Clean Energy and Pollution Reduction Act Senate Bill SB350 Study

Stakeholder Comment and ISO Responses from February 8, 2016 Study Proposal

March 18, 2016

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Clean Energy and Pollution Reduction Act

Senate Bill 350 Study Stakeholder Comments

1 Executive Summary

The Clean Energy and Pollution Reduction Act Senate Bill 350 Study is being performed to provide information to the California Legislature to determine benefits to California ratepayers. The legislation requires:

> 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
>
> a. The creation and retention of jobs and other benefits to the California economy,
> b. Environmental impacts in California and elsewhere,
> c. Impacts in disadvantaged communities,
> d. Emissions of greenhouse gases and other air pollutants, and
> e. Reliability and integration of renewable energy resources.
>
> The modeling, including all assumptions underlying the modeling, shall be made available for public review.

On February 8, 2016, the ISO held a stakeholder meeting to discuss the scope, assumptions and methodology the ISO proposed to perform the study. The ISO received thirty-five (35) comments covering a total of seventeen areas of the study that the ISO asked stakeholders to provide comments on. Topics range from questions on the plausible portfolios and assumptions for the production costing analysis to methods of analysis for economic and environmental portion of the study. The ISO plans to present the preliminary results of the study on April 14 – 15, 2016, and the Multi-Agency Workshop is current scheduled for June 2016.

2 Introduction

Once SB350 was signed into law in October 2015, the ISO formed the SB350 study team shortly thereafter consisting of the following firms:

- The Brattle Group to perform the overarching project management for the study and perform the production cost analysis;

- Energy + Environmental Economics ("E3") to develop renewable portfolios and calculate ratepayer impacts;
- Berkeley Economic Advising and Research ("BEAR") to evaluate the job and economic impacts on California and specifically disadvantaged communities; and
- Aspen Environmental Group ("Aspen") to evaluate the impact to the environment and disadvantaged communities.

The analysis proposed in this study is to determine the impact of expanding the ISO controlled grid and balancing authority area within the context of the SB350 policy objectives of increasing the Renewable Portfolio Standard ("RPS") to 50%; reducing greenhouse gas emissions and increasing energy efficiency. The ISO is studying 2020 with a 33% RPS in California and then assuming the 50% RPS is met in 2030. The 2020 case uses existing study databases and renewable portfolios at 33%. Because this is the first study to evaluate a 2030 case, in the analysis, the ISO is only proposing plausible renewable portfolios for 2030, and is not attempting to forecast or make any policy prescription about future renewable procurement decisions because procurement has not commenced for this period of time as of yet.

The study is evaluating four scenarios that illustrate the impact of expanding the ISO balancing area. Scenario1 represents the "Business-as-Usual" (BAU) case. Because there is considerable uncertainty about one key parameter in the BAU case, namely, California's ability to export power to neighboring systems during hours of oversupply, two alternative BAU cases are considered. Scenario 2 expands ISO operations but maintains renewable procurement policies that promote in-state renewable development. Scenario 3 expands operations and allows renewable procurement to occur from anywhere in the expanded regional footprint. The following illustrates the changing scenarios.

Scenarios	Scenario 1a	Scenario 1b	Scenario 2	Scenario 3
CAISO simultaneous export limit	2000	8000	8000	8000
Procurement	BAU	BAU	BAU	WECC-wide
Operations	CAISO	CAISO	WECC-wide	WECC-wide

It is not the ISO's intent to prescribe the exact 50% renewable portfolio nor determine the out-of-state resources or the transmission projects that may or may not be needed to deliver 50% renewable generation to California. The purpose of the study is to provide a general assessment that can demonstrate the impact to California ratepayers

of an expanded regional grid under several different examples of future renewable portfolios.

In addition, the study will look at California as a whole and is not intended to focus on individual utilities within a balancing area nor require load serving entity to procure based on the sample portfolios provided in this study. The scenario analysis, production cost analysis and environmental analysis are snapshots in 2020 and 2030. The economic analyses requires annual investment and rate impacts through 2045. These will be developed through interpolation and extrapolation from the two snapshot years.

The ISO posted the presentation materials for the February 8, 2016 Stakeholder meeting on February 4, 2016 including a stakeholder comment template. The template outline seventeen topics on which the ISO requested comments, listed in Table 1 below.[1]

[1] Comments were received from Adams Broadwell Joseph & Cardozo on behalf of Labor ("Labor"); the American Wind Energy Association ("AWEA"); Bay Area Municipal Transmission Group ("BAMx") consists of the Alameda Municipal Power, City of Palo Alto Utilities, Port of Oakland and City of Santa Clara, Silicon Valley Power; Bonneville Power Administration ("BPA"); California Department of Water Resources ("CDWR"); California Energy Storage Alliance ("CESA"); California Large Energy Consumers Association ("CLECA"); California Municipal Utilities Association ("CMUA"); California Public Utilities Commission ("CPUC Staff"); Cities of Anaheim, Azusa, Banning, Colton, Pasadena and Riverside, California ("Six Cities"); The City of Los Angeles Department of Water and Power ("LADWP"); Communities for a Better Environment ("CBE"); Defenders of Wildlife ("Defenders"); Large-scale Solar Association ("LSA"); LS Power; MegaWatt Storage Farms, Inc ("MegaWatt"); Modesto Irrigation District ("MID"); Northern California Power Agency ("NCPA"); NRDC Western Resource Advocates Northwest Energy Coalition Western Grid Group ("NRDC"); NRG Energy, Inc. ("NRG"); The Office of Ratepayer Advocates ("ORA"); Pacific Gas and Electric Company ("PG&E"); Peak Reliability ("Peak"); Public Generating Pool ("PGP"); Powerex Corp. ("Powerex"); Pubic Power Council ("PPC"); San Diego Gas & Electric Company ("SDG&E"); Seattle City Light ("SCL"); Sierra Club; Southern California Edison Company ("SCE"); SouthWestern Power Group ("SWPG"); TransCanyon LLC ("TransCanyon"); The Utility Reform Network ("TURN"); TransWest Express LLC ("TransWest"); Union of Concerned Scientists ("UCS").

Table 1 –Scope of topics	
Topic No.	**Topic Description**
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?
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?
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?
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?
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?
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?
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?
8	Are the methodology and assumptions to estimate the potential impact on California ratepayers reasonable? If not, please explain.
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.
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.
11	BEAR will be using existing economic data, and generation and transmission data from E3, the ISO, and Brattle. These data are currently being developed. Are there specific topics that you want to be sure to be addressed regarding these data?
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?
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?

Table 1 –Scope of topics (continued)	
Topic No.	**Topic Description**
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?
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?
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?
17	Other Comments

3 ISO's Revisions to the February 8, 2016 Study Approach

Based on the comments provided by a broad range of Stakeholders, the ISO has given considerable consideration to the suggested changes to the study approach. In this section, the ISO explains the various revisions that the study team is making based on the feedback received from stakeholders. In addition, the ISO explains why in some cases the ISO is unable to make requested changes at this point. Additional detail for each topic is included in Section 5.

Topic 1 – Study Framework

The study framework includes the scope of the analyses and the general analytical methodology that the ISO and its study team proposes to use. The ISO has received many comments about the study framework, including considerations about: (a) the geographic footprint of the analyses under different study cases, (b) cost assumptions, (c) regulatory backdrop and assumptions for California and the other states in the analyses, and (d) other relevant general assumptions for the study. Below are the areas where the ISO will modify the study framework portion of the approach:

Footprint: Based on stakeholder feedback, the ISO is revising the study approach for 2020 to include the expansion of the ISO to include PacifiCorp only. This updated approach is consistent with the proposal currently being considered and analyzed by the ISO. For the 2030 cases, the ISO will be revising the definition of regional expansion to consist of consolidating all of the United States Western Electric Coordinating Council ("US-WECC") balancing areas into one regional balancing area with the exception of the Federal Power Marketing Areas ("PMAs") balancing areas. These balancing areas represent approximately 12% of the load in US-WECC. Since the Energy Imbalance

Market ("EIM") has grown from PacifiCorp to four additional entities within two years, it is possible that more balancing areas are likely to consider participating in the regional market by 2030. Although the ISO is not able to anticipate which entities may intend to join regional market by 2030, it is generally acknowledged that PMAs are less likely to participate due to the limitations placed by the federal governance issues of those agencies.[2] Further, by excluding the PMAs, the results will demonstrate the impact of less than full US-WECC participation in the regional market, as recommended by a number of commenters.

Renewable Costs: The ISO appreciates the additional renewable energy cost information provided by some stakeholders. Based on those input, the 2015 IEPR and the 2016 LTPP, the ISO team is updating the renewable and storage costs used in the analyses.

Tax Incentives: Because of the study's start late last year, assumptions were made based on the data available in the fourth quarter of 2015. Consequently the preliminary analysis presented at the February 8th Stakeholder meeting did not include the recent decisions made on a federal and state level including the extension or the Investment Tax Credit and Production Tax Credit; the California Energy Commission's ("CEC")2015 Integrated Energy Policy Report ("IEPR") and California Public Utility Commission's ("CPUC") 2016 Long-term Planning Process ("LTPP") assumptions. Since the stakeholder meeting the ISO team has updated the assumptions to reflect this new information.

Procurement: The ISO has considered many stakeholders' comments regarding (1) the renewable energy procurement buckets, also known as the Product Content Categories ("PCCs"), and (2) who would be responsible for procuring the resources identified in the SB350 study portfolios. The portfolios presented at the February 8th workshop focused on the likely physical location of the renewable resources procured under the three alternative scenarios, rather than on the PCC procurement rules. The ISO has given careful consideration to stakeholder suggestions that the analysis should conduct a definitive accounting of procurement by the IOUs and other load serving entities in each PCC. The ISO believes that such an effort is beyond the scope of this analysis and is unnecessary to estimate benefits from expanded ISO operations. In addition to the data availability and processing difficulties, the ISO is not aware of a definitive data source for

[2] Specifically the PMAs being excluded for the analysis are Bonneville Power Administration ("BPA") and Western Area Power Administration ("WAPA") – Colorado-Missouri Region, Lower Colorado Region and Upper Great Plains West. Each of the PMAs were formed based on specific federal legislation for each entity that allows the Department of Energy to market and transmit wholesale electricity from multi-use water projects. Power sold from the projects are to preference customers such as Federal and state agencies, cities and towns, rural electric cooperatives, public utility districts, irrigation districts and Native American tribes. They, in turn, provide retail electric service to millions of consumers in the West.

the quantity of existing transmission that might be available for dynamic transfer from a neighboring balancing area under PCC1. As a consequence, the ISO believes it is not possible to determine the potential for resources to connect to neighboring balancing areas under PCC1. The ISO does acknowledge that some amount of additional resource is likely to be procured out-of-state, and therefore has included 5,000 MW of out-of-state resources in Scenarios 1 and 2. However, the ISO will continue to focus on the physical location of the resources enabled by an expanded footprint, without regard to the PCCs.

The ISO believes that all three scenarios could be consistent with current PCC definitions, if sufficient dynamic transfer capability could be secured to support PCC1 procurement. The ISO has included a table that indicates the percent of the total renewable portfolio that is procured from out-of-state resources for each Scenario, including all out-of-state resources regardless of the PCC.

The ISO does not have the authority to redefine the existing PCCs which are defined in existing law. At the same time, the ISO needs to develop assumptions for various future renewable portfolios in order to inform the environmental and economic considerations that are within the scope of these studies. The portfolio assumptions developed for the analysis are meant to represent a diverse mix of sources and are not meant to predetermine the procurement requirements of any load serving entity or to represent future procurement decisions. In other words, the ISO is not identifying or assuming any procurement decisions by publicly-owned utilities or the CPUC and the utilities they regulate.

Transmission Access Charge ("TAC") and Resource Adequacy ("RA"): Various stakeholders raised concerns that this SB350 study was being conducted at the same time as the stakeholder process for TAC and RA, and that the conclusion of those stakeholder processes should be included in the analysis of ratepayer impact. As discussed at the February 8th Stakeholder meeting, the ISO agrees and will be considering the impact associated with operating and investment costs in the SB350 study. After considering the stakeholder comments, the ISO is anticipating that the estimated transmission costs associated with meeting the 50% renewable portfolio standard will be paid by California ratepayers because the policy decisions of California are driving that investment. Those transmission costs are identified in the RESOLVE analysis for developing the renewable portfolios under different scenarios, and incorporated into the TAC for the purpose of calculating ratepayer impacts. The ISO will ensure that those assumptions are transparent when delivering the results. While some stakeholders prefer the ISO to specify the transmission cost allocation approach used, the study assumes that assuming that California ratepayers would assume the full cost

of transmission to support the renewable portfolios as a way to represent the most conservative and "worst case" scenario with respect to California ratepayer benefits. In addition, the ISO will also include in the final results a discussion of the proposed framework and transmission cost impacts based on the then current TAC proposal as a way to represent what might be a more nuanced cost allocation approach. With respect to RA, the ISO assumes RA procurement will stay the same and be the responsibility of the applicable regulatory authority. For the study the ISO makes the assumption that meeting the same reserve margin over a larger balancing area could have load-diversity benefits and those benefits will be estimated in the study. In addition, the local operating and resource adequacy constraints are included in the modeling of California in both the with and without a regional market cases.

Clean Power Plan ("CPP"): The analysis will assume that there will be a carbon price in California in all of the years analyzed, using the updated 2015 IEPR. The ISO has considered the feedback received from several stakeholders about how to model the carbon price outside of California. Since the U.S. Supreme Court has stayed the enforcement of the CPP and there are continued uncertainties around how each state may choose to comply with the CPP, if the stay were lifted, the ISO anticipates that the study will include an analysis with $0 carbon price outside of California to simulate the highest carbon emission future in the WECC, and a sensitivity analysis for the 2030 cases that includes a uniform WECC-wide carbon price outside of California. Further, some stakeholders were concerned that using the WECC "Coal Plant Retirement" assumptions would be unrealistically aggressive, thus, this study will only assume retirements that are already incorporated in the 2024 TEPPC common database in all cases analyzed for the study.

Geothermal and Pumped Storage: Some stakeholders have requested clarifications about why the ISO has assumed 500 MW of geothermal and 500 MW of pumped storage would be part of the renewable energy portfolios. While the ISO acknowledges that the cost of these technologies is high today and is uncertain 14 years from now, the ISO felt that these resources have a chance of being commercially competitive in the future and that incorporating these two technologies in the portfolios would increase resource diversity and facilitate renewable integration. In addition, some stakeholders stated that the ISO should assume that even operating under the Business-as-Usual case, California would increase its resource diversity either through procurement or by increasing its own ability to integrate high solar generation in the future. Thus, to be responsive to Stakeholders' comments, the ISO has made such assumptions.

Analysis of Non-California Impact: A few stakeholders requested that the ISO's study also evaluate the impact to ratepayers outside California. While the ISO appreciates the

interest for such information, the SB350 study will focus on the impact on California ratepayers as required by the legislation. Such estimate of the potential impact to California ratepayers will be based on California's investments associated with meeting the state's 50% renewable portfolio standard with new resources. The analysis will also report the overall system-wide impact, in the form of investment and operational cost savings. However, the analysis will not include a state-by-state analysis of benefits to non-California ratepayers. The assumptions, data, and results of this study will be available to the stakeholders and thus can be used by others seeking to evaluate similar impacts of a regional market on other states or other entities.

Reliability Analysis: Various Stakeholders commented that the ISO should perform power flow and loss of load probability analysis, assess binding constraints, and determine the reliability impacts (e.g. voltage, VAR, Reliability Must-Run, etc.) of the proposed regional expansion. The ISO acknowledges the importance of reliability analysis and the high likelihood that a regional market could provide significant reliability benefits by reducing the probability of loss of load under the same planning reserve requirements. Thus the study will evaluate potential investment savings from load diversity in the expanded region and qualitatively address reliability improvements through the expanded market as well as the additional benefits of regional transmission projects. Operational cost savings, including the costs of energy and ancillary services, will be estimated by comparing production cost simulation results under the base and regional cases. However, the ISO expects that a full reliability analysis is more detailed than is warranted for this study. Should this effort result in a regional ISO, then the reliability issues will be assessed and resolved as the expansion comes to fruition.

Sensitivity Analysis: A few stakeholders requested that the ISO conduct a number of sensitivities related to various topics. The ISO agrees that sensitivity analyses could be used to evaluate various potential future market conditions. Thus, the ISO will develop and perform a limited number of sensitivity analyses in response to stakeholders' requests. As a starting point, the ISO will include a sensitivity analysis for a carbon price outside of California and another sensitivity analysis to include the doubling of the Additional Achievable Energy Efficiency ("AAEE"). The full list of sensitivity analyses will be provided either during or before the April Stakeholder meeting.

Analysis Assumptions: A few stakeholders asked to see more of the base assumptions to be used in theSB350 study. The ISO team provided the major assumptions in the February 8th Stakeholder meeting. Through reviews of stakeholders' comments and suggestions about proposed changes to base assumptions such as the existing use of market enhancements, energy efficiency, time-of-use rates, demand response, and renewable integration tools, the ISO clarifies that the analysis will include as a base

assumption the renewable portfolio buildout to 33% by 2020, and to 50% by 2030; continuation of the existing 2020 programs on demand response, time-of-use rates, energy efficiency, and electric vehicle charging. The focus of the study is to evaluate the potential impact of transitioning the ISO to managing a regional market including an expanded grid. Thus, the ISO does not anticipate to focus on changing these assumptions between the Business-as-Usual and the regional market cases. In addition, the ISO does not expect to use the study to evaluate each utility's resource positions or allocate the proposed portfolios to specific load serving entities. Any actual procurement by the load serving entity will be determined by the CPUC or the applicable regulatory authority.

Topic 2 – Portfolios

Based on feedback and suggestions provided through various stakeholder comments, the ISO is modifying the renewable portfolios to be used in the analyses. The modifications include:

Revised Portfolios: As discussed further in Topic 3, the ISO has updated the cost assumptions used to develop the renewable portfolios. In addition, a number of stakeholders raised concerns with the assumptions used for the scenarios. To respond to those comments, the ISO has reexamined the assumptions involved in developing the portfolios to ensure that the best transmission cost and the environmental feasibility assumptions have been incorporated into the portfolio development.

Consistency with RPS Calculator: A few stakeholders raised the concern that the portfolios should be consistent with the RPS Calculator portfolios. The ISO understands the desire to compare results. In general, the information contained in the RPS Calculator has been used to inform the SB350 study. For example, the SB350 study uses the Super CREZs aggregations from the RPS Calculator's energy-only case to represent California resources. In addition, the study utilizes renewable availability and quality data from the RPS Calculator, but adjusted the costs based on stakeholder feedback. However, the time horizon and the purpose of the tools used in the SB350 study is different from the RPS Calculator. For instance, the RPS Calculator simulates California renewable resource procurement incrementally. It is a tool used to select the least-cost set of resources to fill the need for the state in a given year. On the other hand, the model used in the SB350 studies, RESOLVE, minimizes costs over a long-term time horizon, including incorporating the expected changes in policies, such as building renewable resources at times to take advantage of expiring tax incentives. RESOLVE also adds renewable integration solutions such as energy storage when cost-effective, and captures the impact of the availability of these solutions on the least-cost renewable portfolio. This is increasingly important as the portfolio approaches 50% RPS

and integration challenges become more significant. The ISO study also includes more detail about the potential availability of out-of-state resources that can be delivers over existing transmission, which is not a major focus of the RPS Calculator. In addition, for the SB350 study, the ISO included 500 MW of geothermal and 500 MW of pumped storage in all scenarios as an investment in minimizing renewable integration issues even without a regional market. To avoid the potential for in-state wind development to be overstated, in-state wind is limited based on an environmental screen developed by the ISO team using information provided by CalWEA and other stakeholders.

Locational Marginal Price ("LMP") Analysis: A few stakeholder commented that the study should provide LMP level analysis to provide load serving entity level of information. While the ISO understands the desire to have LMP analysis, the focus of the study is on the state as a whole. In addition, analyses around disadvantaged communities will drill down to specific communities. After much consideration, ISO does not intend to provide results at the load serving entity level because (a) the ISO does not intend to focus on any resource procurement for any load serving entity, and (b) the ISO does not intend to differentiate the ratepayer impact based on different retail rate structures across different utilities.

Renewable Energy Credits ("REC"): Stakeholders commented that the study should evaluate the existing surplus renewables versus building new renewables. While the ISO acknowledges interest in an analysis of the supply and demand of renewable resources across WECC, such a complete assessment of WECC-wide REC supply is beyond the scope of this study. The ISO also notes that the focus of the study is on California under different market configurations while meeting the state's policy goals. Thus, the procurement of unbundled RECs is currently inconsistent with California's GHG policy goals since California utilities receive no GHG credit for unbundled, out-of-state RECs under current California Air Resources Board rules. Further, the study holds the renewable portfolio standard requirements constant for states outside of California. Nevertheless, to account for the likelihood that RECs could be a low-cost option for meeting a portion of California's 50% renewable goal, the study assumes that 2,000 MW of REC-only transactions are available for RPS compliance under all scenarios in the study. Another stakeholder commented that the ISO should evaluate qualifying facilities that could be resold to California. Because the ISO includes the options to procure out-of-state resources independent of whether they are merchant or qualifying facilities, the ISO believes the scenarios chosen already have the flexibility to accommodate procuring excess qualifying facility generation and additional analysis is not needed for this SB350 study.

Sensitivities: Some stakeholders have commented on the magnitude of solar generation deployment in the portfolio. After considering the comments received, the ISO is including a scenario in which a larger quantity of out-of-state, utility scale solar PV is available for procurement by California load serving entities.

Topic 3 – Portfolio Assumptions

Based on the feedback received from stakeholders, the ISO is modifying the portfolio assumption as follows:

Updated Assumptions: Numerous Stakeholders commented that the ISO should update the assumptions for the load forecasts and renewable costs to the information contained in the 2015 IEPR and 2016 LTPP. The ISO agrees and has its load forecast based on the 2015 IEPR including the mid-Additional Achievable Energy Efficiency ("AAEE"). This forecast does not achieve the doubling of energy efficiency called for in SB350 because the state agencies have not yet agreed on how this goal should be accounted for in state planning efforts. The ISO has also updated the renewable resource cost and performance characteristics based on information provided by stakeholders.

The ISO also has reflected the recent extensions of federal tax incentives.

In addition, based on stakeholder feedback, the ISO has updated the amount of existing storage in California and has updated electric vehicle charging patterns in the analysis to reflect universal access to workplace charging. The ISO also increased the distributed generation forecast from 14.6 GW to 18.2 GW by 2030, consistent with the 2015 IEPR.

Rocky Mountain Exclusion: Some stakeholders expressed a concern with the assumption of excluding the Rocky Mountain region for the renewable portfolio analysis and requested clarifications on how such exclusion would affect the results of the analysis. The ISO wishes to clarify that this exclusion only applies to RESOLVE, and believes the effect of this exclusion is minimal because there are ready substitutes for Colorado wind and solar in the states adjacent to California. RESOLVE is being used to model renewable energy procurement whereas the production cost model is looking at the entire WECC to determine regional integration and cost impact. The ISO believes these differences are de minims.

Procurement Strategies: Some stakeholders expressed concerns that the investor-owned utilities have different strategies than the publicly-owned utilities and that the development of the renewable portfolios for the study must be consistent with those unique strategies. While the ISO appreciates the potential differences in utilities' procurement strategies, the ISO has not intended to reflect any procurement

assumptions in the development of the renewable portfolios, particularly since the ISO does not have authority to determine the procurement decisions.

Scenario Value: Some stakeholders have expressed concerns about the usefulness and the potential biases introduced in the development of the various renewable portfolio scenarios and some have requested that the ISO limit its analyses to only some of the scenarios proposed for the study. The ISO has developed the renewable portfolio scenarios to reflect the likely 50% renewable portfolios under a Business-as-Usual ("BAU") versus regional market future, with the intention to evaluate the impact of regional expansion. Thus, the ISO has developed Scenario 1 to reflect the likely BAU cases in which both the operation and resource procurement are confined to the existing ISO balancing area. Scenario 2 reflects the likely case in which the operation of the balancing area is expanded. Comparing the results from Scenario 2 with those of Scenario 1 will reflect the impact of increasing the ISO operational footprint and the benefits gained by doing so. Lastly, Scenario 3 reflects the expansion of the operation and extending the existing procurement practices to the larger footprint. By analyzing this incremental change, the ISO can estimate the impact of expanding the geographic footprint of the resource procurement. Thus, the ISO believes all of these scenarios are informative of the impact to California ratepayers and none should be deleted. Some stakeholder argued for an additional scenario to reflect that some out-of-state renewable resources can be procured even in the absence of regionalization, the development of significant quantities of remote, high-quality out-of-state renewable resource is highly unlikely in the absence of a regional transmission entity. The single biggest reason for this is that these remote projects will have to pay one or more transmission charges to get to the ISO, which would almost certainly make them uneconomic. Thus, all of portfolio scenarios will help meet the study goal of estimating the impact to California ratepayers and thus the ISO has decided to keep all of the portfolio scenarios proposed and has updated them based on the revised assumptions discussed above.

Generator Compensation: Some stakeholders have expressed concerns that the current agreements may or may not financially compensate the renewable energy developers for all of the curtailed renewable energy, and thus if they are not compensated for curtailed generation, less generation would be built in the first place. Therefore, the amount of allowed curtailment in the highly constrained situation (under Business-as-Usual) may be too pessimistic. The ISO acknowledges that merchant renewable generators will need sufficient income to cover costs and earn a return on investment to continue operating. However, utilities will be required to procure sufficient renewable energy contracts to meet California's renewable portfolio standard requirements, and

therefore ratepayers will be affected by the cost associated with renewable curtailments and to the extent that expanded balancing area can reduce renewable curtailments should directly reduce the cost burden to California ratepayers.

Sensitivities: To address some of the comments provided by stakeholders, the ISO is adding a sensitivity analysis that reflects a low load growth future due to doubling of energy efficiency.

Topic 4 – Renewable Costs and Locations

The ISO does not propose to modify the renewable costs and locations further than has already been discussed above.

Topic 5 – REC Assumptions

Stakeholders raised concerns that the study changed the existing procurement and overestimated the number of RECs available. As discussed under the Portfolio section, to account for the likelihood that RECs could be a low-cost option for meeting a portion of California's 50% renewable portfolio standard, the study assumes that 2,000 MW of REC-only transactions are available for renewable portfolio standard compliance under all scenarios in the study. Further, the study incorporates a Scenario 3 portfolio to reflect the likelihood of allowing renewable resources located outside California but within the expanded balancing area to be used to meet California's RPS. .

Topic 6 – Export Assumptions

Based on the feedback received regarding the export capability assumption, the ISO will be evaluating the potential impact of a regional market based on a range of export capability assumptions.

Update Assumption: Numerous stakeholders questioned the validity of the ISO being a net-exporter in the study. While California has historically been a net importer, with the increase in renewables and energy efficiency, as demonstrated in the ISO's "duck curve", California can benefit from exporting power and the expansion of the ISO balancing authority area will allow optimization of the resources in the expanded grid.

Export Quantity: The ISO received various comments from stakeholders regarding the quantity of net export capabilities assumed in the study. Some said it was too low, some too high and some said that there should not be a cap on the quantity of exports. The ISO believes that by providing a range of export capabilities in the portfolios, the impact of the regionalization can be better evaluated. Moreover, a net export capability is an input assumption for the portfolio development and is set as an export limitation for the production cost model. The production cost model includes hurdle rates that will capture various other barriers. The export level used as the input to the model is a

maximum export level for the determination of portfolios. The actual exports in the production cost model may be less than this level.

To reflect the uncertainty about California's ability to export surplus energy, the ISO study includes two alternative BAU cases: one in which external markets are assumed to be able to absorb up to 2,000 MW of California exports in each hour, and one in which external markets are assumed to be able to absorb 8,000 MW during every hour. Note that the export restriction is intended to represent uncertainty about the demand for surplus California power in other markets, and does not reflect physical transmission system limits. The ISO's assumptions are consistent with the CPUC proposal developed in the 2016 Assumptions & Scenarios, which explicitly recognizes the uncertainty about this key assumption.

Topic 7 – Brattle's Ratepayer Approach

The ISO has considered stakeholder comments on the approach for evaluating ratepayer impact. While many have requested the ratepayer impact to be conducted at a more granular level than at the California state level, the ISO considers the scope of the analysis to be centered at the state as a whole, not on specific utilities' ratepayers, or on out-of-state ratepayers. The comments received from stakeholders included:

Ratepayer Definition: A number of stakeholders commented that the impact on California ratepayers should be at a more granular level than California as a whole. To analyze the specific impact on specific utility's load would require the ISO to assume certain retail rate design and allocation issues among various ratepayer groups, which the ISO does not intend to do. The ISO will examine the overall ratepayer impacts through overall changes to cost of wholesale electricity service.

Benefit Allocation: Some stakeholders expressed concerns on the allocation of benefits to other states and methodology proposed. The ISO notes that the legislation specifically requires the ISO to estimate the impact to California ratepayers. Thus, while the ISO focuses on the impact on California and California ratepayers, the study will include an analysis of the impacts in the region as a whole. The ISO team is aligning costs borne by California ratepayers with the benefits received from investments made by California ratepayers; the ISO will not credit California ratepayers with benefits due to investments funded by ratepayers in other states. The study will include documentation on how the impacts on California ratepayers are estimated using the TEAM methodology. While this SB350 study will not include a state-by-state economic analysis for the entire WECC, this study could be used as a foundation for future studies for other entities and states. The ratepayers' cost savings will be estimated via nodal market pricing data, following an approach similar to the TEAM methodology. The

study results will include a description of the TEAM analysis, including data used and examples.

GHG Reporting: A few stakeholders expressed concerns regarding the impact to California's emission performance and did not want the regional expansion to increase fossil fuel production. To ensure that the results are transparent on this issue, the study will include results that summarize fuel burn and emissions by generation type inside and outside of California.

Topic 8 – Ratepayer Assumptions

After evaluating the comments received, the ISO will use a methodology similar to the TEAM methodology to estimate the potential impact on California ratepayers. Additional comments received from stakeholders include:

Grid Management Charge ("GMC"): Stakeholders questioned the impact to the ISO GMC with the expansion of the region. The GMC is the ISO's administrative charge to recover operating expenses. While not originally contemplated in the study, the ISO will include the impact to the GMC of regional expansion in the study.

Topic 9 – Footprint Assumption

Footprint: Based on the feedback received, the ISO is modifying the regional market footprint as discussed in Topic 1.

EIM Expansion Option: A number of stakeholders commented that the study would be more realistic if the 2030 cases only included the current EIM entities in the regional entity. The ISO has seen rapid increase in the number of entities that intend to join EIM in the last two years and while the ISO does not know today who would or would not be included in a regional entity in 14 years, we do believe accounting for US-WECC balancing areas except the PMAs as future participants in an expanded ISO, as discussed in Topic 1 is reasonable for the SB350 study.

Topic 10 – Carbon Price Assumption

Based on the feedback received, the ISO is modifying the carbon price assumptions as follows:

Assumptions: The ISO will use CEC's forecast GHG gas prices for California, consistent with the 2015 IEPR, and will simulate the rest of WECC without a GHG price through 2030.

Methane Impact: A few stakeholders commented that the ISO's analysis should include the impact of upstream releases of methane in the production and transportation of gas used to fuel gas-fired power plants. The ISO acknowledges the importance of methane

leakage in California's GHG accounting. However, such leakage is not expected to be affected by whether the ISO becomes a regional entity. Thus, this study does not intend to focus on the issues of methane leakages.

Sensitivities: For the portfolio assumption topic, the ISO is adding sensitivities to include GHG pricing in the remaining footprint – non- PacifiCorp WECC in 2020 and the PMAs in 2030.

Topic 11 – Data

After considering the comment received, the ISO does not propose to modify the existing economic data, and generation and transmission data. Additional comments received from stakeholders include:

Investment Impact: Some stakeholders requested that the analysis should include second order investments (i.e. investments in other states rebound to California due to its economic size). While the ISO agrees that the concept may be true, such level of detail of analysis is expected to provide only a second order of benefits that California ratepayers would receive. Thus, the ISO intends to focus on mainly addressing the direct benefits. Ratepayers would be even better off if the secondary benefits were analyzed.

Performance Metrics: Some stakeholders requested to expand the analysis to include evaluating the ISO's existing market performance and benefits to customers. The ISO already has this reporting requirement at FERC and believes that if stakeholders are interested in the ISO's performance that is the appropriate report. The SB350 study is to evaluate the impact to California ratepayers of the ISO expanding to a regional operation.

Topic 12 – Sectors for Economic Analysis

Stakeholders have expressed interests in the technique used in conducting the economic impact analysis. After considering the feedback provided, the ISO does not propose to modify the economic analysis 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. Additional comments received from stakeholders included:

Study Flaws: Some stakeholders have expressed concerns about the fact that the economic study results are only as good as the input assumptions which are contingent upon the production cost model. Stakeholders are concerned that the ISO has not allowed sufficient time for stakeholder comments to influence the study. The ISO

understands the concern and has allowed time between release of the preliminary results in mid-April and the final results in late-May to resolve any potential shortfalls that might arise in the study.

Topic 13 – Disadvantaged Communities

After considering the feedback provided, the ISO does not propose to modify the proposed approach for analyzing the economic or the environmental impacts of disadvantaged communities. Additional comments received from stakeholders include:

Community Programs: Information was provided by stakeholders on existing community programs that help disadvantaged communities. The ISO team appreciates the information and will evaluate these programs, but detailed analysis of the impact of these programs is outside the scope of this project, and the analysis is intended to estimate potential impact of regional market with future community programs in place.

CalEnviroScreen: Some stakeholders have express concern was raised that the CalEnviroScreen should be used judiciously and responsibly when considering impacts on disadvantaged communities. Some expressed that the CalEnviroScreen has a role in assessing area impacts but should not be used to assess the impact associated with individual generating facilities. Another commenter wanted more analysis on health benefits related to the reduced emissions of criteria pollutants from fossil fueled generators on communities both within and outside of California. The ISO clarifies that the CalEnviroScreen will be used to identify census tracts of interest and model results will be presented separately for those areas. However, CalEnviroScreen will not be used to assess the potential impact of individual generating facilities.

Topic 14 – Additional Economic Analysis

After considering the feedback from stakeholders, the ISO does not propose to modify the additional economic analysis used in the BEAR model to evaluate direct, indirect, and induced impacts to income and jobs, including those in disadvantaged communities. Additional comments received from stakeholders include:

Labor Usage: Some stakeholders asked about the assumptions for labor usage in the study. The ISO clarifies that the study assumes that employment for out-of-state capacity and transmission comes from out-of-state workers. As a conservative assessment of the benefits to California, no out-of-state renewable generation development will benefit California's workforce other than the impact on electricity prices.

Topic 15 – Environmental Analysis

After considering the comments provided by stakeholders, the ISO does not propose to modify the environmental analysis that will evaluate impacts to California and the west in five areas – air quality, GHG, land, biological, and water supply. Additional comments received from stakeholders included:

GHG Impact: Some stakeholders are concerned that the expanded footprint will increase GHG in the west and potentially allows for non-California coal resources output to increase and serve California load. The ISO understands the concern and the study results will include the impact of GHG on the proposed footprints for each scenario. The ISO clarifies that the environmental analysis will assess changes in GHG emissions brought about by the study scenarios with an emphasis on how those GHG emissions would be treated under California's existing Cap-and-Trade program. This will provide information on the GHG footprint of imported energy.

Conflicts: A stakeholder raised a question regarding how the study would define environmental 'conflict' and focus these efforts on objective criteria rather than perceived conflicts. As suggested, the study will not presume that projects will always create certain impacts, but the high-level scope of this study will identify only whether environmental conflicts could be expected across a region.

Additional Analysis: A number of stakeholders commented that additional analysis should be conducted for the study including site-specific and assessment of specific transmission projects. The ISO appreciates the comments and while rangeland will be considered for any ecological values that are present, the study will not include any site-specific assessment of connectivity and intactness, due to the high-level scope of this analysis. However, these factors will be incorporated at a landscape level because the ISO team will assess potentially affected biological resources using the WECC Environmental Data Viewer and Western Governors Association Crucial Habitat Assessment Tool (CHAT). For transmission projects, the environmental analysis will identify and discuss specific transmission projects that have been the subject of previous environmental reviews by siting authorities.

Topic 16 – Environmental Indicators

After considering the feedback received, the ISO does not propose to modify the environmental indicators further. Additional comments received from stakeholders included:

Siting Decisions: Some stakeholders expressed concerns with the processes that guide siting decisions. The ISO clarifies that these issues will be reflected in the descriptions of the renewable generation buildout. For example, generation buildouts are assumed to

generally adhere to previously-established or proposed development zones, and are likely to follow mitigation practices defined in earlier studies or enforced by siting authorities that have historically reviewed specific development proposals.

Additional Indicators: Some stakeholders requested to expand the proposed environmental indicators. The ISO clarifies that where possible, the generation buildouts will be described in relation to projects that have been the subject of previous environmental reviews by siting authorities. Because the ISO team is using existing public reports, no other changes to the proposed range of environmental indicators would be necessary.

Topic 17 – Other Comments

Additional comments were considered by the ISO. Based on various stakeholders' input, the ISO is modifying the approach as follows:

Project Detail: Many stakeholders commented that additional detail was need to understand the data and input assumptions, models being used and a clearer understanding of the methodology. Thus the ISO is targeting March 30th for release of additional detailed documentation on the assumptions and methodology to allow a better understanding of the study process for stakeholders.

Data Transparency: Some stakeholders commented that ISO and its contractors should release full work papers, all models, and any relevant documentation used to develop the study results consistent with the requirements of SB 350. All electronic work papers should be provided in Excel-compatible format with data and formulae intact, and parties should not need to gain access to proprietary tools to read the inputs and outputs of the various models. Access to confidential data, if used, must be provided to parties willing to sign reasonable Non-Disclosure Agreement. Consistent with the legislation, the modeling, including all assumptions underlying the modeling, shall be made available for public review.

Schedule: A number of stakeholders raised concern with the ISO's compressed schedule for this study. The schedule stems from the timeline needed to implement PacifiCorp's integration as well as Governor Brown's commitment to a regional grid as a key element needed to reach the 50% renewable portfolio standard. To allow implementation of a regional market by January, 2019 the decisions by each of PacifiCorp's six states needs to be made by the end of 2017. PacifiCorp estimates it will take one year from the time of California's decision to obtain the decisions from the six states. Thus, in order to have the possibility of addressing governance issues this legislative session, and provide other information needed to inform PacifiCorp's filings, the ISO needs to complete the studies by June, 2016.

4 Stakeholder Process Next Steps

Table 2 summarizes the anticipated stakeholder process schedule for the SB350 Study initiative.

Table 2 – Targeted Stakeholder process schedule

Step	Date	Milestone
Methodology Detail	March 30, 2016	Provide additional documentation on methodology in advance of the Preliminary Results meeting.
Preliminary Results	April 11, 2016	Draft Final Proposal Posted
	April 14-15, 2016	Stakeholder meeting (web conference)
	April 26, 2016	Stakeholder comments due
Final Report	Late May 2016	Final Report Posted
	June 2016	Multi-Agency Workshop

5 Topics

5.1 Topic 1 – Study Framework

5.1.1 *Question*

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?

5.1.2 *Stakeholder Input and ISO Response*

CBE supports regional sharing, or balancing electricity over a wider Western grid, as a key low-carbon grid balancing tool for our Renewable Portfolio Standard in California (the 50% RPS) and believes that a larger grid is not only important for meeting 2030 RPS requirements, but in the shorter-term for balancing "overgeneration."

ISO Response: The ISO appreciates the comments provided and agrees that a larger grid in the short-term could benefit balancing the increasing renewables on the grid.

LS Power, PG&E, SWPG, and TransCanyon commented that the framework appears to meet the intent but notes additional benefit areas that should be included. NRDC and NRG also commented that 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.

ISO Response: As discussed further below, the ISO understands the concern and the ISO team is modifying the 2030 assumptions for the regional market footprint.

5.1.2.1 Clarification Requests

CLECA and Six Cities are concerned that there are considerable unanswered questions about the terms of PacifiCorp's participation, including resource adequacy ("RA") requirements and the transmission access charge ("TAC") and the assumptions made in the study with the concurrent timing of the stakeholder processes to define these requirements.

ISO Response: The ISO understands the concern with the parallel paths for the studies versus changes to RA and TAC, however, given the timing of the legislation, we need to continue forward. The study will address the operating cost saving and investment cost savings in the study results.

Similarly TURN commented that the study should assume that PacifiCorp successfully develops the four new Gateway transmission projects identified in its 2015 Integrated Resource Plan regardless of whether ISO regional expansion occurs. CLECA, Six Cities and TURN states that the base case should assume that the costs for this new transmission are not allocated to ISO customers through the TAC.

ISO Response: Currently, the ISO's TAC straw proposal is that only regional transmission approved through a comprehensive transmission planning process would be eligible for TAC reimbursement across the expanded balancing authority area. In the ISO's base power flow case, consistent with the TEPPC case, Gateway segments A, B, C and E are assumed to be completed by 2020. In the SB350 analysis, the ISO team is assuming that Gateway segments D and F could be eligible to help integrate additional renewables using new transmission, in Scenario 3. The ISO's analysis will include costs associated with applicable new transmission projects, but will not and should not be interpreted as to provide indications of which transmission project will be built. For the purpose of the SB350 analysis, the ISO is using the TEPPC base case as the starting point. When simulating the market with Scenario 3 renewable portfolio, additional transmission will be assumed to be needed to deliver renewable resources to the local system and those assumptions including TAC impact will be included in the results.

Six Cities and CBE commented that the estimated cost of significant transmission projects built outside of California and assigned, in whole or in part, to California customers, is a relevant factor in assessing the overall benefits of regionalization. For this reason, Six Cities urges consideration of realistic projections of transmission costs for the various scenarios in this analysis. Because the PacifiCorp Gateway projects factor so prominently in ISO members' perception of the costs and benefits of regional

expansion, the ISO should confront the possibility that the Gateway project is built with its (considerable) costs assigned to ISO customers and study the effects on California energy consumers. Claiming that it is unknown whether this project may come to fruition and that it cannot thus be realistically reflected in the relevant studies diminishes the credibility of the study results.

ISO Response: As discussed above, sufficient information will be available to determine the TAC impact to California's consumers, including the transmission costs associated with portfolios that require additional transmission. The detail of assumptions for new and existing transmission, including costs, will be included in the results.

Relatedly, Six Cities commented that the study should also account for uncertainties regarding whether California utilities are expected to be off-takers for large amounts of out-of-state wind and, if so, in what quantities.

ISO Response: To conduct the study, the ISO had to make some assumptions of what a 50% portfolio may involve in 2030. The portfolios used in the analysis represent reasonable assumptions to incorporate diversity of sources and are not meant to predetermine the procurement requirements of any load-serving entity nor are the renewable portfolios meant to dictate to the CPUC Staff or any regulatory authority's procurement decisions. Therefore, there is no need to identify which California utility is procuring which renewable resource in 2030.

CLECA is concerned with the treatment of carbon, will it be "blended" emissions factor or a specific emissions factor associated with the specific plant.

ISO Response: The ISO further addresses emission issues in topics 10, 15 and 16.

LSA recommends that it is unclear if the Business-as-Usual ("BAU") assumptions include retaining the current boundaries of ISO for determining RPS bucket classification. If this is the planned approach it should be clarified.

ISO Response: The ISO clarifies that, when accounting for the potential that out-of-state resources could qualify for PCC1 under dynamic transfer, all of its scenarios are consistent with the current PCC rules.

Powerex commented that the proposed study framework for the SB 350 studies will not meet this objective because the study framework will overestimate the incremental benefits associated with regional integration by: (1) employing aggressive assumptions regarding the likely size and scope of a regional market and (2) measuring the benefits of that market against a "Business-as-Usual" case that does not reasonably capture current regional trade activities or how the ISO is likely to evolve if a western RTO is either not pursued or is limited in its geographic scope.

ISO Response: The ISO aims to conduct a study that incorporates a reasoned approach to regional market development. The study assumption is currently being adjusted to include only PacifiCorp in a regional market in 2020, and evolving to a larger regional market in 2030. The study also aims to capture the current regional trade activities in the "Business-as-Usual" cases by exploring different plausible levels of (a) California exports that may be accomplished in the bilateral power markets; (b) reliance on out-of-state renewables. The study will also compare estimated benefits to benefits estimated and documented in other regions with similar BAU and integrated market structures. Additional detail on the study assumptions will be included in the results.

Powerex further commented that the study framework also appears to implicitly assume that California ratepayers will receive all of the economic benefits associated with the reduced need for new in-state investments as a result of increased access to external renewable and flexible resources, without any portion of those economic benefits flowing to non-California ratepayers that have funded (and will continue to fund) those external resources. Powerex is concerned that such an assumption would be unrealistic and would undermine the accuracy and value of the studies prepared as a result of this proceeding.

ISO Response: The ISO notes that the legislation specifically requires the ISO to analyze the potential economic impact to California ratepayers. The ISO team is aligning costs borne by California ratepayers with the benefits received from those investments; the ISO is not crediting California ratepayers with benefits due to investments funded by ratepayers in other states. This SB350 study will not include a state-by-state economic analysis for the entire WECC, however this study could be used as a foundation for future studies for other entities and states.

SCL and CMUA commented that the proposed study should estimate costs and benefits to consumers of electrical energy in all of the western states as a result of the ISO expanding beyond its 2016 footprint. SCL and CMUA also stated that the study should include a governance model that is fair to all potential market participants and users of the bulk electric system.

ISO Response: As discussed about, this scope is more than is required under the legislation and we are limited in our capabilities to produce results in the timeframe that we have. The ISO acknowledges the importance of the governance model that is being developed in parallel to the study effort and additional information will be provided to stakeholders as soon as it becomes available.

TURN commented that the study must not assume that "regional integration" is the only answer to managing the damage of procurement activity that becomes irrational

over time. California (and other states) should be assumed to take serious steps to address these issues in the "Business-as-Usual" cases. As stated in the SB350 legislation, one of the intents of the studies is to determine the impact of a regional market to California ratepayers.

ISO Response: The ISO has assumed in all scenarios that California has made a significant investment in renewable integration solutions including: 500 MW of geothermal energy procurement (despite higher costs than alternative resources); 500 MW of pumped storage resources; time-of-use rates that provide incentives to retail customers to consume electricity during times of solar overgeneration; near-universal access to workplace charging facilities for electric vehicles; 5,000 MW of out-of-state renewable resources available to be selected for California; and facilitating operating reserves and frequency response by renewables. These efforts represent many of the activities and programs in which California will engage to manage renewable integration challenges, regardless of the development of the regional market.

TURN and ORA commented that the study should consider how a larger balancing authority could affect states' efforts to comply with the Clean Power Plan ("CPP") and whether the expected GHG reductions would go beyond CPP requirements.

ISO Response: The analysis will assume that there will be a carbon price in California in all of the years analyzed. Given the uncertainties around the CPP, and that the focus of this study is not on how any of the states would choose to comply with the CPP, if the stay were lifted, the ISO anticipates that the study will include a sensitivity analysis for the 2030 case that includes a uniform WECC-wide carbon price outside of California to evaluate the potential impact on the GHG emission across WECC.

TURN also commented that the study should assess whether the modeled commitment and dispatch of resources designed explicitly to minimize GHGs comports with FERC policies focused on market design and just and reasonable energy prices.

ISO Response: The ISO clarifies that the production cost analyses will simulate day-ahead unit commitment and security-constrained dispatch based on cost-based bid prices for operating costs, emissions costs, start-up costs, minimum and maximum generation levels, and minimum run time for all generating units in WECC. The cost-based approach assumes effective market mitigation consistent with FERC policies and should thus result in just and reasonable energy prices. The modeling method used in the study comports with industry standard.

CMUA commented that it is CMUA's understanding that PacifiCorp intends to continue in the Northwest Power Pool Reserve Sharing Group ("RSG"). PacifiCorp has not made a determination yet on whether they will stay in the RSG or not.

ISO Response: For the purpose of this study, the ISO assumed that PacifiCorp and the ISO optimized their reserve obligations and if the RSG needed reserves in the 2020 case they would procure them from the ISO markets. For the 2030 case, the ISO assumed that any remaining RSG member that was not in the expanded ISO region would procure any reserves required from the ISO market. The ISO notes that the existing RSGs shares contingency reserves (spin and non-spin) but does not currently share regulation or load-following reserves.

CMUA requested clarification as to their presumption that these studies assess the impacts of regionalization that are entirely incremental to those which could be derived through the Energy Imbalance Market.

ISO Response: CMUA is correct. The SB350 study will estimate the benefits associated with expanding the ISO balancing area including incorporating a day-ahead market, expanding the area over which reserve sharing occurs, maximizing transmission capabilities, and economic optimization of resources day-ahead.

CPUC Staff recommended that all costs to ratepayers be evaluated: both one-time transitional costs and on-going operational costs.

ISO Response: The ISO clarifies that the cost analysis will include operating and investment cost savings, and will estimate the impact to the transmission costs necessary to support the renewable portfolios and Grid Management Charge ("GMC").

5.1.2.2 Model Changes

PG&E recommends that Diablo Canyon be considered as operational for some of the proposed scenarios.

ISO Response: The ISO has assumed that Diablo Canyon is operational for the 2020 scenarios and has retired in the 2030 scenarios.

AWEA, CLECA, CMUA, Labor, Sierra Club, and TURN raised concerns that modeling a scenario where the entire WECC becomes part of the expanded ISO is not very realistic at this point in time, as such an expansion is not likely to happen in the near future. By only studying "full WECC expansion cases" the SB350 studies will, on their face, be subject to substantial scrutiny and may be deemed to be unrealistic and unreliable in analyzing impacts to California ratepayers. Others suggested that the study should consider just an ISO – PacifiCorp expansion. In addition, AWEA, NRDC, and Peak suggested it would be useful to evaluate a study case where regional expansion includes the current committed ISO EIM footprint: PacifiCorp, NV Energy, Arizona Public Service, Portland General Electric, and Puget Sound Energy. That could be expanded to include

Idaho Power should they formally commit to joining the EIM. *(Note: Further footprint discussions are included in topic 9.)*

ISO Response: Based on these comments received by stakeholders the ISO team has reconsidered the study scope and has decided to limit the 2020 expanded balancing area to only include the existing ISO and PacifiCorp. For 2030, the study will include the United States portion of WECC except the Federal Power Marketing Agencies ("PMAs") – specifically Bonneville Power Administration ("BPA") and Western Area Power Administration ("WAPA") – Colorado-Missouri Region, Lower Colorado Region and Upper Great Plains West.[3] The ISO chose not to include the PMAs due to the governance requirement of those agencies and by doing so the results will demonstrate the impact of less than full US-WECC-wide participation in the expanded ISO region.

Labor is concerned that the study framework potentially incorrectly characterizes the application of Product Content Categories ("PCC") in Scenario 2, incorrectly assumes a build out of Wyoming and New Mexico wind resources in Scenario 3 but not Scenarios 1 or 2 (without regional market), and greatly overestimates the amount of new solar resources that would be built in California in Scenario 3.

ISO Response: The scenario analysis tool, RESOLVE, provides for limited procurement of out-of-state resources based on use of existing transmission. As an example all scenarios (1a-c, 2, 3 and 3a) include the following resource options to be selected:

Available Resource	**MW**
NW Wind, Existing Transmission	1,000
NW Wind RECs	1,000
WY Wind, Existing Transmission	500
SW Solar, Existing Transmission	500
SW Solar RECs	1,000
NM Wind, Existing Transmission	1,000

With the above resources available to all of the portfolio scenarios, the ISO believes this is a reasonable representation of the amount of out-of-state procurement that might occur in the BAU case, i.e., in the absence of a regional transmission entity to facilitate needed transmission investments. Scenario 2 assumes that California procurement

[3] WAPA – Sierra Nevada Region is included in the Balancing Area of Northern California.

policies prevent or inhibit the procurement of additional out-of-state resources beyond the 5,000 MW listed in the table above. The modeling does not presuppose or change (nor does it need to) the current PCC rules. The ISO added an additional scenario 3a that allows additional out-of-state procurement and might therefore more closely align with Labor's views of the likely future under regional integration.

Labor also is concerned that the study greatly overstates current prices for solar energy in California; incorrectly assumes that the 30% federal Investment Tax Credit ("ITC") ends in 2016; and fails to include implementation of the many measures already planned to reduce any potential over-generation. All of these inaccuracies would overstate the benefits of regionalism.

ISO Response: As discussed in the introduction, the ISO has updated the assumptions to include the renewable resource and storage costs used in the model as well as extension of the ITC and production tax credit ("PTC") for new renewable resources. In addition, the ISO has assumed a number of renewable integration solutions are in place in all scenarios.

PG&E believes that Scenario 2 (i.e., regional market operations with renewable procurement restricted largely to in-state resources) needs to align better with the recent PacifiCorp integration studies which estimate a cost savings from integration resulting from out-of-state renewable generation.

ISO Response: The scenarios defined will provide the results for procurement of out-of-state renewable generation.

TURN commented that a base case scenario that assumes the current rules apply and the footprint of a California Balancing Authority remains unchanged does not mean that out-of-state resources cannot satisfy Product Content Category ("PCC") 1, 2 and 3 RPS compliance for California load-serving entities.

ISO Response: The ISO agrees that the PCC definition is a topic that can be separated from the footprint issue. Thus, the RESOLVE model is allowed to choose from out-of-state resources in scenario 1 if they are economic.

The portfolios presented at the February 8th workshop focused on the likely physical location of the renewable resources procured under the three alternative scenarios, rather than on the PCC procurement rules. The ISO has given careful consideration to stakeholder suggestions that the analysis should conduct a definitive accounting of procurement by the investor-owned utilities and other load-serving entities in each PCC. The ISO has determined that such an effort is beyond the scope of this analysis and is unnecessary to estimate benefits from expanded ISO operations. In addition to the data availability and processing difficulties, the ISO is not aware of a definitive data source for

the quantity of existing transmission that might be available for dynamic transfer from a neighboring balancing area under PCC1. As a consequence, the ISO believes it is not possible to determine the potential for resources to connect to neighboring balancing area under PCC1. The ISO does acknowledge that some amount of additional resource is likely to be procured out-of-state, and therefore has included 5,000 MW of out-of-state resources in Scenarios 1 and 2. However, the ISO will continue to focus on the physical location of the resources enabled by an expanded footprint, without regard to the PCCs.

The ISO believes that all three scenarios could be consistent with current PCC definitions, if sufficient dynamic transfer capability could be secured to support PCC1 procurement. The ISO has included a table above that indicates the percent of the total renewable portfolio that is procured from out-of-state resources for each Scenario, including all out-of-state resources regardless of the PCC.

MegaWatt is concerned that more dependence on remote resources and long-distance transmission may reduce local system resiliency. Megawatt continues its concern stating that while the study has significant local solar resources, additional local storage is not selected in the resource portfolios. Remote resource and transmission solutions may be advocated by a west-wide entity that local customers must pay for in addition to paying for any local resiliency solutions.

ISO Response: The ISO clarifies that the study uses the current available costs for storage provided by stakeholders, however, at the current cost estimates, storage is not chosen as economical additions. Thus the ISO has added 500 MW of additional energy storage in each of the 2030 portfolios. The ISO believes that transmission-level reliability will be enhanced under regional integration due to increased situational awareness.

Powerex commented further that any scenario used to measure the incremental benefits of regional integration needs to include (as a "base case" or as a reasonable alternative) the likely evolution of the ISO market design in the absence of a formal expansion of its footprint. This should reflect efficiency improvements that can be achieved through eliminating existing barriers to interregional trade and attracting the increased participation of external flexible resources.

ISO Response: The ISO clarifies that the study being performed assumes that each balancing area is efficient, only the transfers between markets face efficiency barriers due to frictions in trades and pancaked transmission charges. For example, the ISO already assumes expanded use of renewable resources for load-following, frequency response and operating reserves. Furthermore, since the SB350 study focuses on

impacts from day-ahead operations, the study does not estimate the potential gains from regional markets in the real-time markets (parts of which can be captured by EIM).

Powerex commented further that benefits associated with reduced in-state investments necessary to achieve California's 50% Renewable Portfolio Standard ("RPS") target need to be clearly and equitably allocated between California ratepayers and ratepayers in external areas, whose past and ongoing investments allow these savings to be realized in the first place. This will help ensure that the studies more accurately reflect the benefits likely available to California ratepayers.

ISO Response: The ISO clarifies that the study will estimate the potential impact to California ratepayers based on California's investments around meeting the state's RPS with new resources, but will not provide a state-by-state analysis of benefits to non-California ratepayers. However, the results of this study can be used by other states seeking to evaluate similar impacts of this regional decision.

Powerex commented that TAC charges to exports are a significant impediment to greater interregional trade and deter a range of activities that can help meet the challenges of renewable integration.

ISO Response: The ISO acknowledges Powerex's concern and the stakeholder process to redesign the TAC for regional integration is evolving in parallel with this study. However, the TAC initiative is not considering elimination of wheeling access charges (WAC) for exports outside of the ISO or regional entity. WAC charges will be eliminated only where pre-integration interties between balancing authority areas become transmission pathways internal to the expanded regional balancing authority area.

In addition, Powerex states that the evaluation of hurdle rates on imports into the ISO do not appear to accurately characterize the amount of import activity that is actually affected by such hurdle rates. On major interties like PACI and PDCI, only a small fraction of imports into the ISO face any incremental hurdle rate at all. Powerex does not contend that interregional trade under a bilateral scheduling framework is as efficient as it could be under centralized dispatch. But the benefits of centralized dispatch under an ISO integrated regional market must be based on a reasonably accurate representation of the existing activity, including modeling hurdle rates only to the extent they actually apply in practice.

ISO Response: The ISO understands the concerns of Powerex. As a matter of logistics, without specific publicly available data about who owns what portions of which path that do not face hurdles, the ISO is not able to capture the size of the bilateral trades that do not face hurdles or frictions. However, the ISO does not believe that modeling contract arrangements on interties at this level of detail is necessary. The ISO's

representation of hurdles is already conservative and likely understating true market frictions between Balancing Authorities. The ISO is not modeling inefficiencies in Point-to-Point reservation scheduling, unexpected transmission outages, abnormal weather conditions, real-life fuel cost volatility and variance, or other variances of generating costs that would create operational or economic hurdles. On a related note, the 2020 Regional Market case assumes that de-hurdled transfer capability is limited to 982 MW from PacifiCorp to ISO and 776 MW from ISO to PacifiCorp. These assumptions represent scheduled and non-dynamic transfers and seem reasonable given prior history between the two regions.

Sierra Club raised concern that by modeling optimization throughout the region, Scenario 2 will far overstate the benefits that would accrue from incorporating PacifiCorp alone. The overly-pessimistic assumptions underlying Scenario 1 means that any comparison using this scenario as a baseline is likely to overstate the benefits of any regional integration; the overly-expansive assumption of optimization throughout the WECC in Scenario 2 means that comparing these two scenarios will provide very little insight into the benefits of integrating PacifiCorp into the California ISO. At a minimum, it is crucial that the consultant model a scenario in which wheeling charges are eliminated only between the ISO and PacifiCorp, and where a realistic scenario for reserve sharing between these balancing areas is implemented without changing the transactional environment for the rest of the WECC. If the modeling shows benefits derived from increased use of "latent flexible capacity," it would be imperative to identify the source of this capacity. This scenario should be compared to a base case scenario in which the benefits of the expanded EIM are represented. This approach will provide the most realistic and useful analysis of benefits for consideration by the Legislature.

ISO Response: The ISO has revised its study scope to only consider the integration of PacifiCorp in the 2020 analysis. The ISO team is modeling the reserve sharing and the ability for larger balancing areas using broader sets of resources in an economical manner.

TURN commented that the study assumptions must reflect local operational constraints and local resource adequacy requirements when considering the impacts of regional expansion on unit commitment and dispatch and assessing the reserve sharing requirements.

ISO Response: The ISO has incorporated these operational constraints and requirements into the modeling assumptions across the relevant cases.

5.1.2.3 Additional Analysis

LS Power commented that for example, the additional transmission outside of the current footprint envisioned by the study to support the supply of out-of-state renewables brings additional benefits beyond those to be studied including reliability benefits, improved renewables integration, insurance value for emergency outages, additional EIM benefits, additional load/resource diversity, and congestion relief throughout the west including at the current ISO interfaces such as COI.

ISO Response: The ISO agrees and a number of these benefits will be included in the results. In addition, those that will not be quantified will be discussed qualitative with the results.

PG&E commented that the study should:

- Add a reliability analysis to compare the relative loss of load probability ("LOLP") contribution of each area to WECC's overall reliability in a WECC-wide regional market. Sensitivities around these input assumptions will be helpful to produce a range of reliability benefits.
- Compare the variable energy and ancillary service costs of each area within WECC before and after the expansion or formation of the regional market (i.e., compare the cost from individual vs. combined commitment and dispatch.

ISO Response: The ISO acknowledges the importance of reliability analysis and that a regional market could provide significant reliability benefits by reducing the probability of loss of load with the same planning reserve requirements. The study will evaluate potential investment savings from load diversity in the expanded region and qualitatively address reliability improvements through the expanded market as well as the additional co-benefits of regional transmission projects. Operational cost savings, including the costs of energy and ancillary services, will be estimated by comparing production cost simulation results under the base and regional cases. Capacity expansion savings will be estimated by Brattle based on load diversity across the entire market footprint. However, the ISO expects that a full LOLP analysis is more detailed than is warranted for this study.

PG&E recommends that studies use at least one scenario with assumptions that include the key elements of the legislation such as 50% RPS and significant increases in energy efficiency savings to the extent that they are cost-effective and feasible, which are aimed at reducing CO2 emissions to contribute to achieving the state's 40% of 1990 level CO2 emissions.

ISO Response: The ISO clarifies that the study will include 50% RPS assumption for 2030 and increases in energy efficiency consistent with the IEPR "mid" level of AAEE.

Additional details of the input assumptions will be provided with the study results. In addition, the ISO is conducting a sensitivity analysis to determine the impact of doubling the Additional Achievable Energy Efficiency ("AAEE") as described in SB350.

CDWR believes the studies need to include existing wholesale demand response. This participation could greatly reduce the issue of over-generation, could be accomplished with existing in-state resources, and could reduce the need for additional transmission capacity.

ISO Response: The ISO appreciates the importance of including wholesale demand response into the market. The study assumes all existing capability will continue and will evaluate the incremental difference between 33% RPS in 2020 and 50% RPS in 2030 along with the TEPPC assumed changes in generation and transmission over that period of time.[4]

CDWR, Sierra Club, TURN and Powerex commented that studies should include the effects of major market enhancements that are underway, such as the flexible ramping product, and their ability to economically address challenges with increased renewables.

ISO Response: The ISO clarifies that the SB350 study will include the market enhancements for integrating renewable resources and additional modeling detail will be included in the results.

CESA also commented that additional focus should be put on intra-California renewable buildouts and more aggressive assumptions regarding grid-changes. The Sierra Club and TURN commented that California has other options as well for managing over-generation such as storage, Demand Response, electric vehicle charging, retail rate design and improvements to the ISO's energy market. None of these alternatives appear to be reflected in the BAU scenario. Sierra Club recommends that scenario 1 reflect the likely potential of these other efforts.

ISO Response: The ISO clarifies that the scenarios used for the study will include a number of renewable integration solutions in the Business-as-Usual cases, including further buildout of intra-state renewables, use of demand response and storage, time-of-use rates, 500 MW of geothermal and pumped storage, and near universal availability of workplace electric vehicle charging. These additions reflect the type of continued efforts and programs that will be implemented with or without a regional market.

[4] The TEPPC base case models 2024 and the 2015 IEPR models 2026. In modeling 2020 – 33% RPS – the ISO backed out generation and transmission based on in service dates. In modeling 2030, the ISO took the combination of the two cases and extrapolated the generation and transmission assumptions to 2030 augmenting the loads and known generation and transmission opportunities.

TURN commented that the analysis must also review the projected RPS compliance positions of major investor-owned utilities to properly assess the extent to which forecasted renewable net short positions through 2030 can be satisfied with PCC 2 and PCC 3 resources.

ISO Response: While the ISO understands TURN's request, the study is evaluating the impact of a regional market on California and therefore the ISO has assumed that the state would meet 50% by 2030 with different renewable portfolios with and without a regional market. The focus of the study is not to evaluate on the utilities' individual net positions in meeting their individual requirements. The ISO believes this is a reasonable assumption that the study assumes that the utilities will meet their 33% requirement by 2020 and, collectively, procure enough to meet the 50% by 2030.

LADWP is concerned that the study framework did not consider the impacts on balancing authority areas outside of the ISO including LADWP. Specifically LADWP is concerned that SB350 requires the study evaluate the impacts on Californians as a whole, not only the potential impacts to ratepayers in the ISO balancing authority area. The study should state that other utilities also provide transmission and balance the energy needs of a large percentage of California's population. LADWP wants to ensure the study is described accurately.

ISO Response: The ISO agrees with LADWP and the ISO will be evaluating the impact on all California ratepayers, not just ISO ratepayers. The ISO will endeavor to accurately describe the other California balancing authority areas in the results.

NCPA commented that the studies will address the current state and a possible future end state (WECC wide footprint), but fail to account for, and/or address any of the additional costs that are likely to materialize as a result of a phased approach to regionalization. Additionally, there are no plans to perform sensitivity analyses on the numerous modeling assumptions that must be made to perform these studies in order to assess the impact of a dramatic miscalculation under the original sets of assumptions.

ISO Response: The ISO will be conducting some sensitivity analyses. In addition, the ISO will provide estimates of additional administrative costs associated with developing regional markets. The ISO will also conduct a number of sensitivity analyses of the renewable portfolios using RESOLVE.

TransWest recommends that the ISO broaden the framework of the RPS study to include an additional scenario (i.e. Scenario 4) which would examine how renewable energy resources would be integrated in California if major new transmission lines were developed into the state but there was no regionalization of the ISO. Scenario 4 utilize the same portfolio as proposed for Scenario 3, including the new transmission solutions

that would allow the ISO system to access Wyoming and New Mexico wind resources. The analysis of this scenario would also include benefits associated with the expanded capacity between the ISO system and the balancing areas participating in the Energy Imbalance Market ("EIM").

ISO Response: The ISO is focused on analyzing the potential impact of a regional market on California, and therefore is not necessarily analyzing how adding transmission under the existing Business-as-Usual would affect California, therefore does not believe an additional scenario of renewable resource portfolio with transmission will be needed. Further discussion of footprint revisions are included in Topic 9. The ISO believes that an expanded footprint would significantly improve the viability of large, new multi-state transmission investments and has therefore included these assets in Scenario 3.

Six Cities commented that the study framework is unduly limited by focusing solely on benefits that may inure directly to California. In order to fully assess the benefits and associated costs of regionalization to California, it is critical to perform an assessment of the benefits and costs of regionalization on a WECC-wide basis as well. The Six Cities thus urge the ISO to expand the proposed studies to include, at a minimum, impacts, costs, and benefits outside of California, which will necessarily feed into an assessment of benefits to California and a determination of whether regionalization of the ISO should move forward. Decision-makers within California should have an understanding of whether the benefits of regionalization may disproportionately flow outside of the state. The costs and benefits to California should be described on as granular a basis as possible – including at the individual utility level so that impacted parties have a complete understanding of the implications of regionalization on their systems. In addition, Six Cities commented that it is critical to identify clearly and focus on those benefits of comprehensive regionalization that could not be achieved through expansion of the EIM.

ISO Response: As discussed above, the study will provide the benefits to the region and to California ratepayers. The latter is required by the legislation. However, the study will not provide a state-by-state analysis of benefits to non-California ratepayers, and it will not estimate the benefits to each individual utility's ratepayers because the ISO does not intend to make assumptions about retail rate structures that might differ across utilities. However, the ISO hopes that the results of this study can be used by other states or other entities within California seeking to evaluate similar impacts of the regional market.

5.1.3 *Changes from the Proposal*

The ISO proposes the following revisions to the study proposal:

- Revise the 2020 expansion to consist of consolidating the existing ISO and PacifiCorp balancing areas into one balancing area.
- Revise the 2030 regional expansion to consistent of consolidating all of the United States WECC balancing areas into one, except the PMAs.
- Revise the renewable and storage costs based on information received from stakeholders.
- The results will include an estimate of the impact to TAC based on the most up to date estimate of the transmission costs associated with the renewable resource portfolios to meet 50% renewable portfolio standard in California.
- Expand the number of sensitivities to include varying levels of carbon pricing and the impact of doubling the AAEE.

5.2 Topic 2 – Portfolios

5.2.1 *Question*

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?

5.2.2 *Stakeholder Input and ISO Response*

SCE commented that the scenarios should give a range of results to understand the impact of regional market expansion. Similarly SCL and TransCanyon support the proposed portfolios.

LS Power and NRDC commented that the portfolios are reasonable except that the assumptions for transfer capability of renewables using existing transmission may be overstated. Sensitivities should be performed to determine if benefit results are sensitive to this assumption. NRDC also commented that the maximum available transmission capacity to support exports under the BAU case should be less than the assumed transfer capacity under the regional operations.

NRG commented that the portfolios are reasonable but questioned whether 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.

ISO Response: Based on the feedback received, the ISO has revised the study assumptions. The 2020 cases will be consolidating the ISO and PacifiCorp, and the 2030 cases will be the US-WECC except the PMAs.

Six Cities recommend that the focus of the studies be on the incremental resources that are expected to be procured above and beyond the level of resources that has already been contracted for. For example, to the extent that entities have already contracted for resources in excess of the 33% RPS requirement, that should be reflected in the studies.

ISO Response: The ISO agrees and the proposed portfolios take the existing information for 33% RPS as a starting point and add additional renewables to achieve 50% RPS by 2030. The renewable portfolio scenarios represent incremental portfolios relative to the 33% by 2020 and they are meant to represent plausible portfolios that California, on aggregate, would likely procure, and are not intended to supersede the CPUC Staff's or any other regulatory authority's authority to determine procurement for the individual utilities.

5.2.2.1 Data Clarification

BAMx, ORA, TransWest commented that it is premature to reach conclusions as to the reasonableness of the portfolios until the input assumptions are better understood. To understand the impact of various assumptions, it would be helpful to identify which assumptions result in binding constraints and how might the results differ if a critical binding constraint was relaxed.

ISO Response: Additional detail of the study assumptions will be presented with the draft results in April.

CMUA also is concerned that the study makes unwarranted assumptions regarding current procurement rules, and how regionalization may affect procurement rules in the future. There are several issues here. Currently, the CPUC Staff is approving renewable power purchase agreements from renewable resources highly distant from California's geographic boundaries. The assumption of a west-wide grid affects this issue. An expanded grid that includes only PacifiCorp may affect competitive delivery of certain resource areas, but it may not. The bottom line is that a simplistic assumption that resources will be procured that would have not been PCC1 but for ISO regionalization is a simplistic assumption that could drastically overstate the possible benefits of regionalization to California consumers.

ISO Response: The ISO clarifies that the study assumes that the existing procurement rules remain in place because the ISO has no basis to change the procurement rules and therefore makes no new assumptions as to how procurement could change over the

next 15 years. Only the CPUC Staff and other regulatory authorities can make that change in the procurement rules for their respective utilities. The study uses one portfolio scenario (Scenario 3) in which transmission is built to facilitate the development of high quality wind in Wyoming and New Mexico to help meet California 50% RPS target by 2030. See the discussion above.

CPUC Staff recommended that at least two of these portfolios should be consistent with those generated by the RPS Calculator to facilitate comparison of results. NCPA made a similar comment.

ISO Response: The ISO understands the CPUC Staff desire to compare results and clarifies that the SB350 study uses the Super CREZs aggregations from the RPS Calculator's energy-only case to represent California renewable resources. However, the time horizon and the premise of the studies are different therefore the portfolios will be different. The RPS Calculator simulates procurement incrementally, selecting the least-cost set of resources to fill the net short in a given year. RESOLVE minimizes costs over a long time period, sometimes building early to take advantage of expiring tax incentives. The ISO study also includes more detail about the potential availability of out-of-state resources, which is not a major focus of the RPS Calculator. In addition, the ISO wished to include 500 MW of geothermal and pumped storage in all scenarios as an investment in minimizing renewable integration issues. The ISO also wished to ensure that the potential for in-state wind development is not overstated, so in-state wind is limited based on an environmental screen developed by its consultant. The.

5.2.2.2 Scenario 1 Comments

Sierra Club comments that Scenario 1 is too pessimistic in that it assumes no common-sense improvements in operations even when such changes are already occurring and are clearly in all parties' interests.

ISO Response: The ISO clarifies that Scenario 1 assumes that the currently proposed operational improvements are in place by 2020 and other resources that assist in integrating renewables such as storage and demand response are also in place by 2030.

CMUA and NCPA are concerned that, transmission assumptions from existing regional Order No. 1000 processes are being discounted or simply not considered, the benefits of identifying the least cost combination of resources and minimizing "over build" in all Business-as-Usual (BAU) cases are overstated.

ISO Response: The ISO clarifies that least cost combination of resources are exactly what is being considered in the BAU cases, using existing transmission systems. To the extent that existing transmission is insufficient for procurement of out-of-state resources, the RESOLVE model includes the costs for transmission when procuring

incremental resources that need transmission. Thus, hypothetical transmission projects that help integrate renewable resources in the most cost-effective manner compared to other options are effectively considered when developing the renewable portfolios. The details of the transmission cost assumptions will be included in the results.

5.2.2.3 Scenario 2 Comments

Labor and TURN raised the concern that Scenario 2 should assume that the footprint of Product Content Category 1 remains exactly as it is today, a preference for California renewables. No other formulation can satisfy the determination of California policymakers as expressed three times in legislation and most recently in the February 4 letter to the Governor.

ISO Response: The ISO affirms that Scenario 2 is intended to reflect identical procurement policies as Scenario 1, consistent with today's policies, with the only difference being the change in regional operations, not procurement. However, any actual procurement decisions will be made by the CPUC and the applicable regulatory authority. The ISO is not presuming to change the existing procurement rules in Scenario 1 or 2. In addition, the ISO is not modeling the PCCs explicitly. Rather, the ISO believe that all three scenarios are consistent with the current PCC rules.

5.2.2.4 Scenario 3 Comments

LSA recommends that at least one scenario include high stress assumptions versus typical days, as this could lead to different renewable portfolios.

ISO Response: As previously discussed, the proposed portfolios in the analysis are merely plausible 50% scenarios and are not assumed to be extreme cases.

In addition, LSA finds portfolio 3 undervalues the potential for solar development outside of California. This may be due to high-cost assumptions for the resource and may also be related to how much transmission will in fact be needed for the out-of-state wind. Because there is significant disagreement over how much transmission may be needed for WECC-wide procurement portfolios, LSA suggests that the study include a sensitivity around this assumption.

ISO Response: The ISO will be performing sensitivities on solar development and the results will be made available to stakeholders.

5.2.2.5 Geothermal comments

CLECA questions the assumptions of 500 MW of new geothermal energy and the dependency on who is responsible for building and paying for the new transmission.

ISO Response: As discussed at the stakeholder meeting and earlier in this paper, the ISO included geothermal in the portfolio as a measure to address renewable integration

challenges. While the 50% portfolios are reasonable assumptions for 2030, the renewable portfolios represent aggregate likely procurement by California entities and are not tied to any load-serving entities. Moreover, the actual procurement by the load-serving entity will be regulated by the CPUC or the applicable regulatory authority.

5.2.2.6 Out-Of-State Resources Comments

CLECA questions the assumptions of the economics of Wyoming and New Mexico wind are dependent on who is responsible for building and paying for the new transmission.

ISO Response: The study will include the cost of new transmission as a California ratepayer cost if it is needed for California to meet the 50% renewable portfolio.

TURN commented that the study should model the impact of adding several thousand megawatts of Wyoming wind on hourly market energy prices in hubs where the energy is presumed to be sold. These market prices should be netted against assumed Power Purchase Agreement (PPA) prices for purposes of determining the net premiums for any California purchaser. The study should include sensitivities to show the consequences for net premiums under different market energy price scenarios.

ISO Response: The RESOLVE tool does model the Wyoming wind as part of the Northwest region, which has different marginal energy prices. New transmission is assumed to be constructed (and the costs included in the ratepayer impacts), which will minimize congestion and minimize locational energy price differentials across the footprint considered. Further, the ISO's analysis is not intended to analyze the terms of the PPAs. However, the TEAM methodology used for evaluating ratepayer impact will assume that the capital cost associated with the renewable resources will be paid for by California ratepayers for the purpose of meeting the RPS and the market energy price levels will be considered when utilities purchase and sell power.

In addition, TURN commented that the study must consider the potential for an expanded balancing authority to permit California Load-Serving Entities ("load serving entities") to meet RPS procurement requirements from existing renewable resources either connected to, or that can deliver to, the new balancing authority.

ISO Response: While the ISO understands TURN's desire to have a supply analysis of existing resources, there are too many assumptions that need to be made for a 2030 case and the ISO's analysis is not going to a load serving entity level because we are not in control of the actual procurement for each load serving entities.

Powerex commented that study framework appears to overlook that there are already numerous examples of renewable resources that have been constructed outside of the ISO balancing authority area for the purpose of being delivered to California to meet its

RPS requirements. It is inaccurate for the E3 study to assume that continued access to additional out-of-state renewable resources, such as Wyoming wind, can only occur with the implementation of a ISO integrated regional energy market.

ISO Response: As described in E3's slide 34 from the February 8th Stakeholder meeting, the ISO has already accounted for all 3,000 MW of existing out-of-state procurement in the 2020 case. An additional 5,000 MW of out-of-state resources are available in all scenarios, including the Business-as-Usual scenario. Scenario 3 makes available 3,000 MW each of Wyoming and New Mexico wind, with additional transmission costs required.

TURN commented that there may be significant quantities of existing surplus renewable generators in the WECC that are not selling output used for any other state compliance obligation and can sell their output (or have their output resold) to California Load Serving Entities versus assuming building new renewables. The study must consider the potential for such surpluses from resources located in either the PAC Balancing Authority, or in any adjacent balancing authority that can deliver directly to the PAC footprint (including Colorado and any Canadian provinces), to substitute for new resource development in Scenario 3.

ISO Response: The ISO clarifies that a complete assessment of west-wide REC supply is beyond the scope of this study and the ISO is not aware of a comprehensive data source that could be used for this analysis. The ISO also notes that procurement of unbundled RECs is inconsistent with California's GHG policy since California utilities receive no GHG credit for unbundled, out-of-state RECs under current California Air Resources Board rules. Nevertheless the study does assume 2,000 MW of REC-only transactions are available for RPS compliance under all scenarios.

TURN also commented that the study should analyze the extent to which approximately 1,500 MW of existing wind operating in Alberta could qualify as PCC 1 renewable energy under Scenario 3. Moreover, PacifiCorp currently manages almost 2,000 MW of existing PURPA contracts and has requests for contracts from another 3,700 MW of eligible Qualifying Facilities ("QFs") outside California. Much of the output from these QFs could be resold to California load serving entities as RPS-eligible output if the PCC 1 eligibility rules are modified consistent with Scenario 3. In addition, TURN commented that significant quantities of existing wind power in the northwest may be available as PCC 1 under Scenario 3. The CPUC Staff also recommended that the analysis should evaluate how out-of-state QFs seeking to participate in the market would be affected by regionalization.

ISO Response: Since the portfolios are samples based on electrical characteristics and costs, any resource that can meet the characteristics and cost threshold can be substituted for the 2,000 MW of REC-only transactions and the 3,000 MW of availability over existing transmission, including QFs and Alberta wind. Thus the ISO believes the scenarios already chosen have the flexibility to accommodate the options TURN and CPUC Staff propose and additional analysis is not practical within the time available for the SB350 study. Moreover, these modifications would only increase the estimated benefits of expanding the boundaries for resources that qualify for PCC 1 because they effectively increase supply and lower procurement costs.

CPUC Staff commented that a scenario that examines out-of-state procurement alone without regionalization should be performed to isolate those benefits from the larger benefits of regionalization.

ISO Response: The ISO is already incorporating 5,000 MW of incremental out-of-state resource availability in all scenarios. The ISO believes that additional development beyond the 5,000 MW would require new transmission and is impractical in the absence of a regional transmission entity.

5.2.3 *Changes from the Proposal*

The ISO proposes the following changes to the portfolio proposal in addition to those changes proposed in earlier sections:

- Due to the revised renewable and storage costs, the renewable portfolios have been updated.
- Expand the number of sensitivities to include high out-of-state solar and high rooftop PV.

5.3 Topic 3 – Portfolio Assumptions

5.3.1 *Question*

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?

5.3.2 *Stakeholder Input and ISO Response*

TransCanyon commented that the assumptions seemed plausible and reflect current understanding of market conditions.

5.3.2.1 Data Clarification

BAMx, CMUA, CPUC Staff, ORA, and TransWest believes additional information is needed before this question can be answered because it is unclear how the assumptions made for the RESOLVE model will or will not differ from those used for the RPS model, which continues to go through substantial changes with extensive stakeholder effort. A detailed explanation of how the RESOLVE model and the RPS model may differ, as well as a detailed explanation for those differences for both in state and out-of-state selection of resources, are needed.

ISO Response: The ISO understands the concern and additional detail on the input assumptions and the RESOLVE model will be provided in the results.

The CPUC Staff also requested a clear explanation of the Power System Optimizer ("PSO") model and model input data and any relevant analysis tools such as the development of load shapes, renewable shapes, and calculation of required operating and flexibility reserves from underlying data.

ISO Response: PSO is a commercially available production cost simulation model and the study results will include a detailed description of the model's functionalities. The results will provide input data assumptions including relevant load and renewable shares and operating requirements and constraints.

Labor, LSA, NRG, PG&E, SCE, SCL, Six Cities and CPUC Staff commented that the study should use the IEPR 2015 forecasts.

ISO Response: The ISO has updated the load forecasts to include the IEPR 2015 data.

SCL commented that the load forecasts should include both high and low load growth scenarios.

ISO Response: The ISO is using the mid-IEPR 2015 forecast and intends to conduct a low load sensitivity analysis.

PG&E also commented that the assumed distributed generation forecast of 14.6 GW by 2030 should be updated to include potential distributed generation increases from the extension of the Net Energy Metering tariff at the retail rate.

ISO Response: The ISO updated the assumptions to include additional rooftop PV consistent with the 2015 IEPR but has not reflected additional behind the meter PV due to the CPUC's recent NEM 2.0 decision, the extension of federal tax incentives and time-of-use rates.

SCE and CPUC Staff commented that the energy efficiency target should be consistent with the legislation, not the IEPR 2015 forecast and recommends that the 2016 LTPP "default scenario" be used.

ISO Response: The ISO believes that the energy efficiency assumptions in the 2016 LTPP default scenario, specifically the doubling of the Mid-AAEE savings, have not been sufficiently vetted to be relied upon for this study. However, the ISO is including a sensitivity analysis that would double the mid-AAEE proposed in the legislation.

SCL also commented that the Northwest Power and Conservation Council's 7th Regional Power Plan estimates that energy efficiency savings will be greater than load growth resulting in declining retail sales in the Pacific Northwest. The study should model this scenario explicitly to estimate the resultant costs and risk to consumers.

ISO Response: The ISO does not anticipate evaluating sensitivities that evaluate changes in non-California loads

LSA commented that the assumptions about which resources can provide ancillary services and meet any local generation requirements in both the RESOLVE model and the production cost runs should be clarified.

ISO Response: The ISO intends to provide this detail with the results.

CMUA and NCPA commented that the models that are being utilized for the SB350 studies do not model the voltage requirements/reliability impacts that will occur as Once Through Cooling units ("OTC") are shut down and incremental resource needs (conventional or renewable) are met by out of state resources transmitted over very long distances.

ISO Response: The ISO is conducting a full production cost analysis including economic dispatch that incorporates the retirement of OTC units and maintains the reliability of the grid in its analysis. However, a full reliability analysis around the OTC retirement is beyond the scope of the study. The ISO will take the responsibility of conducting reliability analyses around generation retirement, with or without the regional market. To the extent that having a regional market improves system reliability, those impacts will be explained in the study

BAMx, PG&E and SCE commented that additional information is needed as to why 500 MW of geothermal and 500 MW of pumped storage were forced into the portfolios. For example, how were these levels determined? How does this assumption alter the balance of the portfolios and what is the net economic cost of this diversity? What related transmission costs may be driven by these assumptions (such as major lines to support geothermal exports from IID)? Similarly the CPUC Staff commented that the model's use of new geothermal and pumped storage capacity is inconsistent with the default assumption in the 2016 LTPP.

ISO Response: The ISO incorporated these two types of resources in the portfolios to provide resource diversity under very high solar generation cases. The inclusion of these resources serve to make the benefits more conservative, i.e., to reduce the cost difference between Scenario 1 (BAU) and Scenarios 2 and 3. As previously stated, the portfolios are only meant to demonstrate reasonable portfolios for the 2030 timeframe and are not intended to be definitive as to what and how much of each resource type should be procured for 2030. That is a decision for the CPUC and appropriate regulatory authority. In the results, to allow for an evaluation of disadvantaged communities and environmental analysis, the study will propose areas for siting generation at the Super-CREZ or air basin level and transmission at the directional level (e.g. Wyoming delivered to California, local, etc.) but will not chose winners and losers. Because the determination of transmission needed will depend on load serving entities procurement, and all of those decisions are out of the ISO's hands, only possible assumptions were made for the SB350 study.

NRG commented that though neither geothermal nor pumped storage appear to be cost-effective, including them for diversity purposes seems reasonable.

ISO Response: The ISO agrees that based on what is known today from a cost perspective geothermal and pumped storage are not economically selected by the model. However, because the portfolios are only representative procurement scenarios for 2030, the ISO desired to include these two additional resource types for the regional integration discussion.

NRG questions the existing 3,820 MW of storage and requests additional information on how it was derived.

ISO Response: The data is being revised but was intended to incorporate existing pump storage units and the CPUC order for 1,325 MW of storage by 2020. The corrected total that is projected to exist in 2020 is 3,157 MW.

NRG commented that more information on how preferred resources are assumed to meet RA needs should be provided.

ISO Response: The discussion of RA will be included in the results.

ORA commented that inconsistencies should be clarified in advance of the proposed April stakeholder meeting. Namely the E3's description of the RESOLVE model, states that the Rocky Mountain area is not being modeled. (See slide 14). First, why was the Rocky Mountain area excluded and what are the expected impacts of such an exclusion? Second, does this exclusion create any inconsistency between the RESOLVE model and the production cost simulations being prepared by Brattle, which presumably would include the Rocky Mountain area?

ISO Response: Exclusion of the Colorado/Rocky Mountain area simply means that no resources from that area are available to be selected for California ratepayers. The effect of this exclusion is minimal because there are ready substitutes for Colorado wind and solar in the states adjacent to California. RESOLVE is being used to model renewable energy procurement whereas the Brattle PSO model is used for production cost analyses. The ISO does not believe that there are any issues with this differences.

TURN is concerned with three key assumptions: (1) there is a substantial amount of unmet RPS need by major Investor Owned Utilities (IOUs), (2) other non-IOU California load serving entities are likely to sign large volumes of long-term contracts for new Wyoming and New Mexico wind, and (3) this need must be satisfied exclusively or primarily with renewable resources that qualify for PCC 1 treatment. The study parameters will not reflect reality if these assumptions are left unmodified. The RESOLVE model does not appear to consider the different procurement strategies of smaller load serving entities such as CCAs, ESPs and smaller Publicly Owned Utilities. TURN commented that it is unable to summarize the supporting data on load serving entities renewable net short positions from recent RPS compliance filings in these comments. The ISO and its contractors should perform this work and ensure that the results are incorporated into the modeling. Failure to incorporate this information would render the modeling seriously deficient and disturbingly disconnected from the real world.

ISO Response: The ISO scenarios add resources to physically meet a 50% RPS, using the CPUC RPS contracts as a starting point. Thus, the ISO modeling does include detailed calculations of the RPS net short positions. Use of banked RECs to meet RPS compliance obligations in the near term may delay but cannot displace the need for new physical assets such as the ones the ISO has modeled in this study. ISO agrees that it is implausible that investor-owned utilities or other load serving entities would procure large quantities of Wyoming and New Mexico wind under Business-as-Usual and has therefore excluded these resources under Scenario 1. However, having a regional transmission entity would facilitate a load serving entities' ability to procure from remote areas, just as today northern California load serving entities can procure renewables from distant locations in Southern California (and vice-versa). Remote, high quality Wyoming and New Mexico wind are therefore made available in Scenario 3. In addition, as noted above, the ISO's analysis is not intended to analyze individual load serving entity's procurement decisions because the ISO is not in control of the actual procurement.

CPUC Staff commented that it is unclear whether high quality Wyoming and New Mexico wind is available only in operational scenario 3 (as indicated on slide 8) or whether it is available in operational scenarios 2 and 3 (as indicated on slide 21).

ISO Response: As discussed in Topic 1, some amount of Wyoming and New Mexico wind are available in all of the portfolios; however additional high-quality wind is made available under Scenario 3 with new transmission under the regional market case.

5.3.2.2 Existing Tools

CDWR believes the availability of in-state wholesale demand response in both the Day-ahead and Real-time markets is an important consideration when developing mixes of renewable and integration resources and should be included in the development of these potential renewable portfolios.

ISO Response: The ISO clarifies that the study includes both new and existing demand response opportunities based on the LTPP assumptions in all cases analyzed.

In addition, Labor commented that, the renewable portfolios do not recognize the great efforts already underway by California to address potential over-generation.

ISO Response: The ISO clarifies that a number of renewable integration solutions have been assumed in all scenarios, including the continued use of demand response, expanded use of variable energy resources for load following and operating reserves, work place EV charging, time-of-use rates, etc.

Labor continued its comment that the model does not adequately recognize current or future programs that will shape the EV deployment, specifically the SCE and SDG&E to deploy EV charging infrastructure that integrate EV charging with electric system needs. In addition load shapes should be adjusted to reflect the expected effect of time-variant retail rate designs as well as load management programs designed to ameliorate potential over-generation.

ISO Response: Based on discussion at the February 8th Stakeholder meeting, the ISO team has updated its electric vehicle charging shapes to assume universal access to workplace charging. Both demand response and time-of-use rates were included in the analysis already.

5.3.2.3 Cost Assumptions

NRDC commented that renewable energy costs have been declining very rapidly, and the model assumptions have consistently been too conservative regarding their cost. NRDC notes that 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.

ISO Response: The ISO has updated the renewable costs based on information provided by stakeholders, the 2015 IEPR and 2016 LTPP.

CESA is concerned the costs for energy storage appear to be inflated. MegaWatt also commented that the assumptions for new storage are incorrect and the portfolios are inconsistent with other studies done for 50% renewables. CESA commented that these costs should be lowered at least to the low-end levels expressed in the Lazard Levelized Costs of Energy Storage study. The Lazard report calculates the unsubsidized low-end Levelized Costs of Lithium Ion Energy Storage as $347/kWh ($486 installed), Flow Batteries at $290/kWh ($372 installed), and Pumped Hydro storage ("PHS") as $188/kWh ($244 installed). By comparison, E3's low-end values appear to be materially higher at approximately $590/kwh for lithium-ion and $390/kwh for Flow batteries. The Lazard report also offers different breakdowns of system costs, e.g. capital costs. Storage 'options' in RESOLVE should primarily center on 2, 4, 6, 8, and 12 hour energy storage capable of twice-daily cycling. Adding in some levels of 30-minute storage with high cycling capability as well as a requirement for RESOLVE to select some large bulk storage sited inside California also seems appropriate.

ISO Response: The ISO has updated the renewable resource and storage costs based on information provided by stakeholders, the 2015 IEPR and 2016 LTPP.

5.3.2.4 Solar Assumptions

NRG also questions 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 ISO-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.

ISO Response: The ISO has updated the behind-the-meter solar assumption to be consistent with the 2015 IEPR for the years that are being studied. In 2030, that quantity is 5 million vehicles. The ISO notes that significant quantities of renewable curtailment are necessary to ensure reliable operations under all scenarios.

NRG commented that the assumption that solar development is nearly unlimited seems premature in light of the land use issues that have arisen.

ISO Response: The ISO has taken the information provided by stakeholders and the 2015 IEPR to determine the revised quantity of solar development.

5.3.2.5 Out-of-State Assumptions

SDG&E commented that they fail to see the value in creating a scenario that assumes less than the 6,000 MW of additional out-of-state wind development potential. SDG&E recommends that Scenario 2 be eliminated.

ISO Response: The ISO clarifies that Scenario 2 can be compared to Scenario 1 to reflect the potential impact of expanding operationally to a larger footprint while retaining the BAU procurement, and comparing Scenario 2 to Scenario 3 provides the impact of expanding procurement to the larger footprint that is enabled by the regional transmission entity.

Labor commented that purchasing 2-3,000 MW of wind energy from Wyoming and New Mexico do NOT depend on any regionalization proposal. Accordingly, development should be assumed for every scenario or none. Similarly LS Power raised concerns that a lower cost of transmission plus a higher capacity factor makes it reasonable to predict more Wyoming wind and less New Mexico wind.

ISO Response: The ISO agrees that some out-of-state wind can be procured even in the absence of regionalization. However, the ISO believes that development of significant quantities of remote, high-quality Wyoming and New Mexico wind is implausible in the absence of a regional transmission entity. The ISO is not using this study to identify specific renewable or transmission projects for future development. Thus, the ISO has reflected the possibility of using wind from both Wyoming and New Mexico in the study.

5.3.2.6 Power Purchase Agreement

NRG commented that 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. 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. NRG states that the ISO's position is that generators will be provided with the compensation they need through their RA contracts, and the ISO 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.

ISO Response: The ISO clarifies that the curtailment of renewable resources occurs when there is insufficient resources to balance them. The ISO only assumes that the ratepayers who pay for the renewable resources would need to pay for more resources to be built if curtailments are high. The study is meant to examine the potential costs if the procurement occurs and all resources need to be compensated to cover their costs, despite the curtailments. Regarding reliability needs, if generators are needed for reliability and have not obtained a power purchase agreement or RA contract, the ISO has contracted directly with the generator through the capacity procurement mechanism.

5.3.2.7 Transmission

BAMx also commented that rather than a single quantity of renewable resources that can be imported over existing transmission, assessing a range of values could better capture future uncertainty as to how much can be accommodated by existing transmission.

ISO Response: The ISO believes that 5,000 MW of new resources over existing transmission is a reasonable, upper bound estimate of the quantity of out-of-state resources that could be available in Scenarios 1 and 2. The ISO notes that only 3,000 MW out of the 20,000 MW needed to meet the 33% requirement by 2020 is located outside of California.

NRG asked 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.

ISO Response: The ISO has incorporated assumptions about TOU rates into the load shapes for all scenarios. More detail will be provided in the study results.

5.3.3 *Changes from the Proposal*

The ISO has modified the portfolio assumptions proposal as follows:

- The assumptions for load forecasts were updated to the 2015 IEPR and 2016 LTPP.
- The tax incentives were extended to their new dates.
- The amount of existing storage for the 2020 cases was revised.
- Workplace electric vehicle charging shapes were added to the analysis.
- Conduct a number of sensitivities to include a low load growth case allowing AAEE to double.

5.4 Topic 4 – Renewable Costs and Locations

5.4.1 *Question*

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?

5.4.2 *Stakeholder Input and ISO Response*

NRG and TransCanyon has no comment on these assumptions and presumes them to be reasonable. Labor, PG&E, SCE, and TURN also commented that the Federal ITC and PTC assumption should be changed to be consistent with the approved extension.

5.4.2.1 Data Clarification

MID commented that further explanation is required around the term "minimizes cost of electric grid operation and expansion." On its surface, the statement appears to presume a best-case scenario for grid expansion, without operational, business or political obstacles, when experience with changes in the electricity market have been anything but seamless. If the presumption is that grid operation and expansion will run seamlessly, such presumption would appear to provide a misleading view of the benefits of regional expansion of ISO operations. MID urges that a more realistic presumption of the efficiency of ISO expansion be inputted into the study, at least as a scenario for stakeholders to review.

ISO Response: The ISO understands the concern has revised the regional expansion assumptions for 2020 to be just the ISO and PacifiCorp, and in 2030 the expansion assumption is US-WECC except the PMAs.

CPUC Staff and PG&E encouraged the study to utilize the costs and locations from the RPS Calculator. ORA commented that if any cost information was used to supplement the information from the RPS Calculator, that information should be identified, including its source, and how it compares to the cost of similar technologies in the RPS Calculator.

ISO Response: The ISO agrees and did utilize renewable availability and quality data from the RPS Calculator, but adjusted the costs after receiving stakeholder feedback.

5.4.2.2 Wind and Solar Assumptions

NCPA commented that the locations assumed for various technologies seem reasonable, but the cost of utility scale solar seemed high.

ISO Response: The ISO has adjusted the cost of solar PV downward to reflect stakeholder comments.

TURN requested clarification on the Behind-The-Meter assumption of 14.6 GW. TURN believes the study must be revised to justify the total penetration estimates, ensure that load forecasts are reduced accordingly (to reflect behind the meter solar output), and clarify that the RECs generated by these systems can be certified and would then be eligible for RPS compliance as PCC 3 resources. In addition, TURN believes E3 should consider a more aggressive behind the meter deployment scenario consistent with recent adoption trends.

ISO Response: The ISO has increased the amount of rooftop PV in the scenarios to reflect the latest IEPR forecast. The ISO has not counted behind-the-meter RECs towards PCC3 due to ongoing challenges with verification and certification through the WREGIS system.

5.4.2.3 Solar Cost Assumptions

AWEA suggests that the most recent NREL forecasts for wind and solar costs be considered for use in the SB350 study process. Similarity Labor and SCL commented that the cost of solar is too high. Labor and TURN cited that while the prices for recent PPAs signed by the IOUs are confidential, it is widely known in the industry that those prices are substantially less than $60/MWh. The City of Palo Alto POU recently signed a solar PV PPA priced at $36.76/MWH for 25 years. Some recently observed transactions include $51.97/MWh and $53.75/MWh PPAs between the Southern California Public Power Authority and two solar developers (8minutenergy and sPower). In addition Labor commented that for Scenario 3 the 4,362 MW (12,752 GWh) numbers should be closer to zero because the price for Utah solar generation will be less expensive because land costs, permitting costs and labor costs would all be less than in California. LSA, NRDC and TURN also commented the assumptions around future cost declines should reflect recent pricing trends. Solar PV costs have declined 80% since 2009, including another 15-18% in 2015 alone. In fact, prices in solar PV Power Purchase Agreements announced in the west in 2015 ranged from $50/MWh to under $40/MWh – 25-50% lower than 2015 installed costs. CMUA agreed based on polling its members. Whereas TransWest believes a more realistic decrease is 12.5% between 2014 and 2015. A more aggressive future cost reduction assumption, based at least on what we're seeing in the market today, is needed in the study to at a minimum reflect these current pricing trends. NRDC cited 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. NRDC suggests that 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.

ISO Response: The ISO has reviewed the renewable cost assumptions and made adjustments to the cost and performance of solar, wind, geothermal and storage resources. In addition, as discussed in Topic 2, the ISO will be conducting sensitivity analyses for both out-of-state solar and in-state rooftop PV.

5.4.2.4 Out-Of-State Assumptions

ORA supports the assumption that external wind and solar resources would be available over the existing transmission system in proximity to the existing delivery points into California. The linkage of the quantity of such available import capacity to the import of coal-based energy should be more clearly identified, especially how the Clean Power Plan was assumed to impact coal imports and whether the pending stay will result in changes to the modeling to reflect another scenario. While overall additional analysis of the ability to accommodate additional resources on existing transmission deserves further study, sensitivity analysis of the impact of the assumption regarding available transmission capacity utilized in the study on the overall portfolio selection and the value of remote Wyoming and New Mexico wind resources and Southwest solar resources is needed. PG&E comments that the estimates of out-of-state resources should be updated with version 6.2 of the RPS Calculator.

ISO Response: As discussed in Topic 2, the ISO agrees and did utilize renewable availability and quality data from the RPS Calculator, but adjusted the costs after receiving stakeholder feedback. However, the RPS Calculator simulates procurement incrementally, selecting the least-cost set of resources to fill the net short in a given year whereas RESOLVE minimizes costs over the entire period. RESOLVE also adds renewable integration solutions such as energy storage when cost-effective, and captures the impact of the availability of these solutions on the least-cost renewable portfolio. This is increasingly important as the portfolio approaches 50% RPS and integration challenges become more significant. The ISO study also includes more detail about the potential availability of out-of-state resources, which is not a major focus of the RPS Calculator.

SDG&E commented that these "manually added" resources be removed and that the RPS Calculator model and RESOLVE model be allowed to determine whether geothermal resources and pumped storage are economic additions given the parameters of the various scenarios.

ISO Response: The ISO understands that the addition of geothermal and pumped storage is not in line with least-cost portfolio selection given today's cost estimates, but wishes to include these resources in order to establish conservative estimates for the benefits of regional integration.

BAMx commented that additional detail is need to better understand the portfolio decisions including whether 3,000 MW of existing transmission is truly available and whether that transfer capability would increase over time as coal-fired generation is retired; did the Out-Of-State resources delivered to California include wheeling and loss charges; cost to integrate such Out-Of-State renewable resources. TURN is also concerned that it would be inappropriate to allocate any new transmission costs to ISO via the TAC for network improvements needed to facilitate New Mexico wind being procured by California load serving entities. Since there is no current proposal to have any of the New Mexico or Arizona utilities join the ISO, it is not appropriate to assume that transmission costs incurred by these utilities are allocated to the TAC collected from California customers. Under the current framework, any new transmission costs associated with New Mexico wind would be borne by the wind developer and incorporated into PPA pricing.

ISO Response: The ISO clarifies that the model does include the incremental cost of the transmission needed to integrate the remote wind to California as it is meeting California's policy of 50% RPS. In its cost minimization, the model does not distinguish between transmission costs that are borne by the developer (and recovered through PPA prices) and transmission costs that are recovered through the TAC which in both cases would flow to ratepayers.

TURN also commented that the price of Wyoming and New Mexico wind should be adjusted to account for net costs resulting from the resale of energy into local markets. Revenues from the sale of energy at these local locations should be netted against PPA costs to determine the total cost and value of the resources. Any estimate of the relative costs of renewables within regions of a larger Balancing Authority must also estimate these offsetting revenues to compute the "net costs" of renewables under different scenarios. TURN further commented that the estimation of LMPs in Wyoming needs to take into account a scenario where 4,000 MWs of new intermittent generation is developed in that region with coincident production profiles. There may be non-

trivial impacts on market prices in hours when these wind projects are liquidating energy that would change the net cost to California load serving entities.

ISO Response: The ISO clarifies that the model does consider net costs, and not just gross costs, in its selection of both remote and in-state resources. New transmission costs were included that allow the resources to be delivered to locations with sufficient depth to absorb the wind generation.

ORA is concerned that the transmission cost for new out-of-state renewable resources may significantly underestimate the cost to interconnect these resources to the local market. An analysis of the impact of doubling or tripling the portfolio selection and integration value would help assess the importance of the accuracy of these transmission costs in accurately modeling these resource options.

ISO Response: The ISO team is using currently available information regarding transmission projects that would be built to serve remote renewable locations. The transmission cost assumptions will be available in the results.

CESA believes the renewable portfolio assumptions may not reflect non-California related renewables expansion. Such expansions could both create competition for out of state resources, increasing costs, and reduce the ability to resolve overgeneration challenges in California by exporting the power. Moreover, other states are pursuing the economic benefits of resource development to serve California and have high, low-cost renewables potential themselves; they are unlikely to forego those benefits in favor of absorbing energy exports from California.

ISO Response: The ISO understands CESA's position but believes the scenarios for this analysis are appropriate as currently configured. The ISO notes that wind potential in both Wyoming and New Mexico exceeds the possible local demand many times over.

SWPG on the other hand asks E3 and the ISO to consider whether the current and future energy landscape continues to support excluding new transmission for out-of-state delivery of renewables to California from four out of five of the scenarios. While E3's point that these resources have been in planning stages for the last 10 years and have not been built yet is well taken, California's renewable policies and landscape are rapidly changing. The 50% renewable goal will put pressure on California land use as acknowledged by the CEC's Renewable Energy Transmission Initiative (RETI) 2.01 and it is increasingly likely out-of-state renewables will be used to meet California's renewable policy goals.

ISO Response: As discussed in Topic 2, the portfolios proposed in the SB350 analysis are merely plausible portfolios for 2030 and already incorporates new transmission to the extent that it is economically chosen by the RESOLVE model. The ISO believes that new

transmission for out of state resources is implausible in the absence of a regional transmission entity.

5.4.2.5 Geothermal Comments

CLECA commented that given the high costs assumed for geothermal resources, it is hard to fathom why E3 has included 500 MW of geothermal resources. In addition, geothermal resources are baseload, and the ISO is focused on flexibility.

ISO Response: The ISO incorporated geothermal in the portfolios to provide diversity in the regional discussion as investments in response to anticipated integration challenges under very high solar cases. The inclusion of this resource serves to make the benefits more conservative, i.e., to reduce the cost difference between Scenario 1 (BAU) and Scenarios 2 and 3. In addition, as previously stated, the portfolios are only meant to demonstrate reasonable portfolios for the 2030 timeframe and are not intended to be definitive as to what and how much of each resource type should be procured for 2030. That is a decision for the CPUC and appropriate regulatory authority.

5.4.2.6 Storage Comments

MegaWatt raised concerns that the study relies on two battery storage technologies, neither of them proven with many years commercial operation for daily cycling at large scale. MegaWatt suggested that sodium sulfur storage which is commercially proven at large scale in daily cycling should replace flow batteries in the storage options and that the cost and performance assumptions for all storage technologies should be vetted and updated as necessary.

ISO Response: The ISO has updated the storage costs used in RESOLVE after reviewing stakeholder comments, but continues to model just two battery technologies and one pumped storage technology in the interests of simplicity. This should not preclude the consideration of other storage technologies such as batteries, compressed air or advanced rail energy storage in procurement or in other forums.

5.4.3 *Changes from the Proposal*

The ISO does not propose to change the renewable costs and locations in the proposal except as previously described in earlier sections.

5.5 Topic 5 – REC Assumptions

5.5.1 *Question*

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 no

5.5.2 *Stakeholder Input and ISO Response*

NRG commented that this classification seems plausible.

CMUA commented that the overall analysis and study process would benefit from greater transparency and disclosure of all of the major and minor assumptions included in the modeling efforts. Even beyond that, CMUA is unclear whether smaller retail sellers in California, like CMUA members, will be able to take advantage of large scale solar thousands of miles from their load service areas.

ISO Response: The ISO will be including a description of the assumptions in the results. In addition, the ISO's analysis is not going to a load serving entities level because the ISO is not in control of the actual procurement for each load serving entities.

BAMx and CESA are concerned that the same political issues that have resulted in the existing limitations on the use of out-of-state RECs will exist in both the Business-as-Usual Procurement and WECC Procurement cases, therefore it may not be reasonable to assume the limitations will be lifted. LSA and Sierra Club commented that any assumptions around RECs be aligned with the statutory requirements of SB 350 and the portfolio content requirements. Sierra Club also commented that the study should be clear in stating its assumptions on how the RPS "buckets" will work under an expanded ISO scenario.

ISO Response: The study assumes the existing procurement rules are in place because the ISO has no basis to change the procurement rules and therefore makes no new assumptions as to how procurement could change over the next 15 years. Only the CPUC Staff and other regulatory authorities can make that change in the procurement rules for their respective utilities.

MID is concerned that the Portfolio Content Category 1 Product assumption in the implementation of a regional market footprint that is being presented, that an expansion of the California Balancing Authority would meet the PPC1 criteria, can have costly impacts to California's ratepayers.

ISO Response: As discussed earlier, the ISO did not change the existing procurement rules in the study and includes the impact of the incremental renewable portfolio cost to California ratepayers in the study results.

NRDC questions 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 ISO 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.

ISO Response: The ISO clarifies that the additional Wyoming and New Mexico wind that are made available in Scenario 3 could be procured under REC-only transactions if allowed by California policy which is out of the control of the ISO.

PPC commented that the model should ensure that it does not overestimate the available RECs from existing and new renewable energy development in the Northwest. It is not clear from the presentation whether the model accounts for the need for load-serving entities external to California to use their local renewables' renewable energy credits to meet their own obligation.

ISO Response: The ISO believes that the Northwest RECs assumed in the study are plausible for the study period. As discussed earlier, the study does not determine the impact to non-California ratepayers. The study does assume that 5,000 MW of out-of-state resources are available for procurement by California LSEs, without regard to the needs of LSEs in other regions to procure renewable energy to meet local RPS requirements.

5.5.3 *Changes from the Proposal*

The ISO does not propose to change the REC assumption proposal except as previously discussed in earlier sections.

5.6 Topic 6 – Export Assumptions

5.6.1 *Question*

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?

5.6.2 *Stakeholder Input and ISO Response*

Labor, LSA, NCPA, PG&E, SWPG, TURN, and TransWest support having a range of export assumptions in the study.

5.6.2.1 Data Clarification

MegaWatt asked what assumptions are made regarding other regions development of solar which could limit the market for solar outside of California. Similarly NRG commented that it is difficult to assess the viability of this number with no historical basis for such a number available. California has historically been an importer of power. 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.

ISO Response: The ISO clarifies that other regions are assumed to procure renewable energy to meet current RPS rules in each jurisdiction, as reflected in the 2024 TEPPC Common Case. Moreover, while California has historically been a net importer with the increase in renewables and energy efficiency, as demonstrated in the ISO's "duck curve", California will need to export power and the expansion of the ISO balancing authority area will allow optimization of the resources of the expanded grid.

AWEA and NRDC commented that 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. In addition, the stakeholders commented that the 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. NCPA also commented that the failure to assess the impacts of transmission projects under the BAU cases (as described in Q2) above, will tend to discount the value of the sensitivity cases being assessed.

ISO Response: The ISO clarifies that the portfolios only chose resources with new transmission to the extent that it is economic over the study period after the existing transmission has been chosen. Once the transmission is built, then the transmission is available for both imports and exports.

CESA understands the role of exports in supporting California's grids. A key component of the study should be to show how these exports exist today. Today's levels of exports may reflect likely levels of export capability. California is not a net exporter today however the export capability is only limited by the transfer capability of the transmission system. CESA also commented that the RPS plans in other states' and other drivers for out of state renewables should inform the model.

ISO Response: The ISO clarifies that other regions are assumed to procure renewable energy to meet current RPS rules in each jurisdiction, as reflected in the 2024 TEPPC Common Case.

ORA supports the proposal to consider three alternative export limits under Business-as-Usual Procurement. However, ORA and BAMx are concerned the lower bound (2,000 MW), which is based upon historic patterns, may not be indicative of the future with greater penetration of renewable generation and associated increased downward

pressure on market prices. External parties will be highly incentivized to procure this energy. The lower boundary of the range of exports should therefore either be increased or given little weight in the valuation of regionalization.

ISO Response: The ISO believes that by providing a range of export capabilities in the portfolios then the impact of the regionalization can be better evaluated.

SDG&E believes creating export limits is highly arbitrary and can mask opportunities for the economical use of energy. SDG&E believes the simulation models should be allowed to use economic dispatch (reflecting hurdle rates to capture institutional barriers to trade) and physical system limitations to determine when it is economically beneficial and physically possible to export energy out of the ISO Balancing Authority to other areas of the WECC. For this reason SDG&E recommends that the "ISO simultaneous export limit" be removed from each of the scenarios.

ISO Response: The ISO clarifies that while export limits will be used in the analysis in both the RESOLVE and the production cost simulation, the ISO team will also provide results from the production cost simulation to explain the economic exports that might have been limited by the imposed limits. Thus, the stakeholders will be able to judge the estimated impact. In addition, the production cost model includes hurdle rates that will capture various other barriers.

5.6.2.2 Alternative Assumptions

TransCanyon commented that Scenario 1 exports seem reasonable but Scenario 2 and Scenario 3 export assumption of 8,000 MW may be high.

ISO Response: The study assumption of 8,000 MW is a maximum export level for the determination of portfolios. The export limits used in Scenario 1 will range between 2,000 and 8,000 MW in the production cost simulation.

AWEA and NRDC are concerned that the current assumptions appear to overstate the ability of California to export surplus generation in a BAU case. AWEA and NRDC believe a comparison needs to be made regarding system operations under a BAU future and one in which trading is expedited by a regional market. BAU bilateral markets will not support the level of solar exports that a regional market would. AWEA, NRDC also believe the study should assume lower transfer limits in the BAU cases and/or higher transfer limits in the regional operations cases.

ISO Response: The ISO believes the range of export levels in the Business-as-Usual scenarios will provide a range for evaluation.

To maximize comparability with studies in the Long-Term Procurement Plan, the CPUC Staff recommended that the study use net-export assumptions should match those

which are developed in the 2016 Assumptions & Scenarios. As those assumptions are currently being vetted by stakeholders, we propose an interim approach: ISO should model Scenario 1a) and Scenario 1c) if they are unable to model all three versions of the BAU scenario. 1a) has the 2000 MW ISO Simultaneous Export Limit while 1c) and Scenarios 2) and 3) all have this value as 8000 MW.

ISO Response: The ISO agrees and has adjusted the scenarios to these four options.

5.6.2.3 Additional Analysis

LSA recommends that the study include support for the particular levels chosen. This support should include research into: (1) the ability of adjacent/nearby BAAs to absorb the additional energy at the times when it is likely to be available; (2) the extent to which those areas might be willing to forego the economic and other benefits of developing generation in their own areas in favor of accepting California's surplus generation.

ISO Response: The ISO assumptions will be included in the results. With respect to evaluating adjacent/nearby BAAs the expansion of the grid will allow an optimization of the resources that should assist with renewable integration.

PGP and PPC commented that due to spring run-off in the Pacific Northwest it is not realistic to assume that during such periods the ISO will be able to export any/all of its surplus energy to the Pacific Northwest. During these periods, PGP would propose that the ISO model the export of energy predominantly to the Desert Southwest to displace thermal resources, limited by the transfer capability between the ISO and the Desert Southwest. The ISO should also evaluate that during this same period of low seasonal demand renewable energy inside the ISO being curtailed to re-establish load/resource balance. PPC also commented that assumptions of very large export amounts to the Northwest may not be a realistic expectation if it requires that these amounts of energy can be absorbed by backing down hydro systems for a sustained period given minimum generation requirements and limited storage capability. Similarly SWPG shaping the values seasonally and hourly (or even on- and off-peak) would likely result in a more accurate representation of California's ability to export surplus generation.

SCL requests specific modeling of the effects on prices at major trading points WECC-wide of the export of surplus generation from California. The study should consider the economic feasibility and consequences of export as well as the physical availability of transmission capacity.

ISO Response: The production cost analysis will not assume that hydro from the northwest can be backed off to absorb oversupply from California. The ISO will consider all other suggestions and adjust the modeling assumptions appropriately. The existing

TEPPC Common Case databases already include the relevant transmission capability. In addition, the ISO notes that the modeling software does not assume a direction for exports from California, but rather the exports are determined by the ability of the market in each region to absorb the energy, up to the assumed export limit. The ISO expects that exports during spring months would largely flow to the Desert Southwest, while exports during winter months would largely flow to the Pacific Northwest.

Sierra Club raised concerns that the ability to export surplus generation out of California depends, in part, on the availability of "latent flexible capacity across a broad, diverse region." While this may reasonably describe parts of the non-California WECC, it is a poor characterization of the PacifiCorp region, with a generation mix comprised primarily of older and inflexible coal plants. If the modeling is to provide adequate insight into the currently-proposed integration, it will be crucial to realistically represent this lack of flexibility to avoid exaggerating the potential benefits of exporting surplus generation from California. Study should therefore focus on the specific unit dispatch constraints of PacifiCorp's inflexible coal capacity to determine the extent to which PacifiCorp's coal fleet limits the benefits of a regional market

ISO Response: The ISO team is using TEPPC Common Case databases for the characteristics of the WECC generation. The study team intends to represent the generation resources as realistically as possible, however, are limited with using public-available data and does not intend to arbitrarily treat PacifiCorp's coal generation as flexible resources. The ISO notes that PacifiCorp does have thermal generation that can be displaced on a dispatch basis by surplus renewable energy from California. The benefits of latent flexible capacity will increase over time as more balancing areas join the new regional entity.

5.6.3 *Changes from the Proposal*

The ISO proposes the following changes to the export assumption proposal in addition to those changes discussed in earlier sections:

- Model two Business-As-Usual scenarios with 2,000 and 8,000 MW of simultaneous export capability.

5.7 Topic 7 – Brattle's Ratepayer Approach

5.7.1 *Question*

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?

5.7.2 *Stakeholder Input and ISO Response*

5.7.2.1 Definition of Ratepayers

CDWR is concerned that by looking at California ratepayers as a whole, the benefits to any particular group of ratepayers, such as the customers of the State Water Project, will not be apparent. CDWR would find more value in a study with more granular results that show how benefits of regionalization would accrue to different groups of ratepayers.

ISO Response: The ISO recognizes that the legislation requires the ISO to evaluate the impact to California ratepayers as a whole and thus, the ISO is not analyzing procurement on a load serving entity basis as that is beyond the control of the ISO. Further, to analyze the specific impact on specific utility's load would require the ISO to assume certain retail rate design and allocation issues among various ratepayer groups, which the ISO is not prepared to do. The ISO will examine the overall ratepayer impacts through overall changes to cost of wholesale electricity service.

5.7.2.2 Data Clarification

NRDC commented that while the approach seems to capture the most important areas of benefit, it 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. In addition, NRDC commented that 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 ISO market.

ISO Response: The ISO clarifies that the study will address the topic of facilitating market transactions associated with surplus renewable energy from California and the use of larger balancing areas to meet the needs to integrate renewable energy resources. It also will include an analysis of load diversity benefits and a discussion of other reliability benefits.

NRG commented that additional information is needed on ancillary service and resource adequacy assumptions to understand impacts. TransWest commented that additional information is need regarding the new transmission assumptions.

ISO Response: The ISO clarifies that study will include the assumptions that NRG and TransWest raised about ancillary services, resource adequacy, and transmission, and the information will be available in the results.

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).

ISO Response: The ISO will include estimations and discussion of these impacts in the study.

5.7.2.3 Benefit Allocation

TURN is concerned that some of the benefits could be double-counted (Brattle presentation, page 8). TURN suggests that the computation of ratepayer impacts must also include an assessment of LMPs in the local area or nodes where renewables are located, consistent with the ISO's own Transmission Economic Assessment Methodology (TEAM). TURN also has significant concerns about the WECC-wide modeling construct and other assumptions that will develop inputs into the ratepayer impact computations.

ISO Response: The ISO clarifies that parts of the ratepayers' cost savings will be estimated via nodal market pricing data, following an approach similar to the TEAM methodology. The study results will include a description of the TEAM analysis, including data used and examples.

PGP commented that the assumptions made for how benefits would be allocated regionally are also key components of the study. For example, if integrating the PacifiCorp Balancing Authority Area into the ISO provides the ISO with increased access to latent flexible capacity, it is important that the benefits are allocated appropriately between the ISO and PacifiCorp and that the benefits of that flexible capacity is not all assumed to go to California ratepayers. Powerex commented that parsing of benefits between California and non-California ratepayers requires making an explicit assumption about how these investment savings will be shared, and the framework under which these savings will be distributed. It should not simply be assumed that 100% of all capital investments that California ratepayers avoid making are treated as benefits to those ratepayers. Powerex shares the view that very large economic benefits can be realized by developing appropriate long-term and short-term market frameworks for flexible resources located outside of the current ISO footprint to participate in meeting California's renewable integration challenges. A critical part of the SB 350 studies has to be a clear and transparent articulation of how those benefits will be shared, which, in turn, must be internally consistent with the estimated benefits for California and non- California ratepayers, as well as with the assumptions regarding participation by entities located outside of California.

ISO Response: The ISO notes that the legislation specifically requires the ISO to estimate the impact to California ratepayers. Thus, while the ISO focuses on the impact on

California and California ratepayers, the study will include an analysis of the impacts in the region as a whole. The ISO team is aligning costs borne by California ratepayers with the benefits received from investments made by California ratepayers; the ISO will not credit California ratepayers with benefits due to investments funded by ratepayers in other states. The study will include documentation on how the impacts on California ratepayers are estimated using the TEAM methodology. This SB350 study will not conduct a state-by-state economic analysis for the entire WECC, however this study could be used as a foundation for future studies for other entities and states.

SCL commented that the study should consider how the use of a price signal, like revised net meter and rate design policies in California, to reduce emissions could affect the total cost of integrating balancing areas and creating a regional market.

ISO Response: The ISO does not intend to analyze policies around net metering or rate design as those policies are already included in the base 2020 scenarios. Further, the ISO does not intend to use this study to analyze how retail rate design might or might not affect emissions in the state as it is beyond the scope of the legislation.

Sierra Club commented that SB1368 imposes an emission performance standard on new investments and long-term financial commitments from California utilities. This law implements Californians' policy preference to reduce and eventually eliminate high GHG resources, particularly from coal generation. The results of the production cost modeling and the overall study should be reported in a manner that allows stakeholders to understand the unit-by-unit impacts (or at least by unit fuel type) that will be projected by the modeling. This will allow stakeholders to evaluate whether any cost savings come at the expense of other impacts such as increased thermal generation or the need to build (or avoid) new thermal generating units. Also consider the impacts of transmission cost allocation in an expanded ISO system. PacifiCorp in particular has plans for large transmission expenditures. Whether and how the cost of these expenditures would redound on California ratepayers should be addressed.

ISO Response: The ISO is aware of the state's concern over the continued use of coal-fired generation. The study will include results that summarize fuel burn and emissions by generation type in California. The impact of adding transmission will also be considered in the study.

Six Cities urge consideration of both broader regional benefits to the WECC and the impacts to California of ISO expansion to the PacifiCorp region only.

ISO Response: The ISO has considered various stakeholders' feedback on this topic and has decided that the 2020 analysis will consider the expansion to PacifiCorp only and the

2030 analysis will involve the expansion to the U.S. portion of WECC, excluding the PMAs.

5.7.2.4 Impact to Transmission Access Charge

NCPA and CMUA believes the methodology for allocating Transmission Access Charges across a broader regional footprint is not included in the study and will have a significant impact on California ratepayers, particularly under ISO's initial "Transmission Access Charge Options" proposal presented to stakeholders earlier this year.[5] Additionally, the schedules for addressing TAC options and any subsequent revisions to the transmission planning process will sequentially follow the SB 350 cost benefit studies, precluding any assessment of potential cost shifting between regions or an assessment of the impacts on current transmission projects that have been approved through the sub regional planning processes. Both of these issues will affect the choice of portfolios described in Q2 and the overall cost benefit assessment. At a minimum, and in addition to modeling changes addressed in responses above, a qualitative assessment will be needed that addresses the potential impacts of incomplete understandings of the 1) TAC allocation process, 2) expanded regional transmission planning process, and 3) rate of incremental expansion of the regional footprint. Separately, a quantitative analysis will be needed to address the reliability impacts associated with the new portfolios (e.g. voltage, VAR, RMR, etc.).

ISO Response: The ISO understands NCPA and CMUA's concerns. The ISO acknowledges the importance of TAC allocation to ratepayer impact analysis. The TAC stakeholder process includes the detailed assessment of the cost allocation process that the commenters requested. For the SB350 studies, the ISO is making assumptions based on the best available information as we agree the impact of TAC cost shifts, if any, needs to be addressed in the impact to California ratepayers. With respect to the rate of incremental transmission expansions, the ISO will make the necessary assumptions for the study which will be clearly explained in the study results. For reliability impacts that NCPA and CMUA are concerned with, the production cost model deals with some of the issues. If the legislature approves moving forward with the ISO's ability to expand, then the reliability issues will be assessed and resolved as the expansion comes to fruition.

[5] Information regarding the ISO's TAC stakeholder initiative can be found at: http://www.caiso.com/informed/Pages/StakeholderProcesses/TransmissionAccessChargeOptions.aspx

5.7.3 *Changes from the Proposal*

The ISO does not propose to change the proposal for ratepayer approach except as previously discussed in earlier sections.

5.8 Topic 8 – Ratepayer Assumptions

5.8.1 *Question*

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

5.8.2 *Stakeholder Input and ISO Response*

NRDC and TransCanyon commented that the methodology and assumptions to estimate the potential impact on California ratepayers are generally reasonable.

5.8.2.1 Data Clarification

NRDC also commented that 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.

ISO Response: The ISO acknowledges that the more renewable generation is built, the more displacement of other generation would occur. However, the ISO is taking the perspective of California's needs to meet the 50% renewable target in 2030 and therefore does not intend to over-build renewables just to displace additional conventional generation in the rest of WECC. If the overall costs of renewable energy becomes low enough such that they are the preferred new resources even without the renewable energy target, and if natural gas prices remain low, it may be natural for certain coal generation to retire. The ISO's analysis does not include economic additions of renewable generation; it also does not assume that other states in WECC would increase their renewable energy purchases or buildout more than what is necessary to meet their existing state renewable portfolio standards, even though in reality, this additional buildout may occur.

TransWest commented that written materials do not provide sufficient information on the new transmission cost assumptions or on what portion of new transmission investment would be included in the California ratepayer impact analysis.

ISO Response: The ISO does not intend to decide how the cost of new transmission will be allocated through this study. However, the ISO will assume that certain transmission costs will be needed to support certain renewable resource development as reflected in

the renewable portfolios and we will use the currently proposed TAC allocation to ascertain the impact to California ratepayers.

5.8.2.2 Benefit Allocation

CDWR is concerned that by looking at California ratepayers as a whole, the benefits to any particular group of ratepayers, such as the customers of the State Water Project, will not be apparent. CDWR would find more value in a study with more granular results that show how benefits of regionalization would accrue to different groups of ratepayers.

ISO Response: The ISO intends to conduct the ratepayer analysis to include all ratepayers in California, including those of CDWR. However, the results will not separately report how the benefits may accrue to different sub-groups of ratepayers (e.g. either by income decile or by utility such as CDWR).

While Brattle identified a number of areas of analysis, BAMx is concerned that it is not clear how such benefits will be allocated between California and external entities, especially in Scenario 3 where the entire United States portion of the Western Interconnection is assumed to participate in a regional ISO.

ISO Response: The ISO anticipates that the study will report the impact on California ratepayers and separately report the potential benefits to the entire regional market.

MID requested clarity on the cost impact to ratepayers because the presentation was not clear whether a comparison would be made between the pre-regional market footprint case and the post-regional market footprint case. What are the specific cost categories that a ratepayer can use as a metric in determining the cost and benefit resulting from the implementation of a regional market footprint?

ISO Response: The ISO clarifies that the analysis will involve a comparison of "Business-as-Usual" cases in which ISO operating its own market against "Regional Market" cases where the participants of the expanded regional market will operate a joint Day-2 market that incorporates the impact of de-pancaked transmission system and optimization of the combined resources while still meeting the California policy goals.

5.8.2.3 Transmission Access and Grid Management Charges

ORA and BAMx commented that in order to truly estimate the potential impact of the transformation of the ISO into a regional organization on California ratepayers, an effort should be made to determine where the shifts of impacts would incur. In particular, the study should identify the relative impacts and benefits of several different, plausible footprints for the expanded regional ISO. It would be helpful for the analysis to address whether there will be additional costs that will be borne by California associated with

regionalization. The analysis should include a separate section on any such costs, including TAC costs, increases in the GMC (for example, will regional operation offices be required), loss of transmission revenues associated with exports, etc. The CPUC Staff made similar comments and believe the analysis should include, but are not limited to: start-up costs to design and implement a new market, costs of transmission, and on-going costs of operations including running a regional market and staffing a regional organization. The ISO intends to include the impact of hypothetical transmission projects to support each renewable energy portfolio in the analysis.

ISO Response: The ISO will assume that certain transmission costs will be needed to support certain renewable resource development as reflected in the renewable portfolios and we will use the currently proposed TAC allocation to ascertain the impact to California ratepayers. In addition the results will include a discussion of the potential impact to the GMC.

CPUC Staff commented that the study should clarify which benefits accrue specifically to California versus other states. Certain parts of the analysis are WECC-wide and therefore quantify benefits across WECC may not aid in California's understanding of the potential benefits vs. costs to our ratepayers.

ISO Response: The ISO team is aligning costs borne by California ratepayers with the benefits received from investments made on behalf of California; the ISO will not credit California ratepayers with benefits due to investments funded by ratepayers in other states. This SB350 study will not conduct a state-by-state economic analysis for the entire WECC, however this study could be used as a foundation for future studies for other entities and states.

TURN commented that the study should therefore assume that the four Gateway transmission projects proposed by PacifiCorp occur in Scenario 1 but without any costs being allocated to ISO customers via the Transmission Access Charge.

ISO Response: The ISO's study assumptions are consistent with the TEPPC case, Gateway segments A, B, C and E are assumed completed by 2020. In the SB350 analysis, the ISO team is assuming that Gateway segments D and F could be eligible to help integrate additional renewables in Scenario 3. The ISO's analysis will include costs associated with applicable new transmission projects, but will not and should not be interpreted as to provide indications of which transmission project will be built. For the purpose of the SB350 analysis, the ISO is using the TEPPC base case as the starting point.

MegaWatt questioned if the de-pancaking of wheeling tariffs effectively a subsidy for remote resources versus more local resources? How does this affect investment

decisions in local vs. remote resources? How do the models and analysis address this issue?

ISO Response: The ISO does not consider de-pancaking of wheeling charges to be a subsidy for remote resources. Instead, de-pancaking of transmission charges allows more efficient power trades and having a regional centralized unit commitment and dispatch of resources will allow more efficient use of all existing resources.

5.8.2.4 Resource Adequacy and Operating Reserves

CLECA is concerned that the ratepayer impact analysis assumes that there will be a regionally uniform RA requirement. California ratepayers should be concerned that a different, lower RA requirement for other entities joining the ISO, such as PacifiCorp, could result in their leaning on CA with its higher requirement.

ISO Response: As discussed in the RA stakeholder process, the ISO is not proposing to accept a construct that allows a merging balancing area to lean on the existing balancing area in the manner suggested.[6] Actually, the proposal seeks to allow local regulatory authorities to determine the load forecast and various reserve requirements, the only change the ISO is proposing for the regional entity for the ISO tariff is to just change the language to be more generic as the regulatory entity will not always be California in the expanded regional area.

CLECA also commented that Brattle assumes that a larger western market will drive down the cost and amount of ancillary services need. Generators need a certain level of income to remain economic and in operation. If Ancillary Service prices fall, they will expect to make up for that loss of income through higher income from some other source, such as RA. CLECA also notes that E3 assumes that generators will be compensated regardless of market prices, which is in direct contradiction to Brattle's assumption. In addition, CLECA commented that Brattle also assumes greater reserve sharing across a larger footprint, but its analysis must first demonstrate that this will not be impeded by congestion. To our knowledge, Brattle is not running a power flow analysis, nor are any of the other studies. Brattle says it will convert production cost savings into utility revenue requirements. Not all procurement is done by utilities, so it will not be subject to revenue requirement treatment.

ISO Response: The ISO acknowledges that merchant generators will need sufficient income to cover costs and earn a return on investment to continue operating. Thus, there is a value to capacity even if wholesale energy prices are insufficient to pay for those investments over the long-term. If capacity is in excess of needs, capacity prices

[6] The current status of the resource adequacy stakeholder process can be found at: http://www.caiso.com/informed/Pages/StakeholderProcesses/RegionalResourceAdequacy.aspx

will decrease. If the drop in capacity prices drives some plants to drop out of the market, prices should increase. Under market equilibrium, capacity will have a value and thus decreasing the need for capacity over the long-term will provide real capital cost savings. Moreover, if the generator is needed for reliability, the ISO has contracted directly with the generator to ensure that it does not drop out of the market through the capacity procurement mechanism. Regarding the concern about revenue requirement calculation, the ISO will be using a methodology similar to the TEAM methodology to estimate the impact on California ratepayers. In those estimations, the ISO assumes that the costs of generation will need to be paid for either via market payments or by ratepayers through their utility rates.

5.8.3 *Changes from the Proposal*

The ISO does not propose to change the ratepayer assumptions in the proposal except as previously discussed in earlier sections.

5.9 Topic 9 – Footprint Assumption

5.9.1 *Question*

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

5.9.2 *Stakeholder Input and ISO Response*

SCE, SWPG, TransCanyon, TransWest commented that the U.S. WECC-wide footprint appears to meet the SB350 requirement. PG&E commented that the proposed approach assuming a U.S. WECC-wide footprint would show a potential benefit estimate provided it is supplemented with some allocation of benefits among regions. SDG&E commented that the footprint should be the entire WECC including Canada and Mexico.

LSA commented that the assumption, while reasonable in the context of the overall expansion, may make it difficult to understand the particular benefits of the expansion to include PacifiCorp. LSA encourages the ISO to consider whether the study or the presentation of the results can be structured to enable an understanding of the potential for more immediate benefits (PacifiCorp as a new PTO) vs. later (broader but more speculative) west-wide benefits (e.g., with NVE, APS, etc.).

NRG commented 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.

AWEA, BAMx, CMUA, CESA, NCPA, ORA, PGP, PPC, Sierra Club, TURN commented that a scenario where the entire WECC becomes part of the expanded ISO is not reasonable, as such an expansion is not likely to happen in the near future.

CMUA further commented that significant portions of the grid in the Western Interconnection are owned and operated by the federal government, i.e. the power marketing administrations) the Western Area Power Administration and the Bonneville Power Administration), the Bureau of Reclamation, and the Army Corp of Engineers. This applies to both generation and high voltage transmission. There are considerable statutory, regulatory, and contractual limitations on the use of federal facilities. It would therefore not be consistent with law, as a limited example, to optimize the grid over a consolidated West-wide Balancing Authority Area, when the use of federal facilities is constrained by the operation of law. Such an assumption presents a false assessment of realistic outcomes, unless it is the asserted belief of the ISO that federal reclamation law and the Northwest Power Act are going to be rewritten by Congress, and a host of regulatory and commercial changes are going to be numerous agencies and market participants, to enable unfettered use of federal facilities. That assumption is not supportable.

ISO Response: The ISO aims to conduct a study that incorporates a reasoned approach to regional market development. The study assumption is currently being adjusted to include only PacifiCorp in a regional market in 2020, and evolving to a larger regional market in 2030. For the 2030 cases, based on stakeholder feedback, the ISO is proposing to include the United States WECC balancing areas except the PMAs due to the federal constraints. The study also aims to capture the current regional trade activities in the "Business-as-Usual" cases by exploring different plausible levels of: (a) California exports that may be accomplished in the bilateral power markets; (b) reliance on out-of-state renewables. The study will also compare estimated benefits to benefits estimated and documented in other regions with similar Business-as-Usual and integrated market structures. The ISO also clarifies that the nodal production cost simulations include the entire WECC footprint. The simulations will reflect operating constraints on all hydro and thermal generating units as defined in WECC's TEPPC data base, the transmission topology from the entire WECC power flow model will be used in the simulation and the limits of all WECC-defined transmission paths will be reflected in the model. Balancing areas within these footprints of the simulated regional entity, as discussed above, will be merged without wheeling charges or other trading costs between them. The individual balancing areas outside the hypothetical regional entity's

footprint will be maintained and all their embedded loads and generation will be simulated. These other balancing areas will remain separated from each other and the regional entity through wheeling charges and bilateral trading margin requirements. These wheeling charges will be imposed on all transactions leaving the regional entity's footprint. While the study will estimate California and WECC-wide impacts, it will not analyze impacts on individual entities or areas in the non-California portion of the WECC.

5.9.2.1 Proposed Alternative

AWEA, BAMx, NRDC, ORA, Peak, PGP, Powerex, and PPC recommended studying two different expansion cases:

1. Only the ISO and PacifiCorp
2. ISO plus the current committed EIM footprint (PacifiCorp, NV Energy, Arizona Public Service, Portland General Electric, and Puget Sound Energy)

CESA, CMUA, Labor, Sierra Club, and TURN recommended that the study be focused solely on PacifiCorp. NRDC commented that an analysis that includes Baja California, Mexico and British Columbia resources should be considered. CPUC Staff commented that a range of alternatives should be studied for WECC-wide regionalization, such as: PacifiCorp only integration, PacifiCorp integration vs. expanded regional EIM (inclusion of additional BAAs), and expanded procurement without regionalization.

ISO Response: Based on feedback received, the ISO is modifying its study assumptions for regional markets so that in 2020 the expanded region will be just the ISO and PacifiCorp and in 2030 we will model the region as all WECC balancing authority areas in the United States except BPA and WAPA. The thought is to make it less than the full U.S. WECC but more than the EIM participants to demonstrate the potential benefits. With respect to procurement, the study is to evaluate the impact of having a regional market by expanding the ISO. The ISO does not make the procurement decisions and any expanded procurement would be up to the CPUC Staff or the applicable local regulatory authority.

5.9.2.2 Out-of-State Assumptions

BAMx is also concerned about heavy reliance on New Mexico wind resources in all the Scenarios and, especially, Scenario 3. This inclusion casts much greater uncertainty over the potential to actually realize the benefits to be identified in the study.

ISO Response: The ISO believes that incorporating remote wind resources based on either existing transmission or including the cost of transmission if new transmission is needed is plausible for 14 years from now.

PPC also raised a concern that much of the flexible capacity in the Northwest is dedicated to load service in the region. In the case of BPA, for example, Northwest public power entities have long-term contracts to a significant share of the energy and capacity from the federal generation assets and have a legal "first call" on that energy and capacity in all timeframes. Although some flexible capacity could be available from federal generation, it is unclear how much capacity the model assumes can be made available from that source. The study should explicitly recognize capacity limitations in the Northwest for integration of wind plants and provision of flexible capacity generally.

ISO Response: The ISO expects to maintain all operating limits on the hydro facilities in both the Business-as-Usual and the Regional market cases. Moreover, the production cost model enforces requirements for operating reserves, load-following, and frequency response when committing and dispatching resources. In the Business-as-Usual cases, the reserve requirements are met through either internal resources or existing reserve sharing agreements. In the Regional Market cases, load and operating reserve requirements are managed on a regional basis.

5.9.2.3 Data Clarification

SCL requested additional clarification on the footprint assumptions. The study documents do not provide enough information about why the authors chose the footprint and what assumptions they make about being in the expanded footprint to properly answer the question. Why are the Rocky Mountain Reserve Sharing areas excluded? Does the inclusion of the Northwest Power Pool mean that all loads, generators, and transmission assets in that footprint are treated as if the ISO is the market, balancing area authority, and reliability coordinator? Regional interties have limitations that do not exist within California. Does the market benefit study incorporate these limitations?

ISO Response: The ISO acknowledges the relevance of the potential resources available in the Colorado/Rocky Mountain region. As discussed earlier in the paper, exclusion of the Colorado/Rocky Mountain area simply means that the study does not specifically assume renewable resources from the Colorado/Rocky Mountain region will be procured to meet California's 50% RPS. The effect of this exclusion is minimal because there are ready substitutes for Colorado wind and solar in the states adjacent to California. The revised 2030 footprint does treat all loads, generators and transmission assets, except BPA and WAPA, as if they are in the ISO market and balancing authority.

With respect to the reliability coordinator function, that would need to be determined by WECC and the agreement of the remaining balancing areas. Further, the analyses observe the transmission limitations across WECC interties.

SCL also commented that for the study to be realistic it should model all known limitations on bulk electric system operations. ISO's transmission access charge is much higher than similar transmission fees in the rest of the WECC. How is the additional payment for using the same transmission estimated and shown as a cost to parties?

ISO Response: As discussed earlier in the paper, the ISO clarified that the nodal production cost simulations include the entire WECC footprint including the transmission topology from the entire WECC power flow model. The impact to the ISO's transmission access charge will be considered in the analysis and explained with the results.

Six Cities commented that the studies should include sensitivity analyses, e.g., what the impacts would be on indicated benefits if transmission costs turned out to be X% higher than assumed in a particular scenario or imports to or exports from California are Y% lower than reflected in a scenario. Additionally, the ISO studies should account for the impacts to customers of California Participating TOs of eliminating wheeling access charges for new Participating TOs coupled with the implementation of sub-regional Transmission Access Charges for existing facilities. The results of this analysis should be provided on a Participating TO-specific basis.

ISO Response: As discussed earlier in the paper, the ISO is not doing a specific entity-by-entity analysis but will include the general impact of potential TAC costs based on the current proposal from the stakeholder process. Six Cities should have enough information to then do any additional analysis they may desire.

5.9.3 *Changes from the Proposal*

The ISO proposes to change the regional market footprint proposal as discussed in Topic 1.

5.10 Topic 10 – Carbon Price Assumption

5.10.1 *Question*

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.

5.10.2 *Stakeholder Input and ISO Response*

TransCanyon, TransWest commented that utilizing CEC carbon price forecasts for California and TEPPC policy cases is a reasonable approach.

Six Cities identified concerns with outdated sources of data and requested that the most recent information be considered as part of this study process, including carbon price forecasts.

ISO Response: The ISO acknowledges the concern about carbon price assumptions. The study will use the latest GHG price assumption for California from the CEC's latest forecast, in its 2015 IEPR.

5.10.2.1 CPP Compliance

NRG commented that this seems to be a reasonable approach, but the choice and weighting of scenarios should reflect the significant uncertainty surrounding the Clean Power Plan ("CPP"). Similarly, NCPA and CMUA commented that the recent stay of CPP certainly impacts the assumptions. This is another example where sensitivity analyses surrounding key assumptions in the modeling are needed.

ISO Response: The ISO will use CEC's forecast GHG gas prices for California, and will simulate the rest of WECC without a GHG price through 2030. The ISO will perform a sensitivity that includes a GHG price for WECC in 2030 which will be available in the results.

5.10.2.2 Price Assumptions

PG&E requested additional detail on the carbon price assumptions including which CEC carbon price forecasts are proposed and compliance with the current 2020 goals from ARB's Cap and Trade program or with the Governor's statewide 2030 will be achieved.

ISO Response: The ISO clarifies that additional detail on the carbon price assumptions will be available with the results.

AWEA, CLECA commented that the study should carefully consider using carbon cost price forecasts in non-California states. Although Clean Power Plan compliance may result in carbon costs in various states, implementing TEPPC policy case carbon price forecasts might overstate future CO2 costs in the rest of WECC. Assuming high carbon prices in the rest of WECC may tend to overstate the carbon reductions that would occur, which could be used to criticize the study results when they are complete. Moreover, it is not a reasonable approach to make such critical assumptions prior to even the preliminary straw proposals for the GHG policy for an expanded ISO.

ISO Response: The ISO agrees that the analysis will not include a carbon price outside California. However the ISO will conduct a sensitivity analysis that incorporates a

carbon price in the rest of WECC, outside of California. The GHG price for California will be based on the latest CEC forecast, included in the 2015 IEPR.

5.10.2.3 GHG Allowances

TURN commented that in the event that other Western states choose not to allocate free GHG allowances to new renewable generation, the purchase of renewable energy from such resources by California load serving entities would not include any GHG allowance value. If these resources are allocated GHG allowances, they would presumably be conveyed to California load serving entities and could be either retired or resold. The study should model the value of these resources with, and without, any accompanying GHG allowances. In addition they would like more clarity on what is meant by the "TEPPC policy cases".

ISO Response: The ISO had initially considered simulating alternative scenarios for the WECC under different futures, such as high coal retirement, or with GHG prices. However, at this point, the ISO intends to stay with the TEPPC base case and the sensitivities discussed above in the analysis and if additional sensitivities other than the one discussed above are necessary, the ISO will address them at a later stage. The ISO does not assume that renewable resources purchased by California will receive GHG allowance values from other states. To the extent that other states would assign GHG allowance values to resources built in non-California states but used to meet California's RPS, those allowance values will reduce the cost of compliance to California ratepayers, further increasing the benefits estimated by the study. The ISO will discuss include such assumption in the study results.

5.10.2.4 Period Limits

The Sierra Club commented that the consultant should assume that carbon emissions from the electric sector will be constrained by the compliance-period limits established in the Federal Clean Power Plan. Because the specific implementation of this program for each state is unknown at this time, it is reasonable to set an aggregate limit for the study area equal to the sum of the mass limit for each state. If the consultant is able to replicate this level of emissions by imposing a fixed carbon price on the dispatch cost, that would be an indication that the price is reasonable for the study period.

ISO Response: As discussed above, the ISO intends to simulate the WECC outside California under the Clean Power Plan for one GHG price assumption sensitivity for 2030.

5.10.2.5 Methane Impact

NRDC commented that the assumed carbon price is reasonable. However, the analysis fails to achieve the requirement of SB 350 to evaluate "emissions of greenhouse gases"

stating the 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 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. NRDC proposed that 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. CESA commented that these assumptions should reflect the price effect of Aliso Canyon's emissions, if applicable.

ISO Response: The ISO acknowledges the importance of methane leakage in California's GHG accounting. However, such leakage is not expected to be affected by whether the ISO becomes a regional entity. Thus, this study does not intend to focus on the issues of methane leakages.

5.10.2.6Additional Analysis

SCL commented that at least 3 additional cases should be studied. One is a social cost of carbon applied to all sources regardless of regulatory means or lack thereof to apply the cost. A second case is to force carbon reductions down according to California's commitment to the "Under 2 MOU" signed in 2015, and estimate resultant total and marginal cost of reducing GHG emissions. The third case is where California utilities would pay PacifiCorp to run gas plants instead of coal plants and count the resultant GHG reductions. The benefit study assumes PacifiCorp would run its gas plants less in response to California exports, which has the perverse effect of increasing GHG emissions.

ISO Response: The ISO acknowledges the importance of proper accounting for GHG emissions. The focus the study is on the impact on changing the ISO's operational footprint, and therefore, the study will assess the potential change on the GHG emissions from resources located in California, those contracted by California utilities, and those outside of California. To the extent that there will be any negotiated "payments" for GHG emission reductions across entities, those can be addressed separately in future analyses. While it is possible to simulate the California economy and how the marginal abatement cost of GHG emission might change, the ISO is focusing on the electricity sector, assuming that other abatement sources and costs do not change significantly between a Business-as-Usual case and a regional market case.

5.10.2.7 Data Assumptions

CBE commented that the ISO should be evaluating conditions that could be set ahead of time to ensure that an interstate grid balancing authority will not result in California importing coal-fired resources, nor in increasing usage of in-state gas-fired resources for export. ISO should ensure that California's goals and communities are protected.

ISO Response: The ISO acknowledges the importance of the assumptions regarding the policies and actions of the neighboring states. The ISO intends to simulate 2030 without a carbon price outside of California and a sensitivity case with carbon price outside of California, if time permits. The results will demonstrate the impacts to coal- and gas-fired generation.

CPUC Staff commented that it is appropriate to use the CEC's 2015 IEPR Carbon Price Projections. It is unclear to CPUC Staff what assumptions the ISO is making regarding the climate change policies and actions of neighboring states. Whether or not additional western states adopt GHG limitations on their electric grids would be a key input into many aspects of the study.

ISO Response: The ISO agrees and has updated the carbon price to the 2015 IEPR projections. At the moment, we will simulate the western states outside of California without a GHG limitation and a sensitivity analysis with a carbon cost.

5.10.3 *Changes from the Proposal*

The ISO proposes the following changes to the carbon price assumption proposal in addition to those changes discussed in earlier sections:

- Update the GHG gas price assumptions to the 2015 IEPR.
- Expand the to include a zero GHG price for states outside of California and a sensitivity analysis that incorporates a GHG price for western states in 2030.

5.11 Topic 11 – Data

5.11.1 *Question*

BEAR will be using existing economic data, and generation and transmission data from E3, the ISO, and Brattle. These data are currently being developed. Are there specific topics that you want to be sure to be addressed regarding these data?

5.11.2 *Stakeholder Input and ISO Response*

TransCanyon believes that the topics currently being considered in the development of economic, generation and transmission data are sufficient.

NRDC commented that 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.

ISO Response: The ISO agrees, but this level of detail is not contemplated in this study and would be a second order of benefits that California ratepayers would receive. Furthermore, the BEAR model is constrained by its inputs. Without first receiving detailed estimates on the level of project development investments in other states for other states, there will be no way to model this within the BEAR framework.

NRDC continues it comment that 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 RTO market. Business-as-Usual suggests a smaller and more expensive solution to California's climate challenges. An expanded RTO 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.

ISO Response: The ISO clarifies that the economic impact will assess the climate impacts on both the expansion of the ISO to just PacifiCorp and then in 2030 to a US-WECC-wide regional except the PMAs.

SCL commented that BEAR should evaluate how the ISO's actual costs and benefits have compared with forecasts. In 2008, the U.S. Government Accountability Office found a lack of consensus about whether RTOs, and their study included ISO, have provided benefits to customers. GAO recommended that FERC provide additional steps to ensure performance and benefits. As of 2008, FERC had not provided any empirical analysis of market performance. In 2011, FERC published some performance metrics, but has not imposed performance requirements on the organized markets. BEAR should study how the use of performance metrics may improve market performance and ensure benefits to consumers. Evaluating performance metrics is beyond the scope of the SB350 economic impact study.

ISO Response: While the ISO agrees this would be useful, the set of performance metrics outlined in the FERC report relates more to system reliability and organizational performance. A general performance audit of ISO is a separate issue than the economic benefits of regionalization. The ISO believes that evaluating the exhaustive list of

performance metrics outlined in the FERC publication is therefore beyond the scope of the SB350 study.

CESA commented that energy storage cost assumptions should be lower than those currently assumed by E3. Downward cost trajectories for storage should be steep. Storage costs could also be lowered to reflect the potential for storage to provide additional benefits not readily reflected in the model, lowering the net cost of some storage projects.

ISO Response: The ISO agrees and has revised energy storage cost assumptions based on information received from stakeholders, the 2015 IEPR and 2016 LTPP.

CESA also commented that the analysis should also incorporate some restrictions on the use of import/export transmission. Costs and timing for transmission build-outs should also be conservative. Transmission expansions can be complicated and difficult, with difficult to determine completion times. CESA is concerned that understatements of these costs could lead to inaccurate study results and misdirected portfolios.

ISO Response: As discussed earlier in the paper, the portfolios for the SB350 study are only plausible scenarios for 2030 and are not meant to be definite portfolios for the Load Serving Entities to procure, only the CPUC and the local regulatory authority can direct the procurement. Transmission assumptions are based on available information and while we are presuming that the transmission can be built in the next 14 years, we believe this is a reasonable assumption.

LSA recommends that BEAR take a look at the most recent Solar Foundation jobs report that can be found here: http://www.thesolarfoundation.org/solar-jobs-census/states/.

ISO Response: The ISO clarifies that BEAR has review this report and will incorporate into its analysis where relevant.

5.11.3 *Changes from the Proposal*

The ISO does not propose to change the existing economic data, and generation and transmission data from E3, the ISO, and Brattle used by BEAR in the proposal except as previously discussed in earlier sections.

5.12 Topic 12 – Sectors for Economic Analysis

5.12.1 *Question*

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?

5.12.2 *Stakeholder Input and ISO Response*

NRG and TransCanyon commented that the approach seemed reasonable. NRDC commented that the 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.

ISO Response: The ISO clarifies that the BEAR model encapsulates the entire economy and will reflect the entire value chain and sectors that are affected through direct, indirect and induced effects of economic activities.

NCPA commented that economic sectors seem appropriate but the economic assessments utilize the outputs of upstream studies (Framework, Portfolios and Ratepayer Impacts) as inputs. If the inputs to the economic study are flawed, the outputs from the economic study will also be flawed. Consistent with comments on improving the input studies above, enhancements to the upstream processes will be necessary in order to make the outputs from the economic models meaningful.

ISO Response: The ISO understands NCPA's concern and has allowed time between release of the preliminary results in mid-April and the final results in late-May to resolve any flaws that arise in the study. Furthermore, based on information received from stakeholders the ISO has updated inputs in order to make the economic outputs more meaningful.

SCL commented that the study should consider differential effects on women, minorities, or children. These populations are important. The study should perform a cumulative effects analysis.

ISO Response: As discussed earlier in the paper, the legislation specifically requires the ISO to evaluate the impact to California ratepayers as a whole and is not analyzing procurement on a specific entity basis as that is beyond the control of the ISO. To do so would require the ISO to take a position on rate design and allocation issues among various ratepayer groups. The ISO will examine the overall ratepayer impacts through overall changes to cost of wholesale electricity service and the results will be further disaggregated by sector, occupation, and household income decile. Although the

populations of women, minorities, and children are important groups to consider, we cannot model the differential effects under this modeling technique.

5.12.3 *Changes from the Proposal*

The ISO does not propose to change the sectors for economic analysis in the proposal except as previously discussed in earlier sections.

5.13 Topic 13 – Disadvantaged Communities

5.13.1 *Question*

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?

5.13.2 *Stakeholder Input and ISO Response*

NRG and TransCanyon commented that based on the study overview the requirements of SB350 ae satisfied.

Labor commented the study should evaluate the economic benefits of the current programs implemented by the International Brotherhood and Electrical Workers union and the Ironworkers union to recruit people from local communities to work constructing new PV generation. These benefits are particularly important in disadvantaged communities such as those in the Central Valley where it is otherwise difficult to break the cycle of poverty.

ISO Response: The ISO team will evaluate these programs, but detailed micro analysis of the impact of these programs is outside the scope of this project, and the analysis is intended to estimate potential benefits under future programs.

NRDC commented that while the framework generally satisfies the SB350 requirement, 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.

ISO Response: The ISO clarifies that the analysis will use the CalEnviroScreen tool for identifying communities of concern. The analysis will explore the locations where changing emissions from fossil fueled generators may have the greatest health consequences.

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.

ISO Response: The ISO clarifies that the CalEnviroScreen will be used to identify census tracts of interest and model results will be presented separately for those areas. However, CalEnviroScreen will not be used to assess individual generating facilities.

5.13.3 *Changes from the Proposal*

The ISO does not propose to change the disadvantaged community framework in the proposal except as previously discussed in earlier sections.

5.14 Topic 14 – Additional Economic Analysis

5.14.1 *Overview*

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?

5.14.2 *Stakeholder Input and ISO Response*

NRG and TransCanyon commented that the economic analysis should satisfy the SB350 requirements and seems reasonable.

Labor commented the study should evaluate the economic benefits of the current programs implemented by the International Brotherhood and Electrical Workers union and the Ironworkers union to recruit people from local communities to work constructing new PV generation.

ISO Response: The ISO clarifies that the economic analysis does assume that local labor is used for construction of new generation and transmission infrastructure. However, evaluating benefits of existing programs is outside the scope of this study.

NRDC commented that 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.

ISO Response: The ISO clarifies that the study assumes that employment for out-of-state capacity and transmission comes from out-of-state workers. As a conservative assessment of the benefits to California, no out-of-state portfolio development will benefit California's workforce other than the impact on electricity prices.

5.14.3 *Changes from the Proposal*

The ISO does not propose to change the additional economic analysis in the proposal except as previously discussed in earlier sections.

5.15 Topic 15 – Environmental Analysis

5.15.1 *Question*

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?

5.15.2 *Stakeholder Input and ISO Response*

NRG and TransCanyon do not view that additional environmental analysis is needed. Similarly ORA finds that environmental impact analysis of air quality, GHG, land use and visual resources, biological resources and ecology, and water supply, is sufficient at this time.

TransWest commented that the environmental impacts associated with overbuilding California resources should be factored into the analysis.

ISO Response: The ISO agrees and if a portfolio results in overbuilding renewables due to curtailment of solar generation then such quantity of renewables is included in the input data for the environmental analysis. Therefore the environmental study will include the build-out in each scenario as defined in the RESOLVE portfolios.

5.15.2.1 GHG Impact

CBE commented that expansion of the ISO grid has the potential to spread California's good RPS policies to other states, benefitting the planet while it reduces costs and pollution impacts in California. Low-carbon balancing could benefit both out-of-state Environmental Justice communities that are currently impacted by polluting power sources and California Environmental Justice communities that host fossil-fueled power plants or will see the benefits of construction of new renewable resources.

ISO Response: The ISO agrees and appreciates CBE's comments.

Sierra Club recommends that the study first focus on the GHG impacts of integrating PacifiCorp into the ISO. The study should consider whether those expenses are more or less likely to occur under regional integration, and what the regional GHG impacts will be from keeping coal units online or retiring those units.

ISO Response: The ISO agrees and has revised the proposed footprint to incorporate just PacifiCorp in 2020 and will evaluate the GHG impacts on that footprint.

TURN commented that any analysis of Greenhouse Gas (GHG) emissions should isolate the impact of a regional balancing authority and separately identify changes in GHGs associated with the Energy Imbalance Market.

ISO Response: The ISO agrees and the study is only evaluating the regional expansion and not the impact of the Energy Imbalance Market. Other studies have evaluated the impact of EIM.

CPUC Staff recommend that the potential GHG costs - in the form of increased emissions associated with the California grid associated with regionalization - should be a major focus of the study as well. The potential for the GHG footprint of the California grid to include greater imports from BAAs with much higher GHG/kWh than California is a major concern and the Aspen presentation did not provide enough detail to ascertain whether this is an intention of the study, and how such an analysis will be conducted. To the extent that California imports more the implications for the State's existing cap and trade regulations are unclear. Evaluating how a cap and trade program would impact GHGs across the larger region as well as how it would be administered would be useful. In addition, evaluating changes to load resulting from growth of electric vehicles and reducing solar curtailment would be useful.

ISO Response: The ISO understands CPUC Staff's concern and the study results will include the impact of GHG on the proposed footprints for each scenario. The ISO clarifies that the environmental analysis will assess changes in GHG emissions brought about by the study scenarios with an emphasis on how those GHG emissions would be treated under California's existing Cap-and-Trade program. This will provide information on the GHG footprint of imported energy.

5.15.2.2 Land Impact

Defenders commented that recent landscape-scale renewable energy planning must be incorporated. Tremendous public and private investments have been made in landscape-scale planning for energy at the local, state, and federal levels (e.g., BLM's Western Solar Energy Program, Desert Renewable Energy Conservation Plan, San Joaquin Valley Solar Assessment, WECC Environmental Data, and County renewable energy and conservation planning efforts). These planning processes have generated high-quality scientific data, particularly for vegetation and habitat values. County-led planning processes have resulted in more information on where renewable energy generation aligns with local government and community values. Additionally, natural and working landscapes are increasingly recognized for their value in sequestering carbon as well as providing biodiversity values and identified as such. The Data Basin platform developed by the Conservation Biology Institute for the California Energy Commission presents an opportunity to provide the best available data, generated not only through renewable energy planning processes, but also by state and federal wildlife agencies, other agencies, and conservation institutions, transparently, to guide

transmission investments to locations which align with appropriately located projects as well as conservation and community values.

ISO Response: As requested by a variety of commenters, the ISO clarifies that the descriptions of the portfolios will reflect earlier foundational studies, including DRECP, County-level, and WECC efforts to identify the locations where siting could be expected to avoid land use conflicts, based on objective criteria where possible.

LSA encourages the consultants to consider the appropriate level of granularity, given the timeframe and level of uncertainty in the timeframe of the studies (2030). Our primary concern is ensuring that the study is able to fairly and reasonably compare potential differences across scenarios and portfolios. LSA strongly recommends that data inputs to this exercise be based on existing and final regulatory decisions, particularly given the high level of the scenario assumptions from the RESOLVE model, which are at the Super CREZ level. At this high level, it would be unreasonable to presume what types of potential land-use conflicts or considerations projects may occur. Specifically, the collaborative San Joaquin effort has not yet yielded a clear picture of future development in the area. So, while there is likely to be development in that area, and in Westlands in particular, LSA cautions against inferring completion of and accuracy from that process.

ISO Response: As discussed earlier in the paper, the ISO is only using plausible portfolios for the analysis and not making decisions on procurement as that is beyond the ISO's purview. For the environmental analysis the ISO team will place the new renewable generation in a Super-CREZ for the environmental analysis, however such placement is meant to illustrate the impact on the environment of the regional expansion and is not a decision on siting new generation as that too is beyond the ISO's authority.

LSA also understands that the study would compare sector-wide modeling results to determine the likelihood of 'conflict,' with the hypothesis that certain scenarios will increase intensification (potential conflict) and others will decrease conflict. LSA is unclear about how 'conflict' will be defined and encourages Aspen and the ISO to focus these efforts on objective criteria rather than perceived conflicts.

ISO Response: As suggested by LSA, the study will not presume that projects will always create certain impacts, but the high-level scope of this study will identify only whether conflicts could be expected across a region.

5.15.2.3 Water Impact

LSA wants to emphasize the water-reduction benefits of the conversion from fossil generation to solar PV, and encourages Aspen to incorporate these benefits into the model. A few specific figures are listed below:

- A 20 MW PV facility requires 30 acre feet of water for construction and 2 acre feet per year in operations (panel washing).
- A 40 MW PV facility requires 30 acre feet of construction and uses 0.5 acre foot of water per year for panel washing
- A 100 MW PV facility used 60 acre feet of water for construction and uses less than 1 acre foot per year for washing.
- At least one PV Company does not require any water for operations, as it does not wash its panels.

LSA noted that a recent LBNL study on the benefits of RPS standards found significant water savings in its analysis of the switch to renewables. This study found that, "Each MWh of electricity generated for RPS compliance obligations in 2013 represents an average savings of 8,420 gallons of water withdrawal and 270 gallons of water consumption" (See Wiser et al, A retrospective analysis of benefits and impacts of US renewable portfolio standards, January 2016).

ISO Response: The ISO appreciates the additional water impact information and the study will consider the information submitted by LSA.

5.15.2.4 Additional Analysis

Defenders also commented that the environmental analysis must also consider:

- Existing and future corridors to permit the movement of species and provide connectivity between eco-regions to provide climate change adaptivity.
- Recovery plans and critical habitat for special status species.
- The intactness of a landscape and the need to avoid disrupting intact landscapes.
- It is our understanding that the land use study will include farmland but it does not mention rangeland. Rangeland is a key source of agricultural activity in the west and provides essential habitat and movement corridors for key biological resources. As such, rangeland must be considered as part of the analysis for its land use, economic and biological services.

ISO Response: The ISO appreciates Defenders comments and while rangeland will be considered for any ecological values that are present, the study will not include any site-specific assessment of connectivity and intactness, because of the high-level scope of this analysis. However, these factors will be incorporated at a landscape level because we will assess potentially affected biological resources using the WECC Environmental Data Viewer and Western Governors Association Crucial Habitat Assessment Tool ("CHAT").

5.15.2.5 Transmission

BAMx and CMUA commented that the specific transmission projects need to be identified to properly assess the environmental impacts.

ISO Response: The ISO clarifies that the environmental analysis will identify and discuss specific transmission projects that have been the subject of previous environmental reviews by siting authorities.

5.15.3 *Changes from the Proposal*

The ISO does not propose to change the environmental analysis in the proposal except as previously discussed in earlier sections.

5.16 Topic 16 – Environmental Indicators

5.16.1 *Question*

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?

5.16.2 *Stakeholder Input and ISO Response*

TransCanyon commented that the indicators presented are sufficient.

ORA staff finds that the listed potential indicators of impacts are a good starting point for focused analysis. The inclusion of analysis on a more granular level would be beneficial, where applicable. For example, including co-development analysis on the "sub-zoned" level for certain areas in the Land Use and Visual Resource section as mentioned by Rachel Gold from LSA and Carl Zichella from NRDC would be beneficial, since a higher level view might not adequately capture the actual benefits or harms to a specific area. This is especially true if this data is readily available for a particular area.

ISO Response: The ISO clarifies that the results will be at an aggregate level, air basin for non-renewables and Super-CREZ for renewables, as the study is based on plausible portfolios and not definitive portfolios as the ISO does not have the authority to determine procurement for California.

5.16.2.1 Data Clarification

Defenders commented that the lack of information on sensitive species or habitats must not be construed to indicate the absence of sensitive species, resources, or biological communities. Further, the indicators cannot be viewed in isolation and the cumulative impact of changes or additions of generation and/or transmission must be considered. The study should include a transparent accounting of when there is a lack of data in a

resource area that creates a situation of uncertainty of impacts. For example, if there are few avian studies or information about migration patterns in an area considered for wind resources, that lack of information should be noted in the study outputs.

ISO Response: The ISO's biological resources analysis will use the Crucial Habitat Assessment Tool (CHAT), developed by the Western Governors' Wildlife Council, as its basis. In addition, the potential development areas that are defined for analysis are large, and no analysis will be done at a project-specific level of detail. The regional scale of the CHAT data, combined with the large study areas will reduce the effect of the presence or absence of site specific data on results. The description of existing conditions will list the specific data sources used for each potential development area, include a discussion of the limitations of available data, and describe the need for site-specific studies for any future development project. Areas with limited data availability will be clearly identified.

Labor commented that air quality impacts should be aggregated by air basin, since this is the level at which compliance with federal and state ambient air quality standards is measured.

ISO Response: The ISO agrees and clarifies that the air quality impacts will be aggregated according to air basin, and the air quality impacts will be analyzed for changes to coal and natural gas firing rates.

NRDC commented that 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.

ISO Response: The environmental analysis projections of changes in air emissions will not include an economic valuation component. Detailed state-wide data on economic productivity responses to changes in air emissions is not available at the spatial resolution necessary to be incorporated into the current analysis. Estimating the impact of reduced emissions on the state's economy is further complicated by the fact that, at the state level, this relationship is bidirectional: lower emissions lead to increased economic activity while increased economic activity generates more emissions. This complication is one reason that previous studies estimating the economic benefits of reduced exposure to air pollution have been carried out primarily at the individual level. However, the ISO's environmental study will illustrate the changes in air emissions among scenarios, on an air basin level, and it will also illustrate where changes in air emissions would occur in areas with high populations of disadvantaged communities.

Sierra Club commented that while there is still a high level of uncertainty as to the location of build-out that would occur outside of California to achieve the level of wind

resources and transmission assumed by the study, the plans for such development are sufficiently complete to understand the impact to sensitive biological resources.

ISO Response: The ISO agrees that the general locations of potential generation and transmission can be defined in a manner that allows characterization of impacts to biological resources.

Sierra Club also commented that the study should consider ALL changes in MWh production towards coal or natural gas on a unit by unit basis, regardless of whether that change occurs in a mapped disadvantaged community.

ISO Response: The ISO study will not consider generation changes for each unit across the WECC. However, it will demonstrate changes in air emissions and how they differ among scenarios.

Some commenters raised concerns with the processes that guide siting decisions.

ISO Response: The ISO clarifies that these issues will be reflected in the descriptions of the buildout. For example, buildouts are assumed to generally adhere to previously-established or proposed development zones, and are likely to implement mitigation practices defined in earlier studies or enforced by siting authorities that have historically reviewed specific development proposals.

5.16.2.2 Proposed Additional Indicators

NRG proposes to add to Land Use and Visual Resource these indicators to the 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

ISO Response: The ISO agrees that that where possible, the buildouts will be located in areas that have been designated for focused or acceptable development, and the buildout will be described in relation to projects that have been the subject of previous environmental reviews by siting authorities. These two suggested topics are consistent with this approach.

NRG proposes to add to Biological Resources and Ecology these indicators to the 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

ISO Response: As described above, the ISO's analysis of biological resources will use the CHAT model as its basis. Because the potential buildout areas are large and no analysis will be done at a project-specific level of detail, project-specific mitigation and monitoring practices will not apply. The ISO's assessment of potential impacts to biological resources will assume the implementation of existing laws and regulations. No other changes to the proposed range of environmental indicators would be necessary.

5.16.3 *Changes from the Proposal*

The ISO does not propose to change the environmental indicators in the proposal except as previously discussed in earlier sections.

5.17 Topic 17 – Other Comments

5.17.1 *Questions*

Please provide any other comments that the ISO should consider.

5.17.2 *Stakeholder Input and ISO Response*

CBE commented that the issues they raised may lead to an excellent regional sharing system that helps California as a whole, and California's fossil-fuel burdened communities in particular, to move to clean, sustainable, just energy system. The barriers are only logistical and political, not technological.

5.17.2.1 Schedule

CBE, CDWR, CMUA, Labor, MID, NRG, Sierra Club, and TURN are concerned that the schedule for these studies is severely compressed for a project and scope of this magnitude. CDWR and CMUA noted that the potentially historic endeavor of regionalizing the West requires a more methodical approach to allow for adequately thoughtful analysis. Labor and CMUA commented that the ISO should not degrade the quality of the studies to meet an artificial, self-imposed deadline. MID and CMUA also noted that the present schedule with a completion date in May/June leaves inadequate time for stakeholders to make informed assessments as to the studies and study process. NRG commented that the compressed time frame and limited number of opportunities for public engagement should be reexamined, or at a minimum, better explained. Sierra Club recommends that ISO revise the study to fully use the time allotted by the Legislature so that a more thorough and accurate study will result.

ISO Response: The ISO understands the concern raised but with the legislative session ending in August, the ISO needs to achieve the currently proposed schedule to allow the legislature time to consider the studies in this session. To allow the regional expansion

to go live on January 1, 2019 the go – no go decision needs to be made by July 1, 2017. In order to make that decision each of PacifiCorp's five states need to approve the proposal. To approve the proposal the ISO needs to have legislative approval of the revised governance and to receive that approval the ISO needs to provide the study results. Thus with the legislative session ending in August, the ISO needs to achieve the currently proposed schedule to allow the legislature time to consider the studies in this session.

NRDC suggested that the April meeting should target details of the production cost modeling, key assumptions and interpretation of results.

ISO Response: The ISO agrees and intends to have those discussions at the April meeting.

5.17.2.2 Data and Input Assumptions

CBE, NCPA, NRDC, NRG, Peak, and Sierra Club commented that the overall process would benefit from greater transparency and disclosure of all of the major and minor assumptions included in the modeling efforts. Sierra Club and TURN commented that ISO should provide this data as soon as possible so that stakeholders can conduct a meaningful analysis and provide input prior to the final results.

ISO Response: The ISO agrees and will be releasing materials in advance of the April stakeholder meeting to allow participants time to review assumptions and the models in advance of the meeting.

TURN commented that ISO and its contractors should release full work papers, all models, and any relevant documentation used to develop the study results consistent with the requirements of SB 350. All electronic work papers should be provided in Excel-compatible format with data and formulae intact, and parties should not need to gain access to proprietary tools to read the inputs and outputs of the various models. Access to confidential data, if used, must be provided to parties willing to sign reasonable Non-Disclosure Agreement. Similarly, NRDC commented that 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 California.

ISO Response: The ISO intends to provide documentation and data associated with input assumptions and results in forms that are accessible to stakeholders. The goal is to be as transparent as possible, including comprehensive explanations of modeling simplifications and approximations where they are used. Each consultant is using fully

documented data, software and models, all of which are available commercially if an entity wants to further evaluate the ISO's analysis.

MegaWatt questions what are the RESOLVE modeling assumptions regarding marginal transmission losses on the West-wide grid? The marginal losses over the full distances North to South and reverse and East to West and reverse may be a significant factor. For example, if at full load on a path the loss is say 15% then the marginal loss would be about 30%. Average losses on the same path might only be 5% because of the capacity factor of the renewable resource transported. With high imports when Northeast wind is blowing or high exports when California solar is surplus, the marginal losses in an economic west-wide dispatch may be important. Local storage of course also has marginal losses, but if the regional marginal losses are not properly characterized the role of local storage versus exports and imports may not be properly evaluated. How does the model consider this?

ISO Response: The ISO clarifies that the models are using marginal losses based on the proposed site of the renewable resource.

5.17.2.3 Process

BAMx commented that the SB350 study process needs a study plan that tests the robustness of any conclusions to a proper range of input assumptions. For example, some critical assumptions (such as the ability to export excess energy without regionalization) are proposed to be tested over a wide range of values. However, other critical assumptions are not (such as the ability to import renewable energy over the existing interties). Furthermore, stakeholders need both additional information about the foundation for the assumptions proposed for the studies and more engagement as the analysis progresses and before conclusions are formulated.

ISO Response: The ISO will be providing stakeholders with the assumptions and data inputs used for the models. With respect to imports, the ISO team is using a production cost model that incorporates the resource from the TEPPC base case.

5.17.2.4 Analysis Considerations

BPA urges California to take a careful look at the costs and benefits of the scenarios it considers. For example, assuming that exports of oversupply are limited to the maximum historical amounts as the 'Business-as-Usual' case clearly understates the ability of existing transmission facilities and policies to assist California in reducing its potential oversupply issues from new renewable generation. Existing facilities can support exports of energy from California to the Northwest in amounts beyond the maximum historical amounts. On the commercial side, developing an assessment of pancaked transmission costs for excess California energy would be a more realistic

assessment of the costs for limiting oversupply for systems that are not part of the ISO-controlled market. The existing transmission tariffs of neighboring BAs could be used to develop the increasing amounts of pancaked transmission costs as the energy moves farther afield from the ISO-controlled market. In developing an assessment of the benefits to California, the studies need to recognize that systems outside the ISO market can address oversupply issues and would actually provide revenues for California ratepayers from existing ISO export fees to recover the cost of California's existing transmission system when supporting the movement of oversupply energy out of the state.

ISO Response: The ISO acknowledges that BPA's proposed approach to analyze the ability for California to export excess energy is sound and will adopt the assumptions of using transmission tariff and additional hurdle rates to simulate the costs for limiting oversupply for systems that are not part of the ISO-controlled market. The ISO intends to include existing transmission tariffs of neighboring BAs to develop the increasing amounts of pancaked transmission costs as the energy moves farther afield from the ISO-controlled market.

NRDC also believes the ISO 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. NRDC and Peak both commented that the ISO 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.

ISO Response: As discussed in a number of earlier topics, the ISO has added additional sensitivities to the study. In addition, the ISO intends to provide a thorough explanation of the "hurdle rates" or "friction" used in both the RESOLVE and the production cost simulations.

LS Power supports the realistic assumption that incremental transmission capacity can be added to the system to support out-of-state renewables (and with the added benefits described herein) at a lower cost than adding multi-billion dollar HVDC additions.

ISO Response: As discussed above, the new transmission cost included in the analysis is merely an estimate based on various transmission options and is not meant to be indicative of any single transmission project.

MID is cautious, if not skeptical, of the claims that benefits of regional expansion will accrue to MID and Californians to the degree that has been suggested and which the

instant study is meant to clarify. MID is interested, among other matters, in the initial claims by BEAR that induced effects of greater disposable income will accrue to Californians, resulting in improvements to the service economy. To the extent such induced effects are the result of reduced electric rates, MID would be very much interested in reviewing the outcome of BEAR's and the other consultants' analyses.

ISO Response: The ISO plans to provide the results of the study to stakeholders.

NRDC commented that ISO and the consultants should be thinking ahead to additional state analyses and broader footprint based assessments.

ISO Response: The ISO team considers this study to be a foundation study that in turn can be used for additional state analyses and broader footprint based assessments at a later date.

TURN commented that the SB 350 study should perform a rigorous analysis that highlights the specific GHG emissions impacts of EIM (including all expected new participants) without regional expansion.

ISO Response: The ISO acknowledges that it would be interesting to understand the impact of EIM under various different participation assumptions. However, this study's focus is on the impact of ISO's operations if it were expanded regionally.

UCS raised concerns that the ISO's assumption that at least 25% of generation in designated regional areas of the ISO in each hour come from "conventional resources" (i.e., natural gas, hydropower, and combined heat and power). UCS asserts that services such as frequency control for which these resources are mandated could be provided by the renewable resources themselves, demand response, or storage. It is unclear whether ISO intends to maintain these assumptions in the proposed study and UCS requests ISO be clear on whether these, or other such assumptions having such a direct impact on renewable curtailments will be included. The second concern UCS raised was the requirement previously modeled was for down-regulation services to be provided by conventional resources. Providing downward regulation is another service that renewable resources can provide. Selectively curtailing renewables at the sub hourly level will reduce total renewable energy curtailment and carbon emissions. UCS believes that the ISO should clearly explain how renewable and non-renewable resources are being utilized to provide grid reliability services, in order to understand how these assumptions may be driving renewable curtailment.

UCS also commented that it seems that either the ISO study will assume participation by VERs in the day ahead market, and the necessary changes to market rules; or conversely that the market rules continue as they are and that VERs continue to be absent from the day ahead market. Whatever assumption is made needs to be clear at the outset, or a

sensitivity run on both assumptions. It is likely that the choice of assumption will have a very large effect on the results.

ISO Response: The production cost simulation assumes that renewable resources can provide regulation down. The renewable resources are simulated with a cost of curtailment, thus can be interpreted as those resources bidding in in the Day-Ahead market with a negative bid offer price.

5.17.3 *Changes from the Proposal*

The ISO proposes the following changes to the proposal in addition to those changes discussed in earlier sections:

- Release additional detailed documentation on the methodology to allow a better understanding of the study process for stakeholders.

6 References

Additional references provided by stakeholders consist of the following:

Annual Technology Baseline Spreadsheet:
http://www.nrel.gov/analysis/data_tech_baseline.html

Joint California Energy Commission and California Public Utilities Commission Long-Term Procurement Plan Workshop on Bulk Energy Storage, November 20, 2015, http://www.energy.ca.gov/calendar/index.php?eID=2535

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

New Mexico, a map of the wind resource potential:

http://apps2.eere.energy.gov/wind/windexchange/wind_resource_maps.asp?stateab=nm

SEIA/GTM Solar Market Insight Q3 2015, Lazards Levelized Cost of Energy Analysis 9.0 and LBNL's Utility Scale Solar 2014 Report.

Solar Foundation jobs report:

http://www.thesolarfoundation.org/solar-jobs-census/states/

Wiser et al, A retrospective analysis of benefits and impacts of US renewable portfolio standards, January 2016

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.DRcP2R6I.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/1PDGyTl

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

Environmental Data Viewer at the Western Electricity Coordinating Council (WECC) https://www.wecc.biz/TransmissionExpansionPlanning/Pages/Environmental-and-Cultural-Considerations.aspx

The Desert Renewable Energy Conservation Plan; http://drecp.databasin.org/

San Joaquin Valley Solar Initiative; http://sjvp.databasin.org/

Western Renewable Energy Zone (Western Governors Association) process http://bit.ly/1Ofdm0w

Solar PEIS and associated zones adopted by the Department of the Interior,

BLM; http://solareis.anl.gov/

Restoration Design Energy Project (BLM Arizona); http://www.blm.gov/az/st/en/prog/energy/arra_solar.html