Stakeholder Comments Template

Submitted by	Company	Date Submitted
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Please use this template to provide written comments on the Clean Energy and Pollution Reduction Act Senate Bill 350 Study initiative posted on February 4, 2016.

Please submit comments to regionalintegration@caiso.com by close of business February 19, 2016

Materials related to this study are available on the ISO website at: http://www.caiso.com/informed/Pages/RegionalEnergyMarket/BenefitsofaRegionalEnergyMarket.aspx

Please use the following template to comment on the key topics addressed in the initiative proposal.

1. Do you think the proposed study framework meets the intent of the studies required by SB350? If no, what additional study areas do you believe need to be included and why?

Comment:

SB 350 set forth as follows:

395 (e) (1) The Independent System Operator conducts one or more studies of the impacts of a regional market enabled by the proposed governance modifications, including overall benefits to ratepayers, including the creation or retention of jobs and other benefits to the California economy, environmental impacts in California and elsewhere, impacts in disadvantaged communities, emissions of greenhouse gases and other air pollutants, and reliability and integration of renewable energy resources. The modeling, including all assumptions underlying the modeling, shall be made available for public review.

(2) The commission, Energy Commission, and State Air Resources Board jointly hold at least one public workshop where the Independent System Operator presents the proposed governance modifications and the results of the studies described in paragraph (1). The related Independent System Operator documents shall be made public before the workshop.

NRG agrees that the proposed framework meets these requirements.

2. Five separate 50% renewable portfolios are being proposed for 2030 as plausible scenarios for the purpose of assessing the potential benefits of a regional market. Are these portfolios reasonable for that purpose, and if no, why?

Comment:

The five portfolios to be studied are:

(1) Business As Usual (BAU) – renewable energy comes mostly from in-state resources with no regional market to reduce renewables curtailment. There are three sensitivities under the BAU case:
   a. Limiting California net exports to 2000 MW
   b. Limiting California net exports to 5000 MW
   c. Limiting California net exports to 8000 MW

(2) BAU renewable energy procurement with regional market operations - renewable energy comes mostly from in-state resources but transmission rates are "de-pancaked" and a regional market means reduced renewables curtailment.

(3) Regional market and regional renewable energy procurement – this portfolio assumes new transmission is built to access higher quality wind resources.

Per Slide 14 of the E3 presentation, Scenario 3 assumes a regional market within the United States portion of the Western Interconnection, except for the Rocky Mountain area. It's not clear whether this means there is any intermediate step between "no regional market" and the "all US Western Interconnection but the Rocky Mountain region" regional market. If there is no intermediate step, a scenario that considers a regional market that is of lesser scope than the "all US Western Interconnection but the Rocky Mountain region" might be informative.

3. To develop the five renewable portfolios the RESOLVE model makes a number of assumptions resulting in a mix of renewable and integration resources for the scenario analysis (rooftop solar, storage, retirements, out of state resources etc.) Do you think the assumptions associated with developing the renewable portfolios are plausible? If no, why not?

Comment:

The study appears to make the following assumptions (NRG comments follow each assumption):

- Renewables are compensated for curtailed energy at full PPA price

Current renewables contracts limit the situations under which renewables can be curtailed and do not provide full compensation for curtailment. While it might be convenient to assume that renewable resources' production can be curtailed without limit, this assumption is unrealistic and could lead to flawed and overly optimistic assumptions about renewable energy deployment and the viability of existing renewable projects.

- Generators are compensated regardless of market prices

Adequate generation with the appropriate locational and performance characteristics will clearly be critical to achieving a 50% renewable energy future, but simply assuming this generation will be compensated is insufficient to ensure that it will be there. Additional renewable resources, both in-state and out-of-state, along with additional imports, are likely to depress California wholesale energy prices even further than their current already-depressed levels. The CAISO's position is that generators will be provided with the compensation they need through their RA contracts, and the CAISO will have a suitable mechanism for keeping a needed generator in operation, but that position has not been tested as it will be with the coming waves of OTC retirements. Further information that indicates how this assumption will be actualized is necessary.

- The study will use CEC's 2013 IEPR California Electricity Demand Mid Baseline + Mid AAEE for non-thermal and non-transportation end uses (Slide 16 of the E3 presentation)

As discussed at the February 8 meeting – why not use the most recent IEPR forecasts for the analysis?

- Slide 17 of the E3 presentation indicates that the study will assume 14.6 GW of rooftop PV by 2030.

NRG questions whether this is a reasonable assumption. For this assumption to be reasonable, it cannot be considered in isolation. From CAISO data, the hourly minimum net load in 2016 to date is approximately 13,500 MW (HE11, Sunday 2/14/16). Assuming that the current amount of installed rooftop PV is 3.3 GW, the additional 11.3 GW of rooftop solar proposed to be added, independent of any other CAISO-metered solar resources coming on line, would leave a net load value below 3 GW. Achieving a net load value this low would seem to require other assumptions that are not fully

evident. This assumption may be valid if there are other mechanisms simultaneously assumed to be in place (additional in-state storage, TOU rates that shift consumption to the mid-day solar hours, or a reliable out-of-state sink for all of this energy), but, standing on its own, this assumption begs the question of how a system with this level of net load can be operated.

- RESOLVE adds new capacity if resource adequacy needs are not met with preferred resources (Slide 18 of the E3 presentation)

In order to assess whether this is a reasonable assumption - how are preferred resources assumed to meet RA needs? Are wind and solar resources assigned RA capacity values through ELCC analysis? Are such ELCC-assigned values grandfathered for existing renewable resources? While the slide observed that no new capacity additions were triggered in the scenarios, more information on how preferred resources are assumed to meet RA needs should be provided.

- Solar development potential is nearly unlimited (Slide 19 of the E3 presentation)

NRG agrees with the comments made by IEP and LSA that this assumption seems premature in light of the land use issues that have arisen.

- 500 MW of geothermal and 500 MW of pumped storage manually added for portfolio diversity (Slide 33 of the E3 presentation)

Though neither of these projects appear to be cost-effective, including them for diversity purposes seems reasonable.

- According to Slide 34, scenarios 1-3 have a “baseline” of 3820 MW of energy storage to meet the 33% RPS requirements.

Even accounting for 500 MW of pumped storage for “portfolio diversity”, this 3820 MW value is 2000 MW above the current storage procurement mandate. While Slide 30 talks in general terms about the RESOLVE model selecting least-cost storage based on capacity and duration, some additional information on what the 3820 MW number is comprised of and how the 3820 MW number was determined would be helpful.

Finally, NRG offers these other assumptions not directly touched on in the slides:

- What assumptions will be made about how TOU rates may or will encourage in-state mid-day consumption, making it less necessary to dump surplus mid-day solar to other states?

- The studies assume a net export value of up to 8,000 MW. It is difficult to assess the viability of this number with no historical basis for such a number

available. California's ability to export its solar surplus to other states should not simply be assumed. Other states with excellent solar and wind resources may experience explosive growth in renewable deployment, and the ability to sink California solar surplus to those states should not be taken as a given.

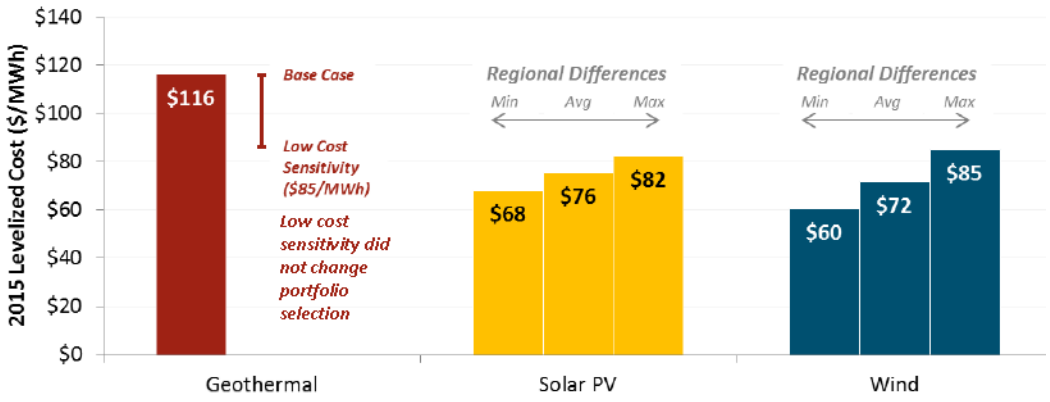
4. The renewable portfolio analysis assumes certain costs and locations for the various renewable technologies. Do you think the assumptions are reasonable? If no, why not?

Comment:

The study makes these assumptions:

- Solar: 8% reduction in cost by 2020, 15% reduction in cost by 2030

Category	Geothermal	Solar PV*	Wind
Capital Cost ($/kW)	$6,633	$2,470	$2,045
Interconnection Cost ($/kW)	$260	$200	$136
Fixed O&M ($/kW-yr)	$263	$30	$33



NRG has no comment on these assumptions and presumes them to be reasonable.

5. The renewable portfolio analysis makes assumptions about the availability and quantity of out-of-state renewable energy credits ("RECs") to California. Do you think the assumptions are plausible? If no, why not?

Comment:

Per Slide 21 in E3's presentation, the out-of-state resources are divided into three classes:

- OOS resources that deliver to local load but qualify for California RECs (2,000 MW of medium-quality wind and solar)
- OOS resources that can be delivered on the existing transmission system (3,000 MW of medium quality wind and solar)
- OOS Resources that require new transmission (6,000 MW of high quality wind from Wyoming and New Mexico)

This classification seems plausible.

6. The renewable portfolio analysis makes assumptions about the ability to export surplus generation out of California (i.e., net-export assumptions). Do you think these assumptions are reasonable? If no, why not?

Comment:

Scenarios 2 and 3 assume that California's ability to export surplus generation is limited only by physical transfer capacity, while Scenario 1 assumes a range of 2,000 to 8,000 MW of export capability.

California has historically been an importer of power. As noted in response 3 above, assumptions about California's ability to export power posit a future for which there is no historical experience, and the ability to reliably sink California solar surplus in other states should not be taken as a given.

The reasonableness of assumptions about California's ability to export power depends on:

- Assumptions about changes in retail rates intended to encourage mid-day consumption
- Load growth in other states and California (especially California-driven growth in transportation electrification)
- The spontaneous or mandated development of renewable generation in other states
- Generating unit retirements, including those driven by the Clean Power Plan

7. Does Brattle's approach for analysis of potential impact on California ratepayers omit any category of potential impact that should be included? If so, what else should be included?

Brattle's approach includes looking at the impacts of

- De-pancaking of transmission charges
- Real-time EIM
- Day 2 energy market
- Integrated Ancillary Service Markets
- Regionally uniform resource adequacy standard
- Regional procurement of flexible reserves
- Reduced renewables overbuild

NRG comments on several of these impacts below.

Comment:

- Consolidated "Balancing Areas" and integrated ancillary services markets (Slides 3, 6 of Brattle's presentation)
- Regional procurement of flexible reserves

There are practical limits to the ability to consolidate and integrate ancillary services procurement, and to procure AS across a wider footprint. Currently, while the CAISO operates as nearly a whole-state BA, the CAISO has provisions for regional procurement of ancillary services. How will the study determine the maximum practical geographical size of regional procurement of ancillary services?

- Slide 5 of Brattle's presentation suggests that Integrated Ancillary Services Markets will further reduce curtailments of renewable generation.

Can the CAISO explain how the two are related? Does the CAISO anticipate that pooling AS requirements across broader areas will reduce unit commitment and the Pmin burden, making more room for renewable energy?

- Regionally uniform resource adequacy standard (Slide 6)

NRG remains skeptical of how "uniform" an RA standard outside of the CAISO's California footprint is likely to be. While this is under development in another stakeholder process, it seems likely that the outcome there will be that the CAISO will continue to defer to LRAs. Moreover, the possibility of California ratepayer benefits flowing from the adoption of a regional RA standard seems remote.

NRG agrees that a larger RA "footprint" could introduce some regional peak diversity benefits (in which the coincident peak of the larger area is lower than the sum of non-coincident peaks of the smaller areas). Again, it is not yet clear whether California ratepayers would benefit from this diversity.

The CAISO will still have to account for deliverability in a larger RA footprint.

- Day 2 energy market

The largest benefits will be created through a "Day 2" market, yet, apart from PacifiCorp's stated intent to explore full participation in the CAISO as a Participating Transmission Owner, to NRG's understanding no other party has expressed interest in being part of a full "Day 2" market. Is the "Day 2 market" assumption a binary one (either all in, or all out)? Should some intermediate step of partial participation in a "Day 2" market be explored?

8. Are the methodology and assumptions to estimate the potential impact on California ratepayers reasonable? If not, please explain.

Comment:

See comments in Section 7.

9. The regional market benefits will be assessed based assuming a regional market footprint comprised of the U.S. portion of the Western Interconnection. Do you believe this is a reasonable assumption for the purpose of this study? If not, please explain.

Comment:

See comments in Sections 2 and 7 above. The expansion of the CAISO market into all US regions of the Western interconnection apart from the Rocky Mountain region is an aspirational goal. For the purposes of this study, some scaled-back expansion could and should be examined to provide an intermediate data point between 'all in" and "none in".

10. For the purpose of the production cost simulations, Brattle proposes to use CEC carbon price forecasts for California and TEPPC policy cases to reflect carbon policy implementation in rest of WECC. Is this a reasonable approach? If not, please explain.

Comment:

This seems to be a reasonable approach, but the choice and weighting of scenarios should reflect the significant uncertainty surrounding the Clean Power Plan.

11. BEAR will be using existing economic data, and generation and transmission data from E3, the CAISO, and Brattle. These data are currently being developed. Are there specific topics that you want to be

sure to be addressed regarding these data?
Comment: The opportunities to comment on this analysis are limited to (1) comments on assumptions due at the beginning of the process and (2) comments on initial results in April. The CAISO should consider providing an additional opportunity to review and comment on the full range of data that will be applied to the study once that data has been fully developed.
12. The economic analysis will focus on the electricity, transportation, and technology sectors to develop the economic estimates of employment, gross state product, personal income, enterprise income, and state tax revenue. These results will be further disaggregated by sector, occupation, and household income decile. Do you think these sectors are the appropriate ones on which to focus the job and economic impact analysis? If no, why?
Comment: These seem reasonable.
13. Under the proposed study framework, both economic and environmental impacts of disadvantaged communities will be studied. Based on the study overview do you think this satisfies the requirements of SB350?
Comment: Yes.
14. The BEAR model will evaluate direct, indirect, and induced impacts to income and jobs, including those in disadvantaged communities. Do you think additional economic analysis is required? If yes, what additional analysis is needed and why?
Comment: This economic analysis should satisfy the SB350 requirements and seems reasonable.
15. The environmental analysis will evaluate impacts to California and the west in five areas – air quality, GHG, land, biological, and water supply. Do you think additional environmental analysis is required? If yes, what additional analysis is needed and why?

Comment:

NRG does not view that additional economic analysis is needed.

16. The environmental analysis presentation identified a number of potential indicators for the various impacts. Are the indicators sufficient? If no, what additional indicators would you suggest?

Comment:

Those indicators are:

1. Air Quality
    a. Addition of fossil fuel generation capacity
    b. Changing fossil fuel consumption and emissions inside a zone with nonattainment conditions
    c. Shifting fossil fuel MWh production into a zone having more severe nonattainment conditions
    d. Changing MWh production towards coal or natural gas in mapped disadvantaged communities

2. Greenhouse Gas Emissions
    a. Changing fossil fuel consumption and emissions across entire study region
    b. Changing MWh production towards coal or natural gas across entire study region

3. Land Use and Visual Resources

    a. Addition of generation or transmission affecting areas designated as sensitive or special use, or areas where development is constrained or precluded
    b. Generation or transmission in or near tribal land areas
    c. Generation or transmission in constrained areas managed as sensitive visual resources (e.g., wilderness, National Parks, scenic highways)
    d. Generation or transmission affecting farm lands

NRG proposes to add these indicators to the above list:

    e. Federal Solar PEIS zones and restrictions on development on Federal lands outside these zones
    f. State efforts to limit solar development to specific study areas within the Mojave Desert and restrict development outside those areas.

4. Biological Resources and Ecology

a. Addition of generation or transmission in locations more likely to be considered sensitive
b. Potential changes in generation resource mix that would affect local biological resources
c. Shifting the potential for land disturbance into a zone where likely to affect sensitive biological communities

NRG proposes to add these indicators to the above list:

d. Impact of more streamlined mitigation processes (i.e., the SB 34 Advanced Mitigation Land Acquisition program)
e. Consider evolving monitoring and mitigation requirements and federal avian permitting criteria

5. Water Supply

a. Addition of thermal generation capacity in a zone of constrained groundwater availability or substantial groundwater depletion
b. Changing MWh production towards solar and increasing the use of water for construction dust control and ongoing panel washing in a zone of low groundwater availability
c. Changing MWh production towards technologies that may have greater cooling water demands and cooling water losses

6. Disadvantaged Communities

a. Addition of generation or transmission in locations disproportionately burdened by or vulnerable to pollution
b. Addition of transmission that may negatively alter the physical character and land uses within disadvantaged communities
c. Potential changes in adverse health effects, to the extent identifiable as a result of changes in emissions
d. Potential changes in water demand in communities dependent on groundwater for other productive use

NRG urges that tools like CalEnviroScreen be used judiciously and responsibly when considering impacts on disadvantaged communities. CalEnviroScreen has a role in assessing area impacts but should not be used to assess individual generating facilities.

17. Other

Comment:

As noted above, the opportunities to comment on this analysis are limited to (1) comments on assumptions due at the beginning of the process and (2) comments on initial results in April. The CAISO should consider providing an additional opportunity to review and comment on the full range of data that will be applied to the study once that data has been fully developed.

The proposed time frame for this complex and important study work is remarkably, even breathtakingly, short. While the CAISO proposes to have the results of the study finalized by June 2016, the deadline established by SB 350 to transmit the studies and revised governance documents to the Legislature is December 31, 2017. The compressed time frame and limited number of opportunities for public engagement should be reexamined, or at a minimum, better explained.