALJs' Ruling, are available to reduce the assumed consumption from the grid. CEERT urges that aggressive action be taken to achieve these measures.

Renewable Generation: In the reference case, generation from renewable energy resources increases from a total of 63 TWh in 2013 to 112 TWh in 2020, an increase of 82 TWh over 2004 levels. Thus, in addition to meeting load growth of 50 TWh between 2004 and 2020, the reference case assumes that renewable generation will displace 32 TWh of fossil generation by 2020.

Reductions in Consumption: CEERT urges that all cost effective measures be undertaken to reduce consumption of electricity in California. CEERT supports a statewide goal of achieving the full economic potential of energy efficiency in the electricity sector by 2020.[28] In this regard, California has a good record historically in promoting energy efficiency in the electricity sector that, together with other trends such as out-sourcing of manufacturing, has succeeded in preventing per capita consumption from increasing. Indeed, per capita consumption of electric energy in California has declined slightly in the last two decades. This trend has been used as the basis for CEERT's recommended reference case on the assumption that aggressive efficiency measures will continue to be promoted in the future.

By their nature, however, almost all electric energy efficiency measures are implemented on the customers' side of the meter as a result of retail transactions. Even appliance efficiency standards require consumers to purchase new equipment and retire the old before savings are realized. To achieve all cost-effective efficiency would, therefore, require that every

[28] CEC Report CEC-200-2007-019-SF, "Achieving All Cost-Effective Energy Efficiency for California."

consumer in California participate fully in every cost-effective measure. This expectation should not form the basis of energy planning scenarios.

Instead, given the state's record of aggressive efficiency programs in the past and the uncertainty surrounding the penetration of even more aggressive programs in the future, CEERT believes that the historical trend in per capita consumption provides a prudent and conservative basis for the reference case scenario. As programs are implemented that succeed in reducing per capita consumption below the current trend, the reference case can be amended.

Finally, CEERT believes that it is important to recognize that, despite the potential for reduced consumption resulting from increased energy efficiency, consumption may also *increase* over the projected amounts if, for example, plug-in hybrid or fully electric vehicles become popular and if port and truck stop electrification make a significant contribution to load. For this reason, CEERT recommends that any significant changes in per capita consumption be treated as sensitivity cases to its recommended reference case.

Reductions in Emissions: A decrease in fossil generation of 32 TWh as shown in this reference case would significantly reduce emissions from the electricity sector. The size of this reduction depends on the relative reduction in generation from coal and gas. If the additional renewable generation displaces only gas-fired power, reductions would be approximately 16 million tons of carbon dioxide equivalent annually. If, however, coal-fired power were displaced, the reductions would be approximately twice as large. CEERT recommends that reductions in the use of fossil fuels for electricity generation be targeted on reductions in the use of coal to the extent possible, thereby maximizing GHG emissions reductions.

Cost: The cost of coal is significantly less than the cost of natural gas on an energy basis. Therefore, the relative cost of the reference case scenario will be higher if coal is displaced preferentially rather than gas as generation fuel. In this case, however, the GHG emission reductions are also higher. The relative cost per ton of GHG emissions reductions can be calculated by the E3 calculator. CEERT believes that this calculation will show that replacing coal-fired power with renewables in the reference case is a cost-effective strategy.

CEERT believes that the investment in renewable energy resources as shown in the recommended reference case can be made at reasonable cost to ratepayers, especially based on a realistic view of future natural gas prices and carbon costs. CEERT also notes that the need for such investments is well understood by the public, based on polls conducted over the years, and will result in only modest cost impacts to ratepayers.

In comparing the costs of the scenarios, however, it should always be remembered that forecasts of future costs are highly uncertain, especially in energy industries. Who would have thought 13 years ago that crude oil would trade above $100 per barrel in 2008, for example? The price of natural gas 13 years hence should be considered equally uncertain. CEERT also notes that long term contracts for electricity from renewable energy resources are highly predictable, unlike the price of electricity from fossil fuels, because they do not depend on or require procurement of fossil fuels. CEERT recommends that the price risk of electricity from fossil fuels be considered as a major factor when comparing the cost of the recommended reference case to sensitivity cases.

Transmission: The amount of new transmission capacity to interconnect the renewable generation shown in the reference case by 2020 is substantial, approximately twice as much as needed in the base case. Transmission planning for reference case implementation must begin as soon as planning for the base case has been completed. The stakeholders involved in the RETI process should be requested to incorporate this task as part of their effort.

CEERT notes, however, that the expansion of the transmission network is driven by total generation and not renewable generation alone. In other words, substantial network upgrades are required to handle the expected growth in electricity consumption regardless of the generation source. Transmission requirements in the reference case require facilities to interconnect new renewable generation, but additional network facilities required should be minimal.

LSE Equity: CEERT urges that the allocation of changes required by both the base case and reference case be allocated equitably between load serving entities (LSEs.) For a variety of historical reasons, LSEs differ widely in their reliance on generation from different sources and therefore in GHG emissions. CEERT recommends that mechanisms be devised to

distribute the cost of changes needed to meet state emissions goals equitably between customers of the LSEs doing business in California.

D. CONCLUSION

Based on the preceding analysis, CEERT, therefore, recommends that the Commission take the following "next step" actions on planning for and comparing proposed emission reduction measures and scenarios:

1. The Commission should adopt the electricity sector base case and reference case scenarios for recommended for use by CARB and state agencies, including the Commission, for comparing emissions reduction scenarios proposed by parties. Base case and reference case scenarios should be reviewed annually and adjusted as appropriate.
2. The base case scenario adopted by the Commission should be based on generation from renewable energy resources increasing to 20% by 2013 and remaining constant at 20% through 2020.
3. The reference case scenario adopted by the Commission should be based on generation from renewable energy resources increasing from 20% in 2013 to 33% by 2020.
4. The Commission should request that stakeholders participating in the Renewable Energy Transmission Initiative (RETI) complete conceptual plans for transmission facilities needed in the base case by the end of 2008 and those needed in the reference case by the end of 2009.
5. The Commission should direct that measures to further reduce per capita consumption of electricity and develop new GHG-free technologies be aggressively pursued, but not incorporated into planning scenarios until their efficacy has been demonstrated in annual reviews.

IV.

RESPONSES TO NOVEMBER 9 ALJS' RULING QUESTIONS

A. QUESTIONS RELATED TO ATTACHMENT A (Staff Workpaper)

1. CEERT RESPONSES

Question 1. Does Attachment A cover all of the viable emissions reduction measures available in the electricity and natural gas sectors? If not, what other measures should be considered for the purposes of forecasting emissions reduction potential within these sectors? Please include suggested data sources and references for information regarding any additional measure you purpose.

CEERT Response to Question 1.

While CEERT supports the categories of GHG emission reduction measures identified in the Staff Workpaper (Attachment A (November 9 ALJs' Ruling)), CEERT believes that the Staff Workpaper is incomplete and requires correction in two respects: (1) While the Staff Workpaper does cover most categories of emission reduction measures, it does not clarify where or when those measures will be addressed or what role this proceeding will play in coordinating those efforts, and (2) the Staff Workpaper does not include several non-electric generation technologies that could have an impact on GHG emissions reductions in the gas and electricity sector by 2020. These concerns are addressed in more detail as follows:

Further Specificity is Needed to Achieve Emissions Reductions

The Staff Workpaper (Attachment A) identifies its purpose as follows:

> "Building on existing analysis surrounding energy efficiency potential, renewable energy development, and other emerging policy directives, this paper aims to build consensus regarding the principal opportunities for direct emissions reductions originating within California's electricity and natural gas sectors. Its overall goal is to provide a clear overview of the technical and policy issues underlying sector-specific emissions reductions, and to set the stage for the development of a quantitative model to assess emission reduction opportunity within the sector."[29]

[29] November 9 ALJs' Ruling, at p. 1.

On December 21, 2007, assigned Commissioner Peevey issued a ruling modifying the scope of Phase 2 of this proceeding (December 21 Assigned Commissioner's Ruling (ACR)) in which he stated the following:

> "Regardless of whether a market-based system for GHG regulation is adopted, I expect that regulatory and other strategies will continue to be employed to reduce GHG emissions in the electricity and natural gas sectors in California. In particular, I expect that currently mandated programs such as energy efficiency programs, renewable portfolio standards, and building and appliance efficiency standards will continue. Such programs also may be expanded if such expansion is found to be desirable relative to other emission reduction strategies."[30]

CEERT supports this statement, along with the general list of GHG emission reduction measures identified in the Staff Workpaper *with* the inclusion of additional technologies discussed later in these comments. However, CEERT also encourages the Commission to consider expanding and modifying the programs referenced in the ACR now. With regard to combined heat and power (CHP) systems, CEERT supports the recommendation in the Staff Workpaper to remove market barriers and disincentives to the installation of combined heat and power (CHP) units, with priority given to fuel cells and other ultra-clean and low-emission[31] generating units.[32] Regarding renewable energy policy, CEERT has been actively involved in the implementation of the Renewable Portfolio Standard (RPS) law since its enactment more than five years ago. However, CEERT believes that substantial reform and streamlining in current RPS implementation will be required to ensure that renewable energy will be increased sufficiently to meet GHG emission reduction goals.[33]

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[30] December 21 ACR, at p. 6.

[31] As first defined in Public Utilities Code 353.2, and subsequently implemented by the California Air Resources Board.

[32] November 9 ALJs' Ruling, Attachment A, at p. 8. These policy changes include, but are not limited to: exemption from departing load charges, incentives for non-generation technologies that are not currently supported by any program, increased incentives for CHP that operates on waste gas, and other changes recommended in the CEC's 2007 Integrated Energy Policy Report.

[33] These issues include, but are not limited to: deliverability requirements and ongoing use and applicability of the market price referent.

In this regard, the December 21 ACR rules that Phase 2 of R.06-04-009 will include consideration of the following:

> "Interactions between a GHG emissions program and programs and policies regarding energy efficiency, renewable resources, distributed generation, combined heat and power resources, and low-emission vehicles, and any other policies or programs affecting GHG emissions from the electricity and natural gas sectors."[34]

CEERT is encouraged by this statement, which is consistent with D.07-12-052 and demonstrates the Commission's intention to continue to coordinate and advance all activities, requirements, and programs to achieve GHG emission reductions in the electric sector. Such coordination is important to ensure consistency and cohesiveness in Commission's recommendations to CARB, the Commission's long term procurement planning policies (R.06-02-013 and its successor proceedings), and other Commission energy proceedings, including R.06-03-004 (Distributed Generation (DG)), R.06-02-012 and R.06-05-027 (Renewable Portfolio Standard (RPS) Program), and R.06-04-010 (Energy Efficiency).

CEERT, therefore, asks that the Commission identify the venues in which each of the measures, barriers, and issues identified in the Staff Workpaper will be addressed. In addition, CEERT asks that the Commission determine and identify which, if any of these issues or measures, require further legislation. Such action by the Commission, as well as CARB and other state agencies, will be important to affect any needed legislative change.

The Staff Workpaper Does Not Include Some Relevant Technologies

CEERT notes that the Staff Workpaper does not include several non-generation technologies that could further reduce GHG emissions in the electric and natural gas sectors by 2020. For this reason, CEERT asks that the Commission consider the GHG emission reduction

[34] December 21 ACR, at pp. 19-20.

potential of all of the following measures: (1) solar water heating in the natural gas sector, (2) solar space heating and cooling in both the electric and natural gas sectors, and (3) plug-in hybrid and electric vehicles and port and truck stop electrification in the electric sector.

Specifically, in March 2007, the National Renewable Energy Laboratory (NREL) released a study of the potential for solar hot water systems to reduce demand in residential and commercial buildings in the United States.[35] In that same study, NREL estimates that, in California, 65% of residential and 75% of commercial buildings could be outfitted with solar collectors for hot water systems. These percentage estimates would basically be the same for solar space heating and cooling systems. The figures listed below, according to NREL's analysis, reflect the calculated technical end-use energy savings potential for only solar hot water systems in both residential and commercial sectors in California.

H_2O Heating Fuel	*Solar Hot Water Potential*
Natural Gas	105 trillion Btu
Oil & LPG	3 trillion Btu
Electricity	8 trillion Btu
TOTAL Energy Savings	116 trillion Btu/year
TOTAL CO2 Savings	7.3 – 8.6 MMT CO2

In addition, neither the Staff Workpaper, the E3 Modeling, nor the CEC's load forecast take into consideration the potential for increased load from plug-in hybrid and electric vehicles and port and truck stop electrification, all of which are under consideration by the CARB for GHG emissions reductions in the electric sector. These impacts must be reflected in both modeling and load forecasts.

[35] P. Denholm. *The Technical Potential of Solar Water Heating to Reduce Fossil Fuel Use and Greenhouse Gas Emissions in the United States.* NREL Technical Report, NREL/TP-640-41157, March 2007.

Question 2. Are there emission reduction measures identified within Attachment A that you believe, based on currently available information, should not be implemented as a means to achieving emission reductions within the context of AB 32? Please justify your answer.

CEERT Response to Question 2.

CEERT believes that technologies, which are not yet commercially available or are unlikely to be widely commercially available by 2020, should not be used for planning purposes to meet AB 32 targets. The Staff Workpaper, in addressing "Conventional Non-Carbon Resources," with reference to large hydro and nuclear facilities in California, states:

> "However, due to their base load and low-emission resource characteristics, these resources may warrant consideration in the context of longer-term GHG reductions. To the extent such examination results in policy changes, any new resource additions are highly unlikely before 2020."[36]

CEERT supports this statement and agrees that these two resource types should not be considered for 2020 targets. CEERT further recommends that speculative technologies, which are not commercially available now or are unlikely to become so by 2020, should not be considered for planning purposes until they become commercially available and fully viable. To this end, CEERT recommends that the Staff Workpaper be revised to reference, and exclude from modeling, these speculative technologies.

In addition, CEERT recommends that the Commission require an annual technology review to gather information on new technologies and pilot projects. As part of this review, the Commission should confirm when a technology has become viable to permit plans and models to be revised to include them. CEERT further urges the Commission to be realistic about the near term costs associated with newly available technologies and the long term costs of bringing those

[36] November 9 ALJs' Ruling, Attachment A, at p. 10.

technologies to scale, including consideration of financial incentives, research and development, and pilot projects.

Question 3. What means beyond policies currently adopted by the two Commissions hold potential for the delivery of additional energy efficiency?

CEERT Response to Question 3.

CEERT has no comment on this question at this time, but reserves the right to address this question in reply comments.

Question 4. What means beyond policies currently adopted by the two Commissions hold potential for the integration of additional renewable resources into the grid?

CEERT Response to Question 4.

CEERT believes that there is additional action that can be taken beyond current policies to increase the potential for integrating additional renewable resources into the grid. These are examined as follows:

Increased Renewables Beyond Current Requirements

Regarding penetration of additional renewables into the grid beyond the currently mandated 20% by 2013, the Staff Workpaper states: "While the Energy Action Plan (EAP) adopted by the Public Utilities Commission and the Energy Commission, and endorsed by the Governor, suggests state policy to increase renewables to 33 percent by 2020, specific targets have yet to be set."[37] It is CEERT's position that California should set specific targets for 2020, as in CEERT's reference case, and set a policy of setting increasing targets beyond 2020, with an eye to 2050. The long-term GHG emission reduction goals of 80% reductions in GHG emissions below 1990 levels by 2050 requires that renewable energy targets clearly increase incrementally before and after 2020.

[37] November 9 ALJs' Ruling, Attachment A, at p. 7.

With regard to integrating higher penetrations of remote renewables, the Staff Workpaper states:

> "(I)n addition, the resource adequacy requirements imposed on LSEs through various decisions in R.05-12-013 and its predecessor rulemakings require LSEs to procure resources within local areas determined by the CAISO. These requirements, intended to satisfy reliability standards, may conflict with preferences for remote generation resources, and resolution of the conflicts could require significant transmission upgrades to reduce the need for local capacity."[38]

CEERT supports such an examination by the Commission as to the interaction between its current resource adequacy policies and resultant capacity-based energy planning and GHG emission reductions for 2020 and beyond. In that examination and its implementation of the GHG emission reduction measures identified in the Staff Workpaper, the Commission should base energy planning and procurement primarily on energy and associated GHG emissions, rather than capacity, as emissions are a function of energy generation. To calculate the potential carbon emissions reductions available from building supply around energy resources, the Commission, CARB, and the CEC, in coordination with the efforts of E3, should invest in economic research and modeling and demonstration projects to establish the applicability and scope of such a new approach, a recommendation CEERT has already submitted to the CARB's scoping plan effort. Such an approach recognizes that large-scale renewables projects can be organized, geographically distributed, and managed to reduce intermittency of wind and solar in several ways and that the generation profiles of wind and solar resources are potentially complementary.

Renewable Energy Transmission Initiative (RETI)

Planning for the transmission infrastructure necessary to deliver needed renewable energy to load centers requires a long-term commitment. CEERT has recommended to CARB in its

[38] November 9 ALJs' Ruling, Attachment A, at p. 7.

scoping plan process that the CPUC, CEC and CARB set priorities for the resources and regions to be developed first and adopt a timetable to ensure that the transmission infrastructure required to deliver power from these resources and regions will be built when and as expected.

A key means of ensuring that the planning required is being undertaken now is the current stakeholder process, the Renewable Energy Transmission Initiative (RETI). There have been a number of worthy efforts over the years by the California Independent System Operator (CalISO), CPUC, CEC, NREL, and others to study achievement of different renewable generation scenarios, including, among other things, total renewable potential, associated costs, and affect on jobs. However, the RETI process is unique in two ways: (1) RETI involves all stakeholders in the resource procurement, planning, and decision-making process for renewable development, including the investor-owned utilities, Southern and Northern California municipal utility associations, military, environmental groups, Bureau of Land Management, ISO, CEC and CPUC, with CARB also having been informally invited to join the steering committee; and (2) RETI's task, as recognized in the Staff Workpaper, is to "identify the transmission projects needed to accommodate these renewable energy goals, support future energy policy and facilitate transmission corridor designation and transmission and generation siting and permitting."[39] Further, the Commission, in D.07-12-052, has already specifically encouraged all utilities, agencies, and stakeholders to participate in the RETI process to address both transmission and procurement shortages in the renewable energy sector and ensure timely transmission upgrades.[40]

[39] November 9 ALJs' Ruling, Attachment A, at p. 7.

[40] D.07-12-052, at p. 78. Specifically, the Commission finds in D.07-12-052: "Because RETI begins with a thorough assessment of the renewable resource potential in California and neighboring regions, the output from RETI will be a critical input for the renewable procurement sections of the IOUs' future LTPPs. The Commission thus encourages the IOUs and all other interested parties to participate fully in RETI as a means of addressing both transmission and procurement shortages in the renewable energy sector." (D.07-12-052, at p. 78.)

While this process is currently a coordinated stakeholder process designed to undertake the renewable resource and transmission planning, it will also provide a roadmap for determining the location, amount, and cost of available renewable resources and associated transmission upgrades. Under these circumstances, policy decisions must be made in conjunction and coordination with RETI's work to confirm RETI's conclusions and guide related renewables procurement and transmission planning and certification.

CEERT, therefore, recommends that RETI be designated by the Commission as the coordinated planning process for meeting RPS targets in current statute – 20% by 2013. Beyond this near-term statutory requirement, RETI should be used to coordinate renewable transmission development based on future renewable policy.[41] CEERT further recommends, consistent with D.07-12-052, that the RETI become the official renewable planning mechanism for AB 32. As the Commission stated in that decision: "We anticipate that the statewide Renewable Energy Transmission Initiative will provide critical output for the IOUs to use in drafting their future renewable procurement plans."[42]

Question 5. How might an emissions reduction strategy within the electricity sector be targeted to displace the most carbon intensive aspects of California's electricity resource mix?

CEERT Response to Question 5.

Greenhouse gas emissions from the California electricity sector result almost exclusively from the use of natural gas and coal as energy sources for electricity. Coal-fired generation is substantially more carbon intensive than natural gas. Carbon emissions reductions can, therefore, be maximized by minimizing the use of coal-fired generation until such time as carbon sequestration technology becomes commercially available at reasonable cost.

[41] However, agencies and LSEs should not delay their existing transmission development plans underway to await outputs of the RETI planning process.
[42] D.07-12-052, Finding of Fact 33, at p. 276.

In 2006, Senate Bill (SB) 1368 (Perata) was signed into law to establish an Emissions Performance Standard for electricity purchase agreements of five years or greater for all California load-serving entities (LSEs).[43] Clearly, the intent of SB 1368 is to reduce the use of coal-fired electricity in California. However, although it prohibits long-term contracts for such power, it does not prohibit short-term contracts, spot purchases, or purchases of generic power that includes a coal component. As a result, the amount of coal-fired power expected to remain in the statewide portfolio in 2020 remains unclear.

Some municipal utilities are currently heavily dependent on coal-fired power, and replacing this power with less carbon intensive natural gas or renewables will increase their rates disproportionately. These LSEs and their customers are naturally concerned about the rate impacts of replacing coal-fired power.

It is CEERT's position that the most effective strategy to encourage coal-dependent, municipally owned LSEs to minimize their reliance on coal is the development of mechanisms that tend to equalize the burden of achieving emissions reductions between consumers served by California LSEs. CEERT is doubtful that the emissions permit trading schemes now under consideration will accomplish this goal and may even exacerbate the problem. CEERT strongly recommends that measures adopted to reduce statewide GHG emissions from the electricity sector recognize the different starting positions of different LSEs and the time required to make significant changes in their portfolios. LSEs should not be penalized for their current emissions levels, but rather for lack of future progress toward the adopted goals.

[43] Public Utilities (PU) Code §8340, et seq. (Stats. 2006, Ch. 598). The Emissions Performance Standard sets a maximum of 1,100 pounds greenhouse gas emission per megawatt-hour.

As an alternative to the auction and trading of emission reductions by coal dependent municipally owned utilities, CEERT would suggest requiring these LSEs to submit enforceable emission reduction plans to CARB that will ensure phased, annual reductions in greenhouse gas emissions, verifiable, expanded investments in energy efficiency, sustained and orderly investments in renewable resources and related transmission facilities, and reduced reliance on coal generation.

Further, planned and future fossil fuel procurement, both in- and out-of-state, and both for long-term and short-term purchases, must be justified in the context of greenhouse gas reduction goals and plans. The Commission recently ordered that:

> "When executing procurement plans in response to this decision, PG&E, SCE and SDG&E shall reflect in the design of their requests for offers (RFO) compliance with the Energy Action Plan (EAP) preferred resource loading order and with greenhouse gas (GHG) reductions goals. Any application for fossil generation filed in response to this decision, shall demonstrate how the resource fits into the investor owned utility's (IOU) GHG reduction strategy."[44]

Finally, California policymakers should focus on meeting emissions reductions for California's own jurisdictional load. A decision by California to eschew the use of coal would send an extremely valuable signal to the industry. References to carbon emissions and/or emissions reductions identified in the scenarios that CEERT has offered in these comments, thus, are reflective of this viewpoint and refer to emissions from generators supported financially by California consumers, regardless of state of origin.

2. CEERT RECOMMENDATIONS

In summary, with regard to the Staff Workpaper (Attachment A), CEERT recommends that the Commission:

[44] D.07-12-052, Ordering Paragraph 3, at p. 300.

1. Identify the Commission venues in which each of the measures, barriers, and issues identified in the Staff Workpaper will be addressed and coordinated and identify legislative action that may be required to remove policy barriers.
2. Expand and modify the policies within the Commission's jurisdiction now, in particular renewable energy and distributed generation policies, as necessary to achieve emissions reductions requirements.
3. Add measures to the Commission's list that have the potential to *reduce* greenhouse gas emissions – solar water heating in the natural gas sector, and solar space heating and cooling in the electric and natural gas sectors; and *increase* electric load – plug-in hybrid and electric vehicles and port and truck stop electrification.
4. Add to Item 3.2.6 in the Staff Workpaper a reference to excluding technologies that are not currently commercially viable, in addition to large hydro and nuclear, for 2020 planning purposes.
5. In the course of examining GHG emission reduction measures identified in the Staff Workpaper, consider the impacts of basing energy planning and procurement primarily on energy and associated GHG emissions, rather than capacity, as emissions are a function of energy generation.
6. Designate RETI as the official planning process for meeting RPS targets in current statute and coordinating renewable planning to achieve policies to reduce greenhouse gas emissions to 1990 levels by 2020 and beyond.
7. Consider directing coal-dependent municipal utilities to submit enforceable emission reduction plans to CARB that will ensure phased, annual reductions in greenhouse gas emissions, and increased investments in clean energy and associated infrastructure.
8. Consider adopting a policy to eliminate all coal purchases by California ratepayers.

B. QUESTIONS RELATED TO ATTACHMENT B (E3 Modeling / Data Sources)

1. CEERT RESPONSES

Question 6. Does E3's modeling documentation adequately document the methodology, inputs, and other assumptions underlying its model? If not, what additional documentation should be added?

CEERT Response to Question 6.

CEERT has no comment on this question at this time, but reserves the right to address this question in reply comments.

Question 7. Provide feedback, as desired or appropriate, on the structure and approach taken by E3 in its GHG Calculator spreadsheet tool.

CEERT Response to Question 7.

CEERT is generally supportive of the use of the E3 calculator for the purpose of AB 32 regulatory deliberations in the electric sector.

Question 8. Provide feedback, as desired or appropriate, on the data sources used by E3 for its assumptions in its issue papers. If you prefer different assumptions or sources, provide appropriate citations and explain the reason for your preference.

CEERT Response to Question 8.

Wind Integration Costs

It is CEERT's position that the methodology used by E3 to estimate wind integration costs is fundamentally incorrect. Such costs are a function of several system-specific parameters: the size of the balancing area, the nature of the dispatchable generation sources in that balancing area, their fuel costs, the characteristics of the wind generation resources as compared to load, and the market and regulatory environment. Further, costs in areas having robust wholesale power markets (such as the CAISO) are generally lower than those in regulated monopoly structures. The essential point is that integration costs are specific to individual

balancing areas and cannot be accurately compared across disparate systems without reference to each of these key parameters.

The E3 approach, however, mixes integration costs from coal-dominated systems with those from hydro-dominated systems; from regulated monopoly environments with those having wholesale power markets; and from large balancing areas (having many generating units) with those from small balancing areas (which have fewer generators to keep demand and supply in balance). The E3 regression analysis treats the integration costs found from the 32 estimates it cites as if they were commensurable, when in fact they are not.[45]

Because its regression analysis is methodologically flawed, the conclusions E3 seeks to draw from it are both incorrect and unsupportable. There is no basis in the considerable worldwide literature about wind integration costs to support a generalization that integration cost quadruples as wind generation doubles.[46]

Understanding the costs and operational impact of integrating wind and other renewables into the California electric system cannot reasonably ignore, as the E3 modeling documentation does, the two substantial studies of these issues conducted by the California Energy Commission (CEC). The first of these studies (January 2003-July 2004) examined the impact of existing renewable generation on the state grid.[47] This study found that "results for regulation and load

[45] E3 also includes integration costs from studies of the Avista and Idaho Power systems. Among other controversial issues, these studies count the opportunity costs of foregone hydro generation as a cost of keeping demand and supply in balance in the presence of wind generation. The resulting "integration" costs reported are much higher than those found on other electric systems around the world. Although Idaho Power has entered into a settlement agreement with the Idaho PUC about the costs reported, there is no industry consensus that the approach taken by the Avista and Idaho Power studies is appropriate or defensible as a basis for estimating wind integration costs. Including the costs taken from these studies further skews the "comparison" of integration costs shown by E3 (Attachment B, Figure 5, at p. 140).

[46] November 9 ALJs' Ruling, Attachment B, at p. 140.

[47] California Energy Commission Final Report, "California Renewables Portfolio Standard Renewable Generation Integration Cost Analysis, Phase 1: One-Year Analysis of Existing Resources" (December 2003); Phase II: "Key Attributes of Renewable Generators" (March 2004); Phase III: "Recommendations for Implementation" (July 2004).

following showed negligible values for integration costs for all of the resources evaluated."[48] In light of this finding, this study recommended that no costs be added to RPS bids for regulation or load following impacts until the CPUC or CEC were in position to produce updated values at a future date.

In the second of these studies, the Intermittency Analysis Project (IAP, 2006-2007), General Electric conducted detailed simulations of the California electric system with different generating mixes and penetrations of 20% to 33% renewables; the 2020 scenario included 12,700 MW wind and 6,000 MW solar generation (25,800 MW total renewables generation). Like the earlier Phase I-III integration studies, IAP methods and results were reviewed in multiple public meetings, with the final report formally adopted by the CEC. IAP findings and recommendations are complex, but, in overview, the study concluded that even in a stressed condition designed to test the system with more renewables than projected for 2010 (Scenario 2010X, with 19,800 MW or 33% renewables in service), existing conventional generating capacity already in place has sufficient flexibility to keep load and supply reliably in balance across a wide range of operating conditions. Conclusions assume the addition of sufficient new transmission, appropriate changes in operations practice, and removal of some contractual constraints on economic dispatch (e.g., through the renegotiation of existing contracts or the execution of new ones that support rational operation of the grid).

The IAP report does not identify overall integration costs for each scenario, but the costs implied by the additional flexibility required with different levels of renewables added are more than an order of magnitude lower than the average of integration costs found on other systems cited by E3. IAP found the additional regulation required with 33% renewables, for example, to

[48] "California Renewables Portfolio Standard Renewable Generation Integration Cost Analysis, Phase III: Recommendations for Implementation." Final Report (CEC P500-04-054), July 2004, at p. 44.

total 20 MW. Using CAISO data, the cost of an additional 20 MW of up-regulation and down-regulation is 22¢/MWh of intermittent renewable energy.[49] An increase of just 10 MW/minute in load-following capability is necessary to incorporate 33% renewables, as compared to the requirements of load alone.[50] Multi-hour scheduling flexibility requirements increase by 1,000 MW over the capability needed to meet load alone.[51]

In summary, the methodology used by E3 to estimate wind integration costs in California is logically flawed and is not supported by facts or evidence, and the dollar impacts of integration costs are higher than those suggested by CEC studies by material amounts. E3 should be directed to consult with experts in wind integration cost studies performed for California at the NREL, Oak Ridge National Laboratory, and General Electric, in order to develop integration cost estimates pertinent to the California electric system that will stand up to scrutiny.

Firming Cost

The approach used by E3 to compare the capacity provided by wind resources to that provided by other generating technologies is also flawed and not supported by the facts or evidence. E3 appears to assign the all-in cost of a combustion turbine (CT) to back up every MW of wind installed. Even with this back-up, which would be sufficient to make wind fully dispatchable, E3 credits wind with only a 10% on-peak capacity value. This approach greatly increases the evaluated cost of wind capacity relative to that of other resources.

[49] "Intermittency Analysis Project: Appendix B: Impact of Intermittent Generation on Operation of the California Power Grid," July 2007. CEC-500-2007-081-APB, at p. 186.
[50] "Intermittency Analysis Project: Final Report," July 2007. CEC-500-2007-081, at p. 41.
[51] Id., p. 41.

The fundamental problem here derives from the mistaken concept of a firming penalty as applied to wind. Because wind is primarily an energy resource and because individual loads and generators do not need to be balanced, there is no need for back-up generation for wind.

Because wind displaces operation of more expensive fossil-fired units, it functions as negative load, reducing the amount of load to be served. While the net load that must be served after accounting for wind does have more variability than the load alone, it is neither necessary nor economic to counter each wind movement with a corresponding movement of a load-following unit. The net increase in variability is less than the isolated variability of the wind alone.[52]

Wind provides less planning reserves to the system than most other generating resources. In contrast to the E3 approach, however, accepted industry practice is to calculate this with a standard reliability model (Effective Load Carrying Capability (ELCC)). The ELCC of wind generation depends largely on the timing of wind energy delivery relative to times of high system risk, defined as Loss of Load Probability. Studies performed for the CEC using this approach to calculate the capacity contribution of California wind resources to the state electric system have found the ELCC of California wind to be in the mid-20% range.[53]

E3 should, therefore, be directed to abandon attempts to compare the capacity equivalency of different resources by application of a firming penalty. Instead, E3 should be required develop an ELCC-based approach to comparing resources.

[52] J. Charles Smith, Michael R. Milligan, Edgar DeMeo and Brian Parsons, "Utility Wind Integration and Operating Impact State of the Art." IEEE Transactions on Power Systems, Vol. 22, No. 3, August 2007, p. 903. Engineering and scientific consensus descriptions of the impacts of wind power on electric systems is presented in a special issue of IEEE Power & Energy magazine devoted entirely to this topic (Volume 5, Number 6: November/December 2007).
[53] Id., at pp. 903-904.

Wind Capacity Factor

E3 uses the DOE-AWEA 2007 *Wind Vision* report as the source of the wind power capital and operating costs employed in its GHG calculator. However, E3 should also use the capacity factors for different classes of wind identified in that report, as those capacity factors represent a government-industry consensus view of the technology improvement path for wind generation through 2025.[54] Using the *Wind Vision* report numbers will increase the capacity factor employed in the GHG calculator in 2020.

Transmission Costs

The E3 GHG calculator uses transmission costs from a variety of sources.[55] The $2,282 million cost of the Tehachapi Transmission Project (TTP) used by E3 is taken from a 2005 study completed before the final configuration of that project had been identified.[56] The CAISO approved the TTP in January 2007 based on an estimated cost of $1,793 million supplied by SCE.[57] It is important to note that roughly half of the $1.8 billion cost derives from upgrades of the SCE system south of Tehachapi that had been planned before the Tehachapi Transmission Project was conceived. They provide reliability and economic benefits to CAISO ratepayers completely separate and apart from providing access to renewable generation, but are not required to connect Tehachapi generation to the EHV grid. The capital cost of transmission to access wind generation in Tehachapi is thus roughly $900 million.[58]

The E3 calculator should refer to renewables transmission costs calculated by the Intermittency Analysis Project (IAP Final Report, Appendix A: Intermittency Impacts of Wind

[54] DOE/AWEA Wind Vision Analysis, Supporting Documentation, Appendix B., Table 10, at p. 15.
[55] See, November 9 ALJs' Ruling, Attachment B (Table 1), at p. 143.
[56] Center for Resource Solutions, "Achieving A 33% Renewable Energy Target." Prepared for the California Public Utilities Commission, November 1, 2005.
[57] CAISO South Regional Transmission Plan for 2006, Part II: Findings and Recommendations on the Tehachapi Transmission Project, November 7, 2006, at p. 55.
[58] In its TEAM evaluation of the TTP, the CAISO attempted to distinguish renewables transmission costs from SCE network upgrade costs, but abandoned the attempt as too complex.

and Solar Resources on Transmission Reliability). IAP found the capital cost of transmission required to serve load and connect renewables generation at penetrations of 25%-31% in 2020 to be $5.7 billion. As with Tehachapi Transmission Project costs, it is important to note that more than half of the new or upgraded line segments identified by the study were found necessary just to meet load growth to 2020, regardless of renewables additions. The cost of new transmission required to meet the renewables goal is roughly half the $5.7 billion total.

Question 9. Are uncertainties inherent in the resource potential and cost estimates adequately identified? Does E3's model provide enough flexibility to test alternative assumptions with respect to these uncertainties?

CEERT Response to Question 9.

CEERT has no comment on this question at this time, but reserves the right to address this question in reply comments.

Question 10. Has the E3 model adequately accounted for the implications of increased reliance on preferred resources (renewables, efficiency) on system costs?

CEERT Response to Question 10.

CEERT has no comment on this question at this time, but reserves the right to address this question in reply comments.

Question 11. Should E3's model, in Stage 2, attempt to model potential market transformation scenarios, in the form of cost decreases, new technologies, or behavioral changes? What might be an appropriate way to characterize such potential for market transformation?

CEERT Response to Question 11.

CEERT does not believe that E3's model, in Stage 2, should attempt to model potential market transformation scenarios. The E3 model should focus on current reality – commercially available technology and current prices. Opportunities for market transformation and new technologies should be evaluated only when and if they become market realities.

Question 12. What specific flexible GHG emission reduction mechanisms to mitigate the economic impacts of achieving the desired GHG emission reductions should be modeled in Stage 2?

CEERT Response to Question 12.

CEERT has no comment on this question at this time, but reserves the right to address this question in reply comments.

Question 13. What output metric or metrics should be utilized to evaluate the least cost way to meet a 2020 emission reduction target for the sector?

CEERT Response to Question 13.

CEERT has no comment on this question at this time, but reserves the right to address this question in reply comments.

2. CEERT RECOMMENDATIONS

In summary, with regard to Staff Workpaper Attachment B (E3 Modeling/Data Sources), CEERT recommends that the Commission:

1. Direct E3 to replace its estimate of wind integration costs with an analysis specific to the California electric system completed by the Intermittency Analysis Project and adopted by the California Energy Commission, consulting as appropriate with experts in wind integration studies at the National Renewable Energy Laboratory, Oak Ridge National Laboratory and General Electric.
2. Direct E3 to apply an ELCC-based approach to comparing the capacity provided by variable-output and conventional resources, and to eliminate application of a firming penalty for this purpose.
3. Specify that the E3 calculator use wind capacity factors in the DOE-AWEA 2007 Wind Vision report.
4. Direct that the E3 calculator employ the renewables transmission costs found by the Intermittency Analysis Project, distinguishing as appropriate between transmission needed to connect renewables and transmission needed because of load growth.

CONCLUSION

CEERT greatly appreciates the opportunity to comment on the E3 model and data sources and the Staff Workpaper. CEERT respectfully requests that the Commission adopt CEERT's recommended proposed scenario framework to evaluate and compare emissions reduction measures and its recommendations made in response to the questions posed by the November 9 ALJs' Ruling. These recommended actions will ensure that California is on course for meeting the AB 32 GHG emissions reduction target by 2020 and achieving further GHG emissions reductions beyond 2020.

Respectfully submitted,

January 7, 2008

/s/ SARA STECK MYERS

Sara Steck Myers
Attorney for CEERT

122 – 28th Avenue
San Francisco, CA 94121
(415) 387-1904
(415) 387-4708 (FAX)
ssmyers@att.net

CERTIFICATE OF SERVICE

I, Sara Steck Myers, am over the age of 18 years and employed in the City and County of San Francisco. My business address is 122 - 28th Avenue, San Francisco, California 94121.

On January 7, 2008, I served the within document **OPENING COMMENTS OF THE CENTER FOR ENERGY EFFICIENCY AND RENEWABLE TECHNOLOGIES ON THE E3 MODELING METHODOLOGY AND THE STAFF WORKPAPER ON EMISSION REDUCTION MEASURES** in R.06-04-009, with electronic service as prescribed by the Commission's Rules of Practice and Procedure on the service list in R.06-04-009 and with separate service of hard copies by U.S. Mail to Assigned Commissioner Peevey and Assigned ALJs Lakritz and TerKeurst and with separate filing and service in California Energy Commission Docket No. 07-OIIP-01, at San Francisco, California.

Executed on January 7, 2008, at San Francisco, California.

/s/ SARA STECK MYERS
Sara Steck Myers