COMMENTS OF CALIFORNIA ATTORNEY EDMUND G. BROWN
California Public Utilities Commission 33% Renewable Portfolio Standard Implementation Analysis, Preliminary Results

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Comments of California Attorney General Jerry Brown on California Public Utilities Commission 33% Renewable Portfolio Standard Implementation Analysis, Preliminary Results
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The California Attorney General submits these comments on the California Public Utilities Commission's (PUC's) Preliminary Results of its Report entitled "33% Renewables Portfolio Standard Implementation Analysis."[1] Because of the importance of the report and the central role of the PUC in meeting the 33% Renewable Portfolio Standard (RPS), we offer these observations for your consideration. Analyzing the path to the reaching the 33% RPS by 2020 is a difficult task, and the PUC Report does a good job in identifying many of the complex issues and challenges. The analysis could be improved, in our view, through an expanded discussion in several areas, particularly with respect to likely costs associated with different aspects of achieving the 33% objective, including the quantification of power demand in 2020 and the declining cost of distributed solar PV and other renewables during the relevant time period.

Projected Shortfall to Reach 33%

In some important instances, the Report's analysis relies upon data and assumptions that appear to be outdated or of questionable validity, including with respect to projected growth in electricity demand, the amount of existing renewables, and the impact of energy efficiency and other policies. As a result, the Report may substantially overestimate the amount of new renewable resources needed to meet the 33% goal. This is a significant issue.

First, the analysis assumes that demand in 2020 will be 308,000 gigawatt hours (GWh), based on estimates provided by the California Energy Commission (CEC) in 2007 (p. 19). These estimates are no longer consistent with the most current data. They fail to take into account the impacts of the current economic recession or the greater than expected reductions that have been realized from efficiency programs. Since the publication of the 2007 data, the CEC has revised its projections for statewide electricity consumption in 2018 downward by 9.6%.[2] In light of that substantial revision, the PUC analysis should be updated.

Second, the report assumes that the starting point for existing renewables is 27,000 GWh (p. 19), a figure drawn from the CEC's 2007 Net System Power Report. This figure, however, only takes into account purchases claimed by the utilities, and not the total power in the system estimated by the CEC, which also includes out of state renewable purchases by publicly owned utilities. The total system power figure appears to provide a more complete picture of actual State renewable resources. Significantly, the total system power figure, has been used as the renewable baseline by the Renewable Energy Transmission Initiative (RETI)[3] and CEC analyses.

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[1] The Attorney General submits these comments pursuant to his independent power and duty to protect the natural resources of the State from pollution, impairment, or destruction in furtherance of the public interest. (See Cal. Const., art. V., § 13; Cal. Gov. Code, §§ 12511, 12600-12612; *D'Amico v. Board of Medical Examiners* (1974) 11 Cal.3d 1, 14-15.)

[2] Chris Kavalec, 2009 IEPR Workshop, California Energy Demand 2010-2020, Staff Draft Statewide Forecast Results for Electricity and Natural Gas (June 26, 2009), available at http://www.energy.ca.gov/2009publications/CEC-200-2009-012/CEC-200-2009-012-SD.PDF.

[3] See RETI Phase IB Final Report (2009) at 3-3.

A recent CEC evaluation, for example, assumes that existing renewables in California are 32,469 GWh (29,780 In CA and 2,689 outside CA) as of Dec, 2008.[4]

Third, the report does not include as part of its base case the impacts of achieving the targets called for by AB 32's Scoping Plan and otherwise mandated or promoted by state law. For example, the report uses a figure of 16,450 GWh for energy efficiency gains from 2008-2020, while the Scoping Plan sets an objective of 32,000 GWh by 2020.[5] This goal is fully consistent with the PUC's own very aggressive efficiency mandates, including its big bold market transformation strategies, and its order requiring that investor-owned utilities achieve 100% of cost effective efficiency measures by 2020.[6] The report also assumes that no additional combined heat and power (CHP) will be installed between now and 2020, while the Scoping Plan sets a target of an additional 4,000 MW from CHP, enough to displace approximately 30,000 GWh of demand from other power generation sources.[7] Recent legislation establishes important new incentives that are designed to overcome two of the major barriers to more widespread CHP deployment,[8] and the PUC is actively engaged in efforts to promote new cogeneration. Additionally, the report assumes that only 847 MW of rooftop solar PV will be installed by 2020, while the Scoping Plan, as well the California Solar Initiative, calls for 3,000 MW.[9] Recent experience supports higher estimates; the annual rate for new installed solar capacity in California nearly doubled in 2008 over 2007 (from 81 MW per year to 156 MW per year), a marked increase from the 30-40 percent annual growth rate of prior years. [10] In our view, the PUC analysis for achieving 33% renewables should build on existing legal requirements, the AB 32 Scoping Plan, and the PUC's own mandates and studies. At the very least, if the PUC analysis uses different assumptions, it should explain the reasons for those differences.

Revising these assumptions substantially reduces the amount of new renewables needed to meet 33%. A recent CEC report, for example, that incorporates the Scoping Plan's targets and uses the 2008 total power system numbers, estimates that only 45,000 GWh, rather than 75,000 GWh, of new resources would be needed, and that this reduction both saved energy and

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[4] Angela Tanghetti & Karen Griffin, Impacts of AB 32 Scoping Plan Electricity Resource Goals on Natural Gas‐Fired Generation. California Energy Commission, CEC‐200‐2009‐011 (2009) at 14, available at http://www.energy.ca.gov/2009publications/CEC-200-2009-011/CEC-200-2009-011.PDF.

[5] California Air Resources Board, Climate Change Proposed Scoping Plan (Oct. 2008), at 44. This figure is derived from studies by the PUC and CEC of the potential from cost effective efficiency measures. The Scoping Plan noted that a more aggressive set of strategies could result in energy efficiency savings of 40,000 GWh by 2020. *Id.,* Volume I: Supporting Documents and Measure Detail at C-100.

[6] Interim Opinion On Issues Relating To Future Savings Goals And Program Planning For 2009-2011 Energy Efficiency And Beyond, Decision 07-10-032 (October 18, 2007).

[7] Scoping Plan at 43.

[8] The bills are AB 2791 (Blakeslee, 2008) and AB 1613 (Blakeslee, 2007). The incentives include a mandated investor-owned utility tariff and an on-bill financing program for projects up to 20 MW to defray upfront costs for nonprofit organizations and government facilities.

[9] Scoping Plan at C-122.

[10] PUC, California Solar Initiative Annual Program Assessment (2009) at 2. The number of residential applications in June, 2009 was the highest ever, 7.8 megawatts. See http://www.californiasolarstatistics.ca.gov/reports/8-05-2009/ApplicationStatsByMonth.html.

reduced peak load by up to 15% by 2020.[11] The RETI process also assumes that only 59,710 gigawatt hours would be needed to reach the 33% goal.[12] These lower numbers are likely to have a significant impact on the costs of achieving the 33% objective. An alternative scenario prepared by the Natural Resources Defense Council and the Union of Concerned Scientists, for example, found that using these alternative assumptions (as well as assuming reductions in solar and wind costs and lower cost renewable resources) could result in the 33% RPS standard being met at a cost of $45 billion.[13]

The report models a scenario in which the Scoping Plan's goals are met but only as a "low-load" alternative, and find that the incremental costs of achieving 33% actually would be *greater* under this scenario than if more renewables were needed to meet the 33% goal (p. 28). As the report recognizes, more analysis is needed to explain this counter-intuitive result. It appears in part to result from the assumption that because many central station renewables take a long time to come online, excess natural gas capacity will have to be built in the interim between now and 2020. A high distributed generation (DG) alternative, however, could avoid this excess capacity problem by allowing more generation to come on line much more rapidly. Thus, it would be worth modeling this low-load scenario in combination with the high DG alternative. Likewise, the low-load scenario may not produce excess capacity if it is modeled assuming more realistic, lower energy demand numbers in the near-term future, based on the CEC's most recent forecast.

The reference case and other scenarios also should be expanded to include discussion of a portfolio that meets the Governor's Executive Order S-06-06 requiring that 20% of the RPS come from bioenergy sources. The different mix of renewables needed to comply with this order could alter considerably the cost and timing of renewables development.

Likewise, the report should include a more nuanced discussion of how once-through cooling units will be replaced over time, such as that utilized by the CEC in its recent report on the impact of the Scoping Plan on new natural gas fired generation, because this could have substantial impacts on the amount and type of additional capacity generated between now and 2020.[14]

Fixed Technology Costs

The PUC Report assumes that there will be no changes in the costs or performance of renewable technologies between now and 2020 (p. 21). This is a very conservative assumption that does not give any weight to price reductions that will result as the scale of development

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[11] Joel Klein, Comparative Costs of California Central Station Electricity Generation Technologies, California Energy Commission, CEC-200-2009-017-SD (2009) at 2, available at http://www.energy.ca.gov/2009publications/CEC-200-2009-017/CEC-200-2009-017-SD.PDF.

[12] The report acknowledges the different RETI numbers but does not explain why it elects not to use them. See Input & Assumptions to 33% Renewables Portfolio Standard Implementation Analysis (July 2009) at 16.

[13] Comments of Natural Resources Defense Council & Union Of Concerned Scientists on Allowance Allocation, Flexible Compliance, CHP, Emission Reduction Measures, And Modeling Issues, Order Instituting Rulemaking to Implement the Commission's Procurement Incentive Framework and to Examine the Integration of Greenhouse Gas Emissions Standards into Procurement Policies, PUC Rulemaking 06-04-009, at p. 50, available at http://www.cpuc.ca.gov/EFILE/CM/83884.pdf.

[14] Tanghetti & Griffin, *supra*, at 16-21.

increases, i.e. the "experience or learning curve," or to the recent sharp cuts that have taken place in the price of solar PV. [15] This also runs counter to most studies of renewable energy, which project that costs will come down over time, particularly for solar energy. At the very least, the PUC should analyze a scenario in which costs of solar and wind technologies decline over the study period. By modeling costs without considering price reductions or performance improvements, the Report likely over-estimates the cost of meeting the 33% goal.

For example, a recent report by the CEC projected that between now and 2021 the cost of wind and solar would significantly decline. It noted that "[s]olar photovoltaic, which has seen cost reductions since the 2007 IEPR, is projected to show the most improvement of all the technologies, bringing its capital cost within range of the gas-fired combined cycle units near the end of the study period."[16] It estimated that the levelized cost of solar PV in 2018 would be about 30% of the levelized costs assumed in the 2007 IEPR. [17] An accompanying consultant's report estimated that over the next 20 years, the costs of parabolic trough technology could decline by 34- 55%, that onshore wind costs are expected to decline by 4-14%, and that the cost of geothermal technologies could drop by 7-20%.[18] That report also notes that wind turbines are becoming more efficient, with greater capacity ratings and higher towers.[19] Numerous other analyses reach similar conclusions. The Gigaton Throwdown, a consortium of clean tech leaders and academics, suggested in a recent comprehensive report that an appropriate experience curve for evaluating renewable technologies is 18-23% (costs drop by 18% to 23% every time total production doubles) and projected substantially lower costs for solar and other technologies as production ramps up.[20] Likewise, an analysis by researchers at the National Renewable Energy Laboratory concluded that as the market for thin-film solar PV expands, "economies-of-scale production capacity should substantially reduce the manufacturing price of the thin-film PV products and potentially make solar electricity price-competitive with grid-parity electricity in the not-too-distant future." [21]

Distributed Generation

As the PUC Report notes, distributed generation has the potential to play a very important role in reaching the State's renewable goals. DG can come on line very quickly, avoiding the high costs, regulatory and construction delays, and environmental opposition associated with building new transmissions lines, as well as the losses associated with transmitting electricity. In our view, the report overestimates the costs of the "high distributed

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[15] As a CEC report recently explained, experience curves are a well accepted tool in projecting technology costs. Charles O'Donnell, et al, (KEMA), Renewable Energy Cost of Generation Update, PIER Interim Project Report, California Energy Commission, CEC-500-2009-084 (2009) at 7, available at http://www.energy.ca.gov/2009publications/CEC-500-2009-084/CEC-500-2009-084.PDF.

[16] Klein, *supra*, at 2.

[17] *Id.* at 37 (Figure 20).

[18] O'Donnell, supra, at 66, 94, 123.

[19] *Id.,* at 105.

[20] Gigaton Throwdown, Redefining What's Possible for Clean Energy by 2020 (2009) at 64, 119, available at http://www.gigatonthrowdown.org/files/Gigaton_EntireReport.pdf.

[21] Harin S. Ullal & Bolko von Roedern, *Critical Issues For Commercialization Of Thin-Film PV Technologies*, Solid State Technology (Feb. 1, 2008), retrieved August 27, 2009 from accessmylibrary: http://www.accessmylibrary.com/coms2/summary_0286-34442128_ITM.

generation" scenario by assuming that the current installed cost for solar PV is $7/W-e (p. 31), and as a result, high DG is forecast to be the most expensive of all the alternatives. While the $7/W-e figure may have been the price for single-axis tracking polycrystalline silicon PV in 2007, it does not accurately reflect the current costs of the other major PV category, fixed thin-film PV arrays. Thus, it would be helpful for the report to include an alternative high DG analysis that assumes a more realistic, current price of thin-film PV, to provide a more balanced assessment of this possible approach.

As the report acknowledges, one of the RETI sensitivity analyses estimates that the cost of thin-film for solar is $3,700/kW (ac), or $3.70/W-e.[22] That is roughly half the PV cost assumed in the PUC report. Moreover, this lower figure seems to be the current state of the art installed cost for commercial-scale fixed thin-film solar PV. For example, Southern California Edison (SCE) estimated in its March 2008 application to the PUC (since approved) that the average cost of solar PV facilities installed as part of its urban rooftop program will be about $3.50/W-dc.[23] This translates into a cost of approximately $4.20/W-e, as of March 2008.[24] First Solar, the manufacturer of the thin-film panels being used by SCE, recently announced that its cost of producing panels has dropped from $1.23/watt in 2007 to $1.08/watt in 2008, and that its manufacturing costs in the second quarter of 2009 were $0.87/watt (a total drop of nearly 30%).[25] If one were to adjust the $4.20/W-e estimate in SCE's March 2008 application to reflect the decline in panel cost of $0.36/watt from 2007 to mid-2009, it would result in an adjusted current cost of $3.84/W-e. It also is worth noting in this regard that the PUC has approved a power purchase contract for fixed thin-film PV at a price that meets or is below the 2007 market price referent for projects coming on line in 2009, of just under $100/MWh for delivered energy.[26] This is less than what the RETI sensitivity analysis (and PUC report) assume the delivered energy cost will be for a typical solar PV facility, estimated at $168/MWh (p. 31). In short, taking into account the significant drop in the cost of thin-film technology that already has occurred, as well as the additional decreases in the price of solar PV predicted by experts and industry leaders, as noted above, a high DG alternative is likely to be considerably less costly than the PUC report suggests.

The PUC report discusses supply constraints for solar PV as one reason for assuming higher costs for the high DG alternative (p. 32). In fact, it appears that worldwide markets have demonstrated the ability to produce rapidly solar PV necessary for the fast ramp-up that occurred in Europe over the past several years, and that current market conditions include a glut in solar PV.[27] The CEC recently noted that the suppliers of silicon have announced plans to

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[22] RETI Phase 1 B, (Jan. 2, 2009) at 5-27-28. RETI does state that this number represents "goals and cost targets provided by manufactures and developers."

[23] See http://docs.cpuc.ca.gov/word_pdf/FINAL_DECISION/102730.pdf at 7.

[24] The PUC report assumes a dc-to-ac conversion factor of 0.83, see p. 31, n, 35. Using this conversion factor, $3.50/W-dc translates into $4.20/W-e.

[25] First Solar, Fast Facts: Company Overview, available at http://www.first-solar.de/pdf/FS_Company_FastFacts_MD-5-601-NA.pdf.

[26] See SCE contract with FSE Blythe, http://docs.cpuc.ca.gov/word_pdf/FINAL_RESOLUTION/85192.pdf at 13.

[27] *See* Bill Powers, *CEC Cancels Gas-Fed Peaker, Suggesting Rooftop Photovoltaic Equally Cost-Effective,* Natural Gas & Electricity (Aug. 2009) at 8, 12 (noting that worldwide thin film PV production capacity reached 3,600 megawatts a year in 2008 and is projected to reach 7,400 megawatts a year in 2010, and that worldwide conventional polycrystalline silicon PV production capacity reached 13,300 megawatts a year in 2008 and concluding that " there is a tremendous amount of available worldwide PV manufacturing capacity.")

increase their production capacity to 150,000 tons per year, equivalent to 15 gigawatts of solar cells, and that it now appears to be a buyers market for solar PV, with retail prices dropping.[28]

The PUC report notes the possibility of solar thermal resources with storage (p. 31), but does not discuss the possibility of solar PV with storage. Such a combination could provide a short-term substitute for additional natural gas capacity needed to ensure necessary system reliability, and is worth exploring.

Timeframe of Analysis

The PUC report compares the projected costs of a 33% renewable scenario to an all-gas scenario and a 20% RPS in 2020. But looking just at costs between 2008 and 2020 produces somewhat misleading results that do not show the long-term gains of renewable energy compared to fossil fuel alternatives. Many of the comparative benefits of renewable energy will be realized over a longer time horizon, once the capital costs of investment are paid off and renewable energy is being generated at little or no cost. By contrast, the costs of natural gas will continue to steadily rise; the report, for example, estimates that electricity under the "all gas scenario" will increase by roughly 14% per decade between now and 2020 (p. 22). To provide a more complete picture of what the true comparative costs and benefits of a 33% renewable portfolio would be, the report also should analyze electricity costs over a longer time horizon, such as from 2020-2040 or 2020-2050, and should provide comparative figures under the various scenarios of the net present value of electricity costs over this period.

Conclusion

We recognize that evaluation of variables associated with attaining the 33% renewable portfolio standard poses very significant challenges, and we appreciate the PUC's efforts in meeting the task. Thank you for the opportunity to provide our input into this process. If you have any questions about these comments, please contact Special Assistant Attorney General Clifford Rechtschaffen at cliff.rechtschaffen@doj.ca.gov, 510-622-2260.

[28] O'Donnell et al, supra, at 98. The report explains that "[t]hese price drops are, in part, an outcome of the billions of dollars of investment made around the world in new manufacturing capacity for solar modules over recent years. As consumers demand this new energy source, so market size and production volumes allow the industry to bring down costs."