

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?

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Comment: In general, the study framework meets the intent of SB 350. However, the study framework would better inform the legislature’s decision if it also evaluates a regional market footprint less than WECC-wide.

The study framework should also evaluate the benefits/costs of a regional market footprint consisting of the current CAISO EIM footprint, PacifiCorp, NV Energy, Arizona Public Service, Portland General Electric, Puget Sound Energy

and Idaho Power.

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 scenarios are generally plausible. However, the maximum available transmission capacity to support exports under the BAU case should be less than the assumed transfer capacity under the regional operations case because:

- Bilateral markets are unable to utilize the full capacity of the existing transmission due to contractual and operational restrictions, and
- The regional operations case will facilitate the deployment of dynamic methodologies that will increase transfer capacities relative to the BAU case. This is less likely to be the case in the BAU bilateral market.

Additionally, to achieve high levels of exports under the BAU cases, CAISO should explain whether and how much new transmission will be needed and the cost of that new transmission.

The study should reduce the maximum BAU exports (and imports) and increase the maximum exports (and imports) under the regional operations cases.

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: Renewable energy costs have been declining very rapidly, and the model assumptions have consistently been too conservative regarding their cost. Because the RESOLVE model uses outdated and conservative assumptions about future solar and wind generation costs, the resulting resource mix will be unrealistic. The Draft Renewable Portfolios presentation on Feb. 8 showed solar PV capital costs declining 8% by 2025 and 15% by 2030 (slide 29). In contrast, many analyses conclude that these reductions and more will be achieved within the next few years. For example, in its November 2015 *Executive Briefing: The Future of US Solar*, GTM Research concluded that utility scale fixed tilt PV capital cost will decline from \$1.45/W at present to \$1.04 by 2020, a 28% decrease. The decline could even be faster in California, Nevada and Arizona where there is a very high-value solar resource and a substantial experience base. Similar if not quite as dramatic reductions may be in store for future wind, geothermal and storage costs. The DOE and NREL have released ranges of current and future renewable cost and performance that are much more realistic than

the B&V data used by E3. http://www.nrel.gov/analysis/data_tech_baseline.html.

At a minimum, the study should evaluate a range of renewable energy and storage technology costs with median values that are more realistic than assumed in the study plan.

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: No, the study uses highly pessimistic costs for solar and wind. Some areas of the West (Xcel, NV Energy) are already purchasing renewable generation at costs lower than new gas-fired generation and lower than system average cost.

At a minimum, the study should conduct sensitivity analysis of likely lower solar and wind costs than assumed in the study plan, reflecting the expected continued decline in these costs forecast by financial analysts such as Bloomberg New Energy Finance. Given the extension of the ITC and PTC, agreements between western states (see "Governors' Accord for a New Energy Future," February 16, 2016), and the commitments inherent in the Paris COP accord that is expected to increase international renewable energy investment, downward pressure on renewable energy pricing is expected to continue.

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: The e3 presentation from February 8 references only northwest wind RECs and southwest solar RECs (at: <http://www.caiso.com/Documents/Presentation-SB350-DraftRenewablePortfolios-E3.pdf>, see slides 35-40). Wyoming wind is coupled with an assumption that new transmission is required. Why are Wyoming (or for that matter Colorado) wind RECs not considered as options? Why are only northwest RECs assumed here? If PacifiCorp joining the RSO brings access to CA market bucket one renewables into both these states (and potentially other states with good wind resources), why aren't these wind RECs in consideration? In general, relaxing the tight assumptions about resources, and RECs, in these scenarios to consider a broader range of options would seem to be worth considering.

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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: No. A proper comparison needs to be made regarding system operations under a BAU future and one in which trading is expedited by a regional market. The distortions in system availability related to a balkanized system are likely to be understated.

BAU bilateral markets will not support the level of solar exports that a regional market would because:

- (1) Bilateral markets always leave unused transmission capacity on the table compared with regional markets. It has proven impossible to fully utilize the existing transmission system operated by 38 separate Balancing Area Authorities.
- (2) Bilateral markets effectively limit trading partners to neighboring utilities. Past efforts to create fast bilateral markets (e.g., ITAP) that enable trading across multiple utilities have failed. While there are examples of trading across multiple utilities in the current bilateral market, they are not thought to be of sufficient scale to contradict the notion that bilateral trades can occur at levels that are large enough to matter for purposes of this analysis.
- (3) It will be much more difficult to implement new methodologies that result in higher real-time path ratings (e.g., FASTC) in the BAU case compared with regional markets where a single BAA manages the transmission system. This is because deployment of such new technologies will be easier to achieve when there is one entity operating the system compared with the 38 BAAs currently operating the system.

The study should assume lower transfer limits in the BAU cases and higher transfer limits in the regional operations cases.

The study should explain whether the inefficiencies inherent in the BAU case will require the construction of new transmission to reach the assumed solar export levels.

Revised transfer limits that reflect lower transmission utilization in the BAU cases than in the regional market cases should be modeled for both California exports and California imports.

The study should explain why making the most effective use of existing transmission won't be sufficient before assuming that new transmission is required.

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?

Comment: It seems to capture the most important areas of benefit but should more explicitly address avoided need for new gas-fired back-up generation and the extent to which facilitating market transactions for surplus renewable energy allows for continued renewable construction in California to serve neighboring BAAs with high penetrations of fossil generation. This has both an economic development benefit (being analyzed in the employment and impacted community work by BEAR) as well as an expedited carbon reduction benefit as more low cost renewable power – mainly solar – becomes available to offset coal and gas generation in neighboring BAAs. Potential for reliability benefits should be addressed. The 2011 Southwest outage was attributed by FERC in large part to “lack of real time grid awareness.” See: <https://www.ferc.gov/legal/staff-reports/04-27-2012-ferc-nerc-report.pdf>. While that outage did not start in CAISO, it had very large impacts on California ratepayers, particularly in San Diego. A study of EIM expansion benefits has applied Value of Lost Load Analysis to the SW outage, finding very large dollar costs from the Southwest outage. See: <http://www.westerngrid.net/wp-content/uploads/2014/10/EIM-Synapse.pdf> at page 16 and following. A very large reliability benefit to California ratepayers will accrue as market expansion brings “real time grid awareness” to entities now not part of the CAISO market. That set of reliability benefits should be thoroughly included in Brattle’s analysis.

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

Comment: Generally, yes. See answer to question 7, above. Reducing renewable “overbuild” may be an incorrect metric if the day 2 market can absorb greater amounts of renewables for export out of California. More fossil generation could be retired faster elsewhere in the WECC footprint if more zero-marginal cost renewable energy is available to displace it.

9. The regional market benefits will be assessed based on 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: Yes, but a more realistic intermediate footprint should also be included in the analysis. In addition it is unclear why Mexico and Canada, especially British Columbia, are being excluded. Mexican renewable energy resources located in Baja are part of the WECC, and there is no absolute impediment to Mexican BAs participating in either an EIM or a regional market. Baja is part of the WECC footprint and electrical connections for the purposes of wheeling renewable power into the US have been made and are being contemplated. Likewise, while Alberta has its own grid operator and is relatively isolated with limited transfer capability to the rest of the region, interchange from and to British Columbia is a significant factor for the western grid, directly affecting not only the Northwest but also California via transactions across the intertie system. Additionally, seasonal hydro storage in British Columbia and intraday storage across the Columbia River basin on both sides of the border are important to include in a full regional analysis, both in general system terms and as potential sinks for California solar surplus.

A more realistic regional market footprint should be evaluated that includes CAISO, PacifiCorp, NV Energy, APS, Puget Sound Energy, Idaho Power and PGE.

An analysis that includes Baja California, Mexico and British Columbia resources should be considered.

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: The assumed carbon price is reasonable. However, the analysis fails to achieve the requirement of SB 350 to evaluate “emissions of greenhouse gases”. Carbon is only one of the greenhouse gases. Some analyses indicate that depending on methane leaks in natural gas production life cycle GHG emissions from gas-fired generation may meet or exceed those from coal-fired generation when upstream methane leakage is accounted for. The recent Aliso Canyon leak exposes the vulnerability of an aging natural gas infrastructure and the possibility of losing ground on GhG emissions related to its failure.

Moreover upstream gas leaks – including in the western U.S.—have been shown to be significant sources of methane emissions. See:

<http://westernenergyboard.org/wp-content/uploads/2015/05/04-2015-MJBradley->

[WIEB-NG-Methane-Emissions-Phase-2-Final.pdf](#) ; <http://bit.ly/1TmAqRH>, and <http://bit.ly/1KohwbW>.

The study should include a sensitivity analysis that reflects the impact of upstream releases of methane in the production and transportation of gas used to fuel gas-fired power plants. The sensitivity analysis should assume that total GHG emissions from the use of natural gas in power plants is approximately equivalent to 75% of GHG emissions from coal power plants.

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: Yes. California will experience one set of economic and jobs impacts if, under BAU conditions, most of its investment in clean energy projects to meet its climate goals is made within the state. It will experience another, different, set of impacts if its climate goals are met within the context of the expanded RSO. Under that set of impacts, more investment might be made sooner, in higher quality resources in other states, meeting California's climate goals at lower cost to California consumers and citizens. Capturing that cost differential seems like job one for BEAR. However, there are some knock on effects that we suggest also be considered. Some level of project development investments in other states will inevitably rebound to California providers of goods and services, simply because of the scale of the California economy in relation to the economies of the other states. California clean energy investors, their bankers, advisors, and suppliers of investment services; California suppliers of labor for logistics, construction, operations and maintenance and other services; California suppliers of goods and services across a range of required inputs for clean energy projects elsewhere; California suppliers of insurance, legal, environmental planning and compliance, safety, required project products and supplies, etc.) across and up and down the value chain will all benefit sooner and at larger scale from the efficiencies created by an expanded RSO market. Business as usual suggests a smaller and more expensive solution to California's climate challenges. An expanded RSO suggests a larger and faster solution. We suggest that the economic impacts to California consumers and citizens need to be considered in the context of that larger and faster solution. We trust that BEAR will be looking to incorporate a broad range of such impacts in its analysis.

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: This approach appears to be appropriate and informative. Some additional consideration of sales employment, especially with regard to distributed solar energy generation may be warranted. These are appropriate sectors to consider, should be augmented to provide a complete economic analysis. The entire value chain that will be engaged in a transition to clean energy, as suggested in our prior comments, needs to be captured.

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: Generally this satisfies the requirements of SB 350; however, more analysis needs to be done on health benefits related to the reduced emissions of criteria pollutants from fossil fueled generators on communities both within and outside of California. These reductions are a direct co-benefit of reducing GhG emissions. See: *“Effect of Air Pollution Control on Life Expectancy in the United States: An Analysis of 545 U.S. Counties for the Period from 2000 to 2007”* Correia, Andrew W.; et al. *Epidemiology*, January 2013, Vol. 24, Issue 1, 23-31. doi: 0.1097/EDE.0b013e3182770237 - And: [“Persistent Environmental Pollutants and Couple Fecundity”](#) Buck Louis, Germaine M.; et al. *Environmental Health Perspectives*, November 2012. doi: 10.1289/ehp.1205301, And: *“The Benefits and Costs of the Clean Air Act from 1990 to 2020”* U.S. Environmental Protection Agency, Office of Air and Radiation, March 2011 – And: *“The Impact of Pollution on Worker Productivity”* Graff Zivin, Joshua S.; Neidell, Matthew J. National Bureau of Economic Research, April 2011. - See more at: <http://journalistsresource.org/studies/environment/pollution-environment/health-effects-costs-air-pollution-research-roundup#sthash.DRcP2R6l.dpuf>

Also see: <http://www.hewlett.org/newsroom/press-release/new-study-finds-central->

[valley-air-pollution-costs-regional-economy-3-billion-annually](#).

Additional analysis by the Rand Corporation can be found at:

http://www.rand.org/pubs/research_briefs/RB9501/index1.html

Finally, other relevant analysis of economic impacts related to remediating criteria pollutants can be found at: <http://bit.ly/1PDGyTI>

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: The study work should reflect a complete analysis of all supply-chain benefits, including services, goods, and jobs sourced or created in California from construction and operation of new generation, transmission, efficiency investments, RECs acquired, etc. outside of California. For example, if a California based wind company develops projects in another state, that development effort creates jobs in California. If wind machines are manufactured, sourced, or shipped in California and deployed in other states, then California jobs and economic benefits will result. If California capital funds development in other states, then California investors and those who supply investment services will benefit.

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: See answer to question 13 for air pollution discussion.

For biological and land use analysis we recommend utilizing the geospatial analytical work done as part of developing the following studies and tools:

1. Environmental Data Viewer at the Western Electricity Coordinating Council (WECC)
<https://www.wecc.biz/TransmissionExpansionPlanning/Pages/Environmental-and-Cultural-Considerations.aspx>
2. The Desert Renewable Energy Conservation Plan; <http://drecp.databasin.org/>
3. San Joaquin Valley Solar Initiative; <http://sjvp.databasin.org/>
4. Western Renewable Energy Zone (Western Governors Association) process
<http://bit.ly/1Ofdm0w>
5. Solar PEIS and associated zones adopted by the Department of the Interior,

<p>BLM; http://solareis.anl.gov/</p> <p>6. Restoration Design Energy Project (BLM Arizona); http://www.blm.gov/az/st/en/prog/energy/arra_solar.html</p>
<p>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?</p>
<p>Comment: As mentioned above the economic impacts of reduced exposure to ambient air pollution needs to be integrated into the analysis. Research shows this to be a substantial environmental and human health benefit.</p>
<p>17. Other</p>
<p>Comment:</p> <ul style="list-style-type: none"> • CAISO needs to conduct both quantitative and qualitative sensitivity analyses. Sensitivity analyses are essential to adequately inform the Legislature of the impact of alternative assumptions on the impacts of a regional market. <ol style="list-style-type: none"> a. At a minimum, CAISO should conduct quantitative sensitivity analyses of: changes in solar, wind, geothermal and storage costs; assumptions about upstream GHG emissions from gas-fired generation; a range of possible required transmission additions, and a high renewables resource mix outside of California. b. For other assumptions that cannot be easily quantified in the time available for the study, CAISO should present qualitative information on the impact of alternative assumptions on the benefits of a regional market. For example, CAISO should explain: <ol style="list-style-type: none"> i. The reliability benefits flowing from regional operations compare to BAU cases. ii. The impact of higher or lower than expected storage costs. iii. The expected cost of achieving higher GHG reductions after 2030 with and without a regional market. • CAISO needs to explain the “hurdle rates” or “friction” in the Resolve and Production Cost models that are designed to reflect inefficient operation of the grid in the BAU cases. It is critical that the BAU cases reflect all the many inefficiencies in current bilateral markets, including: <ol style="list-style-type: none"> a. The operation of the transmission system where substantial amounts of transfer capacity are not used and where higher cost generation is dispatched before lower cost generation.

- b. The larger hurdle rate exports of intermittent solar will incur in western bilateral markets compared to the hurdle rates used in the past for dispatchable resources (e.g., gas, hydro, coal). The study needs to explain the nature of the assumed contracts for exports of solar resources. Past efforts to create quick bilateral markets in the West (e.g., ITAP) that would enable trades with more than a utility's immediate neighbor have largely been failures. Unless CAISO can explain why things are different now, it should assume that solar exports are limited to CAISO's immediate neighboring utilities.
- c. Balkanized reserve practices, which will be alleviated by market expansion
- **The SB 350 work plan is appropriately focused on CA impacts and benefits. However, CAISO and the consultants should be thinking ahead to additional state analyses and broader footprint based assessments.** Modeling simplifications and approximations need to be well documented and explained, allowing for future improvements. Data and assumptions need to be well –documented and transparent, reflecting realistic ranges of values. Inputs, results, and models should be structured to facilitate use by decision makers and stakeholders for other work aimed at assessment outside of CA.
- **Details of the production cost modeling were not vetted in the February 8 meeting and CAISO should ensure stakeholders have an opportunity to weigh-in on key assumptions and interpretation of results.** The proposed April meeting should target this need, and as much advance review time as possible should be provided to participants.
-