CalWEA

California Wind Energy Association

April 28, 2014

Mary D. Nichols, Chairman
California Air Resources Board
1001 I Street
Sacramento, CA 95812

Richard Corey, Executive Officer
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Sacramento, CA 95812

Via CARB comments webpage:
http://www.arb.ca.gov/lispub/comm/bcsubform.php?listname=drafteaspu14&comm_period=N

Re: *Proposed First Update to the Climate Change Scoping Plan: Building on the Framework*

Dear Chairman Nichols and Mr. Corey,

The California Wind Energy Association ("CalWEA") appreciates this opportunity to comment on the Air Resources Board's February 2014 *Proposed First Update to the Climate Change Scoping Plan: Building on the Framework* ("*Proposed First Update*" or "*Update*"), particularly Appendix C, the Electricity and Natural Gas Working Paper. As stated, the *Update* will define ARB's climate change priorities for the next several years and frame the activities and issues facing the State as it develops an integrated framework for achieving both air quality and climate goals in California beyond 2020.

As we described in our November 1, 2013, comments on the ARB's October Discussion Draft,[1] the wind industry has made a significant contribution toward achievement of California's AB 32's 2020 goals. Wind energy capacity has more than tripled under the state's Renewables Portfolio Standard ("RPS") laws, now providing about 7% of California's electricity needs.

CalWEA agrees with the *Proposed First Update's* statement that a 2030 GHG-reduction target consistent with the reduction levels needed to stabilize global warming by 2050 is achievable. Further, in the electric sector with which we are most familiar, we believe that – carefully planned -- renewable energy can play a major role in helping to achieve that goal *at an affordable cost*, as discussed below. Setting a 2030 target very soon will be absolutely essential to foster the advance

[1] CalWEA's November 1, 2013, comments are available at:
http://www.calwea.org/pdfs/publicFilings2013/CalWEA_Comments_ARB_Scoping_Plan_Update_Discussion_Draft_11-1-13.pdf

planning that will be required to achieve the goal and to provide a clear market signal for continued investment in low-carbon technologies such as wind energy.

CalWEA is appreciative of modifications to the Discussion Draft that address some of our previously stated concerns. However, we have specific concerns regarding the new Appendix C, addressing Electricity and Natural Gas issues, and offer some suggestions. Specifically, as discussed below, we recommend the following improvements to Appendix C:

- Recognize the importance of the mix of renewable resources, and the flexibility of the existing gas generation fleet, in minimizing the need for integration resources and associated costs;
- Correct or clarify several statements regarding the grid-integration of variable renewable energy resources;
- Provide important analytic context in the section on geothermal energy; and
- Improve the document's internal cohesion.

1. Recognize the importance of the mix of renewable resources, and the flexibility of the existing gas generation fleet, in minimizing the need for integration resources and associated costs

Appendix C places an emphasis on the solutions needed to integrate high penetrations of renewable energy. [2] The document states, for example, that "[e]ffectively integrating large proportions of renewable resources include simultaneously pursuing several potential solutions" such as "dramatically increased deployment of energy storage technologies, advanced demand response, and advanced development of the smart grid."[3] While all of these solutions must certainly be pursued and deployed, the document should first highlight the importance of dramatically reducing the need for these mechanisms in the first place by paying careful attention to the renewable resource mix and improving the capabilities of the existing thermal generation fleet.[4]

A major January 2014 report by the research firm Energy and Environmental Economics (E3),[5] sponsored by California's five major utilities, studies several 50% renewable energy scenarios in 2030 for their grid impacts and associated costs. The E3 report clearly demonstrates that the grid impacts – and associated need for and cost of grid-integration solutions – will vary dramatically depending on the technological and geographical diversification of renewable energy resources. The report shows that a more technologically and geographically balanced resource portfolio (as compared to a

[2] See, e.g., Appendix C at pp. 28, 51, 65, and 67.
[3] Appendix C at p. 51.
[4] Appendix C notes, at pp. 18 and 33, that three recent studies looking at how California can reach its 2050 GHG reduction goal did not attempt to capture operational constraints of high amounts of intermittent renewable resources on the grid, and states that further analysis by the California ISO is needed. Certainly much analysis will be needed. However, the report should acknowledge the findings of the three recent reports discussed here.
[5] *Investigating a Higher Renewables Portfolio Standard in California*, available at http://www.ethree.com/public_projects/renewables_portfolio_standard.php.

hypothetical one dominated by in-state solar resources) would encounter dramatically fewer integration issues.

A further analysis by CalWEA of the E3 report, based on the data in the E3 report, creates a more optimized portfolio mix than the one studied by E3.[6] This further analysis underscores the point that the resource portfolio mix will have a significant impact on the need for integration solutions and associated costs. Specifically, CalWEA's analysis shows how the 9% to 14% rate impact of E3's Large Solar Scenario can be reduced to 2% using a more carefully balanced mix of resources and implementation of low/no cost integration measures. Because this mix relies on a greater diversity of renewable energy resources, including a moderate amount of out-of-state wind resources, this finding is consistent with the statement in the Appendix that "if greater emphasis is placed on regional, west-wide development, California could achieve higher renewable generation targets at lower costs and greater GHG savings."[7]

A separate analysis of the E3 study by the consulting firm Crossborder Energy points to the importance of the flexibility of the thermal generating fleet in integrating renewable energy resources.[8] Improving the antiquated operating procedures that impose significant restrictions on the ability of thermal generation in southern California would also significantly affect the amount of other, more costly, solutions needed to integrate levels of renewable energy resources beyond 33%. Specifically, enabling existing gas generators to reduce output when renewables output is high would significantly reduce the amount of "overgeneration" that otherwise would require more costly solutions.[9]

2. Correct or clarify several statements regarding the integration of variable renewable energy resources

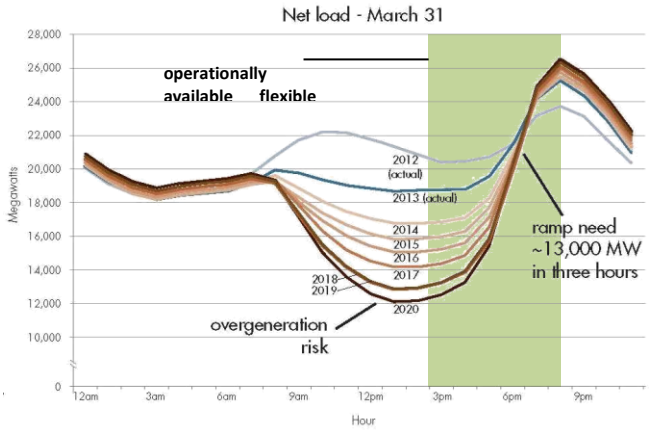
Several statements misstate or overstate the issues relating to the integration of variable renewable energy resources. This statement encompasses some of the problems:

> Increasing amounts of wind and solar resources without on-site storage are requiring changes in grid operation and infrastructure to integrate growing amounts of variable generation ... The GHG benefits of increased renewable energy will vary depending on how well generation matches demand and the extent to which gas-fired electricity generation is needed.[10]

First, this statement confuses the relatively modest challenges associated with the near-term integration of 33% renewables with the more significant challenges as we increase renewables

[6] Dariush Shirmohammadi and Nancy Rader, "Investigating the Investigation of a Higher Renewables Portfolio Standard in California: A Review of the Five-Utility E3 Study," California Wind Energy Association (April 2014). Available at: http://bit.ly/1kwt7YS.
[7] Appendix C at p. 34.
[8] Crossborder Energy, "50% Renewables: Too Much of a Good Thing?" (March 24, 2014). Available at http://bit.ly/OFK6sG.
[9] *Id.* at p. 11.
[10] Appendix C at p. 35-36.

significantly above that level.[11] The document should make clear that there is substantially more than enough flexible capacity in operation today to address the need for flexibility in 2020. The picture below superimposes two CAISO graphics: the "Duck Chart" from the CAISO's 10/2013 "Fast Facts" and a light-green bar from a CAISO 3/22/2013 presentation, which represents all available and dispatchable Effective Flexible Capacity (EFC) during a critical month. All 28,000 MW of EFC is operationally available to address the 13,000-MW ramping need. This fact should be highlighted, although it would be reasonable to note that efforts are underway at both the CAISO and the CPUC to establish new rules and modest incentives to ensure that this capability is made available to the CAISO when needed.



Source: CalWEA, based on CAISO materials (see text).

Second, the Appendix C statement quoted above suggests that adding on-site storage to wind and solar resources would be an economically and/or technically appropriate thing to do. As discussed in the previous section, above, the most cost-effective way to add wind and solar to the grid is first to develop a cost effective and diverse mix of renewable resources and to ensure maximum flexibility of the gas generation fleet. These two steps will enable the integration of renewables, at least up to a 50% penetration level, with low-cost integration services.

Third, while it is unclear what, exactly, is meant by the statement that the "GHG benefits of increased renewable energy will vary depending on how well generation matches demand and the extent to which gas-fired electricity generation is needed," the statement seems to suggest that integration services from gas-fired resources will substantially offset the GHG benefits of renewables. This is not the case, as documented by recent reports from the National Renewable Energy Laboratory (NREL), which found that the increase in plant emissions (CO2, NOx, and SO2) from cycling to accommodate wind and solar is relatively small, with a "negligible" impact on CO2 emissions. The small increase in plant emissions from cycling to accommodate variable renewables is more than offset by the overall reduction in CO2, NOx, and SO2.[12]

[11] Part of the problem is that the document does not clearly differentiate between its discussion of near-, mid- and long-term issues.

[12] NREL, *Western Wind and Solar Integration Study* (September 2013). Available at: http://www.nrel.gov/electricity/transmission/western_wind.html.

Finally, storage resources, regardless of their size, technology, or location, will be used most efficiently if treated as system resources to be managed centrally by the grid operator rather than as local resources tied to renewables or load.

3. Provide important analytic context to the section on geothermal energy

The geothermal section in Appendix C comes across as a restatement of geothermal industry material rather than an analysis pertaining to the cost-effective achievement of GHG-reduction or the various other goals mentioned in this section.

We agree that the CPUC should update procurement practices, including an updated assessment of the integration costs of all renewables, including wind and solar resources – and it is our understanding that the CPUC is in the process of doing so. However, neither the ARB nor other state energy agencies should foster the illusion that consideration of these values, or the cost/value of ancillary services,[13] will cause geothermal resources to become competitive with other renewable energy resources. Moreover, it is incorrect to state that the capacity value of geothermal is not reflected in renewable energy pricing, as Appendix C states.[14]

To the contrary, ancillary service costs, as a fraction of wholesale energy costs, have historically been very small, as indicated by the CAISO graphic reproduced below. We expect that other integration costs related to wind and solar resources, when quantified by the CPUC, will be similarly low.[15] These costs/values are very unlikely to make up the difference in costs between lower-cost renewables and geothermal, as shown in the table reproduced from the E3 report referenced above. Finally, utilities' RPS procurement practices have always credited resources for the utilities' (albeit opaque) assessment of capacity value.

All this said, geothermal may well play a role in a cost-effective, higher-penetration renewables portfolio mix, as indicated by the E3 study and CalWEA's review of the E3 study, referenced above. We encourage the ARB to highlight the importance of conducting this type of careful and methodical planning for the affordable achievement of electric-sector GHG-reduction goals prior to establishing GHG policy priorities.

Regarding the recommendation that "Using geothermal power's potential as a flexible resource should be encouraged"[16] – the ARB and other state energy agencies should recognize that (a) using geothermal as a flexible resource will raise the per-MWh cost of geothermal energy, given that that this flexibility would require lower overall output thus requiring capital costs to be spread over fewer MWh, and (b) as indicated above, the value of ancillary services is relatively low compared to the relatively high cost of geothermal energy, and thus is not likely to improve the overall competitive position of geothermal energy.

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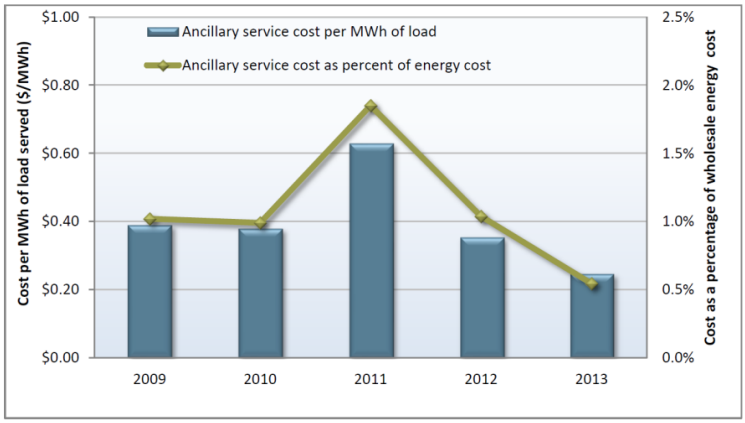
[13] Ancillary services include regulation up and down, and spinning and non-spinning reserves.
[14] Appendix C at p. 40-41.
[15] See CalWEA's Comments filed in CPUC R.11-05-005 on Second Assigned Commissioner's Ruling Issuing Procurement Reform Proposals (Nov. 20, 2012) at p. 32. Available at: http://www.calwea.org/pdfs/publicFilings2012/CalWEA_Comments_on_Second_Assigned_Commissioner_Ruling_11_20_12.pdf.
[16] Appendix C at p. 41.

Figure 6.1 Ancillary service cost as a percentage of wholesale energy costs (2009 – 2013)



Source: CAISO, *2013 Annual Report on Market Issues & Performance* at p. 11 and 140. Available at: https://www.caiso.com/Documents/2013AnnualReport-MarketIssue-Performance.pdf.

Table 19: Reference Case renewable resource capital costs and LCOEs over time (all costs in 2012 $; capital costs for solar PV are reported relative to the plant's DC nameplate capacity).

Technology	Capital Cost *($/kW)*			LCOE *($/MWh)*		
	2013	2020	2030	2013	2020	2030
Biogas	$3,040	$3,040	$3,040	$ 85	$ 108	$ 108
Biomass	4,974	4,974	4,974	90	131	131
Geothermal	6,080	6,080	6,080	107	148	148
Hydro - Small	4,238	4,238	4,238	157	241	241
Solar PV - Residential Rooftop	4,165	3,362	2,951	223	311	278
Solar PV - Commercial Rooftop	3,123	2,521	2,213	177	243	218
Solar PV - Fixed Tilt < 20 MW	2,643	2,133	1,873	103	142	127
Solar PV - Fixed Tilt > 20 MW	2,357	1,903	1,670	91	126	113
Solar PV - Tracking < 20 MW	3,000	2,422	2,289	92	128	114
Solar PV - Tracking > 20 MW	2,692	2,235	2,126	82	114	102
Solar Thermal - No Storage	5,370	4,539	3,986	164	216	192
Solar Thermal - Six Hour Storage	7,780	6,577	5,775	160	213	188
Wind - In-State	2,111	2,006	1,930	69	102	99
Wind - Out-of-State	1,963	1,866	1,795	54	86	83

Source: E3 (see footnote 4).

Finally, the suggestion is buried in the geothermal section that CPUC procurement practices should be developed to include a "higher value portfolio that includes not just lower-cost projects" but also those that "reduce the risk of forest fires that damage transmission lines, encourage

investment in disadvantaged communities, create jobs in California, and provide value to the state as a whole."[17] While these goals and values are obviously important, before suggesting that geothermal resources be procured to achieve these goals, the ARB should carefully consider the costs and benefits of doing so, as compared to other means, as well as the appropriateness of addressing these issues within the utility procurement process.

4. Improve the document's internal cohesion

Appendix C, as reflected to some degree in the *Proposed First Update,* reads as if it were written by multiple authors with conflicting objectives and without much coordination. As just one example, the Appendix does not "connect the dots" between the Zero Net Energy (ZNE) recommendations (listed on p. 66), which will be largely dependent on solar energy, and the discussion of the operational challenges with high penetrations of solar energy described on p. 50-53. The reader is left wondering whether the integration impacts and associated costs of ZNE goals have been considered as compared with providing energy from a more diverse, and possibly less costly, set of central renewable energy sources (see section 1 above).

As we recommended in our November 1, 2013, comments, the ARB should call for (or conduct for itself) a comprehensive cost-effectiveness analysis that evaluates the costs and benefits of various policies and programs before establishing policy priorities. A comprehensive cost-effectiveness analysis should evaluate, with stakeholder engagement, the efficiency of various policies and programs in reducing GHGs, with separate consideration of non-GHG-related program objectives.

CalWEA appreciates this opportunity to comment on the *Proposed First Update to the Climate Change Scoping Plan*.

Respectfully Submitted,

Nancy Rader
Executive Director

[17] Appendix C at p. 40.