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)

California Energy Commission Docket #07-OIIP-01

REPLY COMMENTS OF THE NATURAL RESOURCES DEFENSE COUNCIL (NRDC), THE UNION OF CONCERNED SCIENTISTS (UCS), AND THE GREEN POWER INSTITUTE (GPI) ON MODELING-RELATED ISSUES

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I. Introduction and Summary

The Natural Resources Defense Council (NRDC), Union of Concerned Scientists (UCS), and Green Power Institute (GPI) respectfully submit these reply comments in accordance with the "Administrative Law Judges' Ruling Requesting Comments on Modeling-Related Issues" (ALJ Ruling), November 9, 2007; the "Administrative Law Judges' Ruling Extending Comment Deadlines and Addressing Procedural Matters," dated November 30, 2007, extending the commenting schedule; and pursuant to Rules 1.9 and 1.10 of the California Public Utilities Commission's (CPUC) Rules of Practice and Procedure. NRDC/UCS/GPI also concurrently submit these comments to the California Energy Commission (CEC) in Docket #07-OIIP-01, the CEC's sister proceeding to this CPUC proceeding.

NRDC is a non-profit membership organization with a long-standing interest in minimizing the societal costs of the reliable energy services that a healthy California economy needs. In this proceeding, NRDC represents its more than 124,000 California members' interest in receiving affordable energy services and reducing the environmental impact of California's energy consumption. UCS is a leading science-based non-profit working for a healthy environment and a safer world. Its Clean Energy Program examines the benefits and costs of the country's energy use and promotes energy solutions that are sustainable both environmentally and economically. GPI is the

renewable energy program of the Pacific Institute, a leading environmental research and advocacy institution that is active in water and energy issues. The GPI has performed pioneering research on the greenhouse gas implications of renewable energy production.

In these comments, we respond to opening comments filed by parties on January 4, 2008 on modeling-related issues and greenhouse gas (GHG) emission reduction measures to help inform the Commissions' recommendation to the California Air Resources Board (CARB). In summary, our reply comments elaborate on the following key points:

- Impact on Criteria and Toxic Pollutants Should be a Key Output Metric.
- Energy Efficiency Scenarios are Appropriately Aggressive.
- Water-Embedded Energy Savings are Appropriately Included as an Emissions Reduction Measure.
- The State's Electricity System can Support 33% Renewable Penetration Without the Need for Significant Additional Storage.
- Concerns that Renewable Costs May be Higher Than Estimated in the Model are Unfounded.
- The Model's Transmission Cost and Wind Integration Cost Methodologies Should be Revised.

II. Impact on Criteria and Toxic Pollutants should be a Key Output Metric.

Parties raised many suggestions for key output metrics in their opening comments. One key metric that has been missing from the discussion (and from Attachment A) is the analysis of the impact of the GHG emission reduction measures on criteria and toxic pollutant emissions. AB 32 requires CARB to do all of the following before adopting a market-based mechanism: "(1) Consider the potential for direct, indirect, and cumulative emission impacts from these mechanisms, including localized impacts in communities that are already adversely impacted by air pollution. (2) Design any market-based compliance mechanism to prevent any increase in the emissions of toxic air contaminants or criteria air pollutants. (3) Maximize additional environmental and economic benefits for California, as appropriate." (Health and Safety Code Section 38570(b))

Deep in the SpecGen tab of the GHG calculator is a calculation of NOX, SOX, and PM10 emissions under the reference, target, and user cases. Detailed information on these pollutants will be essential for CARB to conduct its required analysis.

Impacts on criteria and toxic pollutants should figure prominently in summaries for policymakers and E3 should provide access to information on changes in emissions at generating units, or at least at the regional level, given the health and environmental impacts on local populations.

III. Energy Efficiency Scenarios are Appropriately Aggressive.

Western Power Trading Forum (WPTF), Pacific Gas & Electric (PG&E) and others question whether the energy efficiency supply curves are overly optimistic, resulting in a model that underestimates the cost of compliance with GHG emission limits. WPTF, in particular, suggests that "very optimistic views of energy efficiency and new renewables … raise real reliability concerns from a resource perspective."[1]

Cost-effective energy efficiency is the state's top priority resource; therefore, it is essential that the state aggressively pursue all cost-effective opportunities. We believe that the modeling scenarios, particularly in the aggressive policy, represent appropriately ambitious energy efficiency initiatives. In addition, as noted in our opening comments, innovative program approaches and regional collaboration could result in lower costs and greater savings than the model currently assumes. Moreover, a number of parties, including SMUD and SCPPA, commented that the E3 supply curves substantially underestimate municipal utility efficiency resources.[2]

On balance, we think it is at least equally likely that the efficiency supply curves and administrative cost estimates are too pessimistic. In any case, we agree with WPTF's recommendation,[3] and that of many other parties, that the commission should carefully assess all model inputs and assumptions, and direct E3 to perform sensitivity analyses of critical parameters. The E3 model can provide valuable insights to the Commissions if it is used carefully and intelligently, and with an appropriate understanding of the inherent uncertainties involved in the modeling process.

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[1] WPTF at 4.
[2] SMUD at 1 and SCPPA at 8.
[3] WPTF at 10.

IV. Water-Embedded Energy Savings are Appropriately Included as an Emissions Reduction Measure.

PG&E "urges the CPUC to wait until the proposed Water-Energy Pilot is complete before incorporating water-related electricity measures into the potential study and modeling used for AB 32 because the pilot may find that certain measures are not cost-effective. Additionally, effectively pursuing saving water-embedded electricity may require new legislation if undertaken outside AB 32's regulatory scope." (p. 15) Contrary to PG&E's arguments, energy savings associated with water conservation should be included in both potential studies and AB 32 modeling without delay. The CPUC's pilot programs for IOUs examine the water-energy connection under only very limited conditions, and only for those programs funded by IOUs. Although improvements may be made, the cost-effectiveness calculator currently developed by Energy Division construes cost effectiveness in a very narrow manner by only accounting for energy savings within a particular utilities' service territory. Since the state's water system does not overlay perfectly with the energy utilities' service territories, and because AB 32 modeling is intended to look at savings throughout the electricity sector on a statewide basis, we urge the Commissions to include examination of water-embedded energy savings, which can potentially result in significant GHG reductions.[4] CARB has the ability to implement policies to encourage water-embedded energy savings through its AB 32 authority.

V. The State's Electricity System can Support 33% Renewable Penetration without the Need for Significant Additional Storage.

PG&E greatly mischaracterizes the operational challenges involved in integrating increased amounts of renewable energy into the system. PG&E claims that "Energy storage will be critical to successfully integrating significant levels of intermittent generation…In order to complete the modeling process for AB 32 emissions reduction

[4] NRDC estimates that increased water efficiency throughout the state could reduce the state's GHG emissions by up to 4.8 MMTCO2e from business-as-usual emissions in 2020, with further savings from strategies like water recycling. (See NRDC Scoping Plan recommendation submitted to CARB, "Urban Water Use Efficiency," October 1, 2007.)

modeling and evaluation, a reasonable approximation of projected storage costs will need to be modeled."[5] PG&E also implies that over-generation will be a serious problem with higher levels of renewable energy, noting that the "potential problems associated with over-generation could add substantial costs to procuring renewables."[6]

PG&E's claims are unsupported by analytic evidence. Analyses conducted by and for the CEC indicate that high renewables penetration scenarios in California can be achieved with minimal integration costs and without the need for additional storage capacity. NRDC/UCS/GPI support the recommendations of the CEC Intermittency Analysis Project ("IAP"), which calls for enhancing infrastructure and policy to optimize the use of existing pumped storage hydro, as well as exploring storage technologies as an alternative load shifting mechanism.[7] The IAP report, which is the most comprehensive and detailed analysis of the technical challenges presented by integrating 33% renewables in California to date, does not support PG&E's assertion that wind over-generation would substantially increase the cost of renewables or give credence to PG&E's contention that storage is a limiting factor for increased levels of renewable procurement.

While storage can help facilitate the integration of very large amounts of intermittent generation, significant new storage capacity is not necessary to achieve 33% renewables in 2020. In the rare event of over-generation during off-peak periods, the situation can be easily and cost effectively addressed by curtailing some wind generation for a small fraction of the hours in any given year.[8] Furthermore, improved wind forecasting and enhanced operation of and investment in the state's flexible generation resources would help to minimize the possibility of curtailment. While the state should continue to engage in research and development of advanced storage technologies, which will facilitate achieving extremely high levels of intermittent renewable generation in the post-2020 timeframe, the E3 model correctly recognizes that these technologies are not essential to meeting the 33% RPS goal.

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[5] PG&E at pp.21-22.
[6] PG&E at p. 20.
[7] California Energy Commission, *Intermittency Analysis Project: Final Report*, CEC-500-2007-081, July 2007, p. 40.
[8] According to p. 44 of the CEC IAP Final Report, "Under the rare occasions of coincident minimum load, high wind generation and low conventional hydro flexibility, it must be possible to curtail intermittent renewables."

PG&E's claim that storage must be included in the model is not justified by any serious analysis and would only serve to artificially inflate the costs of integrating renewable resources. Accordingly, the Commissions should reject PG&E's recommendation that storage costs be included in the E3 model.

VI. Concerns that Renewable Costs May be Higher than Estimated in the Model are Unfounded.

Several parties questioned the renewable cost assumptions of the E3 model, claiming that the model underestimates the actual costs of procuring renewable resources. For instance, the Western Power Trading Forum ("WPTF") asserts that because the model fails to assess transmission congestion costs within California, "it is very likely that renewable additions will create higher system costs than are reflected in the model."[9] SCE and SCPPA similarly question the model's assumption that 10% of existing transmission capacity will be available to transmit new wind generation and criticize the model's failure to account for congestion costs.[10]

These concerns are unfounded. All generators – not just wind generation – face potential congestion costs in delivering their output to load. Applying congestion costs to one type of generator without doing the same for all generation types would skew the results of the model. Furthermore, it is likely that the transmission additions that are required to deliver large amounts of new wind generation to California load will mitigate congestion costs in existing transmission lines, thus providing network benefits that are not captured in the E3 model. As NRDC/UCS note in their opening comments, the E3 transmission methodology assigns the entire cost of transmission investments needed to support new renewable resources to the renewable generator. This assumption fails to account for the possible network benefits of these transmission upgrades and likely overestimates the cost of bringing new renewable resources to load.[11]

WPTF also expresses concerns that the model overestimates the amount of renewable resources available to supply California needs, particularly considering the

[9] WPTF at pp. 7-8.
[10] SCE at p. 25; SCPPA at pp. 13-14.
[11] NRDC/UCS at pp. 14-15.

potential development of GHG policies in other Western states.[12] However, WPTF fails to acknowledge that only 2,000 to 2,500 MW of the 16,119 to 20,644 MW (approximately 12%) of renewable resources assumed to serve California in the target cases is sourced from other states in WECC.[13] As E3 stated at the November 14, 2007 GHG modeling workshop, the model assumes that RPS targets and goals in other WECC states and provinces are fully attained in 2020, thus leaving few low-cost renewable imports available to meet California's renewable supply needs.[14] Accordingly, NRDC/UCS/GPI disagree with WPTF's premise that the implementation of regional GHG policies would "dramatically reduce the availability of low-cost renewable resources to serve California load,"[15] because the model already assumes that renewable imports are limited.

SCE also asserts that the E3 model "does not account for the scarce supply of renewable resources," and implies that the wind cost assumptions in the model are too low.[16] According to SCE, "only a fraction" of the 400,000 GWh of wind power that the model assumes to be available at a busbar cost of $60/MWh or less can actually be installed by 2020.[17] However, SCE provides no evidence to back this claim. Moreover, the vast majority of the 400,000 GWh of low-cost wind that SCE references appear to be located in Wyoming. None of this low-cost Wyoming wind is delivered to California under the target case, due to the high transmission costs associated with delivering wind from Wyoming to California. Most of the state's wind supply in the 2020 target cases is located in-state and has a busbar cost that is significantly higher than that of Wyoming wind resources. Unlike SCE's claims regarding the scarcity of renewable supply, the wind resource assumptions in the E3 model are well documented and based on extensive data and analysis from government sources.[18]

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[12] WPTF at p. 3 and p. 8.
[13] Data obtained from the "Main" tab in the E3 GHG Calculator spreadsheet tool.
[14] See pp. 35-38 of Attachment B to the ALJ Ruling for documentation of the model's RPS assumptions. The model's reference case assumes that 15% of load in WECC as a whole is met by renewable resources in 2020 – approximately double the percentage in 2008.
[15] WPTF at p. 3.
[16] SCE at 3.
[17] Ibid.
[18] E3's documentation of wind resource assumptions are provided in pp. 71-76 of Attachment B to the ALJ Ruling.

NRDC/UCS/GPI recognize that high demand for wind generation in California and elsewhere may have resulted in some escalation of market prices in the short term, but the long-term cost of renewable resources – which are far more important to the results of the Commissions' modeling efforts – are much less susceptible to the short-term price escalation concerns expressed by SCE.

VII. The Model's Transmission Cost and Wind Integration Cost Methodologies should be Revised.

NRDC/UCS/GPI support CEERT's recommendation to revise the model's wind integration cost methodology to consider California-specific analyses, such as the CEC Intermittency Analysis Project.[19] NRDC/UCS/GPI also agree with SMUD's observation that the assumptions guiding the various integration cost studies that E3 reviewed are inconsistent. In particular, SMUD notes that the methodology of the Idaho Power study "has been singled out as being inconsistent with other studies."[20] SMUD also states that "expectation that the integration costs ought to be linear with penetration also does not seem consistent with industry expectations."[21] Indeed, most of the individual studies included in E3's regression of wind integration costs imply a logarithmic, rather than linear, relationship between wind capacity penetration and $/MWh integration costs, with the Idaho Power study standing out as the notable exception.[22] NRDC/UCS/GPI share the concerns of CEERT and SMUD, and recommend that the wind integration cost assumptions used in the model be revised so that they do not rely upon outdated data from the outlying Idaho Power study. The wind integration cost assumptions should also be benchmarked against the findings of the CEC IAP and recent meta-analyses of wind integration costs.[23]

NRDC/UCS/GPI also support's CEERT's recommendation that the model refer to the transmission cost assumptions included in the CEC IAP, and distinguish "as appropriate between transmission needed to connect renewables and transmission needed

[19] CEERT at 32-35.
[20] SMUD at 8.
[21] Ibid.
[22] See p. 140 of Attachment B to the ALJ Ruling.
[23] See, for instance: Smith et al., "Best Practices in Grid Integration of Variable Wind Power: Summary of Recent U.S. Case Study Results and Mitigation Measures," presented at EWEC 2007, Milan, Italy, May 2007."

because of load growth."[24] As NRDC/UCS noted in their opening comments, the model's existing documentation of the assumptions underlying the allocation of new transmission investments does not provide sufficient confidence that the model is fairly and accurately treating the costs of transmission investments associated with new renewable development.[25]

VIII. Conclusion

NRDC/UCS/GPI appreciate the opportunity to offer these reply comments on modeling-related issues, and we look forward to working with the Commissions, E3, and the parties going forward to improve upon the GHG modeling performed.

[24] CEERT at 37, 39.
[25] NRDC/UCS at 14-15.

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CERTIFICATE OF SERVICE

I hereby certify that I have this day served a copy of the **"Reply Comments of the Natural Resources Defense Council (NRDC), the Union of Concerned Scientists (UCS), and Green Power Institute (GPI) on Modeling-Related Issues" in the matter of R.06-04-009** to all known parties of record in this proceeding by delivering a copy via email or by mailing a copy properly addressed with first class postage prepaid.

Executed on January 18, 2008 at San Francisco, California.

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