

Stakeholder Comments Template

Submitted by	Company	Date Submitted
Carl Zichella Doug Larson Brian Parsons Jennifer Gardner Nancy Kelly Sophie Hayes Fred Heutte William Appel James Baak	NRDC Western Grid Group Western Grid Group Western Resource Advocates Western Resource Advocates Utah Clean Energy Northwest Energy Coalition Islands Energy Coalition Vote Solar	June 22, 2016

Please use this template to provide written comments on the Clean Energy and Pollution Reduction Act Senate Bill 350 (SB350).

Please submit comments to: regionalintegration@caiso.com by close of business
June 22, 2016

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

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

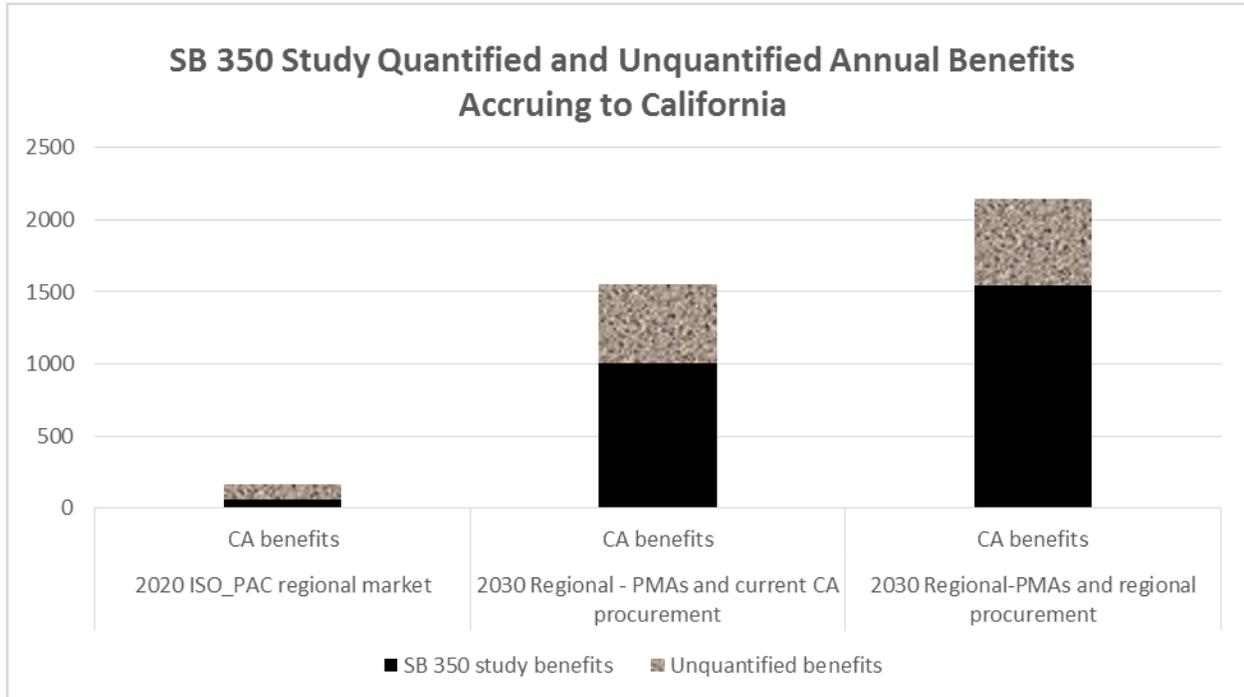
1. Are any of the study results presented at the stakeholder workshop unclear, or in need of additional explanation in the study's final report?

Comment: ***The SB 350 report needs to make clear that the results presented significantly understate the benefits to California and other parts of the West from a Regional System Operator (RSO) in 2020, 2030 and in the longer term.*** The graph below shows our estimate of the understated benefits to just California in the SB 350 study results. Our estimates show that 2020 benefits could be as much as treble those reported previously, up to \$165 million more while 2030 results could be greater than \$500 million more than reported.

We found understated or unaccounted for benefits in the following categories:

1. Increased system reliability due to creating a larger Western market;
2. Improved use of the physical capabilities of the existing grid both on constrained WECC transmission paths and within the existing WECC balancing areas;
3. Avoided construction of redundant transmission projects;
4. Improved risk mitigation from a more diverse resource mix and larger integrated market;
5. Competition induced power plant efficiency and availability;
6. Lower renewable integration costs for reasonably-expected non-RPS renewable power;
7. Additional available transfer capacity due to coal retirements beyond TEPPC 2024 assumptions;
8. RSO-derived economies of scale in transmission construction to access distant renewables which would benefit consumers inside and outside CA;
9. RSO-derived benefit of lowering cost of integrating new low carbon generation;
10. Long term market benefits that extend beyond the study time frames (2030);
11. Regional unit commitment efficiency improvements that will occur due to the more efficient generation dispatch in non-market areas;
12. Behavioral changes on the part of the Power Marketing Administrations and consequent hydro efficiency improvements;
13. The incremental benefits that would likely occur if non-participating POUs in California join the RSO;
14. The impact of consultant identified modeling shortcomings on RSO benefits;
15. Reduced transaction costs that would accrue to California customers in a regional market;
16. The reliability benefits of more rapidly and efficiently forecasting and adjusting for abnormal weather and loads;
17. The reliability benefits of RSO control that can more quickly and economically dispatch around an N-2 event than the current bilateral system;
18. Frequency response procurement cost savings to comply with upcoming NERC requirements;
19. Reduction in upstream methane emissions due to the lower gas burn with an RSO;

Overarching recommendation: *The final report should list in detail all of the understated benefits and give an order of magnitude estimate of those benefits.*



The following areas require elaboration and clarification.

- a. ***The report needs to emphasize that costs and benefits in 2020 and even 2030 underestimate the long-term value of a regional market.***

UNDERSTATED LONG-TERM BENEFIT. A regional market creates the platform that California and the rest of the West need for low-cost deep GHG reductions in the power sector. Any evaluation of the costs and benefits of a regional market should be made in the context of actions needed to achieve climate stabilization in 2050.

- b. ***The SB 350 study should acknowledge the regional unit commitment efficiency improvements that will occur due to the more efficient generation dispatch in non-market areas.***

UNDERSTATED BENEFIT. The unrealistic level of assumed efficient unit commitment in the Current Practice case in non-market areas leads to significant understatement of the benefits achieved by the Security Constrained Economic Dispatch (SCED) in a large regional day-ahead market. In non-market areas BA operators dispatch generation according to fixed rules of thumb and contractual relationships, not primarily economic efficiency, as is the case with a regional market. One clear example of the limitations in achieving SCED in the non-market environment is illustrated by the efficiency improvements Public Service of Colorado is achieving through joint dispatch of generators among PSCo, Black Hills Energy and the Platte River Power Authority. Similar inherent inefficiencies in current BA operations outside of markets mean that the SB 350 modeling assumes a much higher level efficient dispatch in non-market BAs than actually occurs. The result is a significant understatement of benefits in SB 350 studies. We recognize that most of these efficiency gains from improved efficiency of

dispatch would occur outside of the current CAISO footprint and, accordingly, have excluded these benefits from the graph above. ,

- c. ***The SB 350 study should acknowledge the significant benefits from more efficient hydro dispatch that would accrue to an RSO, particularly if the Power Marketing Administrations (PMAs) participated.*** UNDERSTATED BENEFIT. We believe it would have been prudent to model the WECC footprint including the PMAs. Because the modeling assumes historical hydro dispatch, the SB 350 study significantly understates benefits of a regional market. With transparent pricing from a regional market, hydro operators are very likely to adjust their dispatch (within environmental limits) to maximize the value of their generation. Both the Western Area Power Administration (WAPA, or “Western”) and the Bonneville Power Administration (BPA) can be reasonably expected to maximize the value of their hydro assets, as these efficiencies are likely to result in cost savings for their customers. In the case of WAPA, it signs 8 or 16 hour block contracts rather than using its hydro system for more valuable ramping generation. This likely behavioral change by PMAs is not reflected as a benefit of a regional market. This understated benefit would be very large if the PMAs were included in the market footprint. While the PMAs would likely retain operations of their hydro assets, some portion of this efficiency gain would accrue to California because of (1) more efficient hydro dispatch within that part of WAPA’s system serving customers in California and (2) more efficient hydro dispatch throughout the West. In addition to playing a useful role in real time balancing and firming renewables and responding to load variation outside their currently assigned balancing areas, hydro resources could also provide important flexibility by generating less energy when renewable oversupply is available, and shifting output to periods of fast ramps and higher demand.
- d. ***The SB 350 study should acknowledge the incremental benefits that could occur if non-participating POUs in California join the RSO.*** UNDERSTATED BENEFIT. The analysis of the CAISO + PAC RSO does not include any additional California publicly owned utilities participating in the RSO (e.g., LADWP, SMUD, IID). By contrast, all California POUs are assumed to participate in the 2030 west-wide RSO. However, in the future without an RSO, the study assumes POU renewables will not be curtailed. We question these assumptions. We believe it is likely that additional California POUs will participate in an RSO before 2030. We also believe that unless California POUs participate in an RSO they will experience the same costs of curtailment of renewable generation that IOUs face; therefore, these costs should be reflected in the study results.

2. Please organize comments on the study on the following topic areas:

- a. **The 50% renewable portfolios in 2030**
- b. **The assumed regional market footprint in 2020 and 2030**
- c. **The electricity system (production simulation) modeling**
- d. **The reliability benefits and integration of renewable energy resources**
- e. **The economic analysis**
- f. **The environmental and environmental justice analysis**

Comment:

c) The 50% renewable portfolios in 2030

- i) ***We request that future wind and solar generating costs be detailed and we may request a sensitivity case to reflect even lower wind and solar costs.***

SENSITIVITY ANALYSIS. We recognize the improvement CAISO has made in estimating the cost of future wind and solar generation. However, we believe that costs are likely to decline further as have been forecast by industry analysts with experience in current trends.

d) The assumed regional market footprint in 2020 and 2030: *The study should include: 1) a sensitivity analysis that evaluates the incremental benefits to the CAISO + PAC 2020 and 2030 scenarios that would accrue to California if NV Energy joined, and 2) a 2030 regional market footprint scenario that includes the Bonneville Power Administration and Western Area Power Administration and all the entities embedded in those Power Marketing Administrations.*

- i) **Two additional regional market footprints should be analyzed.**

(1) ***The SB 350 study should include a sensitivity analysis that evaluates the incremental benefits to the CAISO + PAC 2020 and 2030 scenarios that would accrue to California if NV Energy joined.*** UNDERSTATED BENEFIT: SB 350 should evaluate benefits in 2020 and 2030 from an RSO footprint that includes CAISO, PAC, and NV Energy. As has been seen in the EIM, the participation of NV Energy adds significant transmission connectivity that increases benefits beyond that forecast. Evaluating the incremental benefits of NV Energy participation in the RSO would provide an important building block to fill the gap between the minimal assumed CAISO + PAC RSO and a regional RSO. Additionally, it is possible that NV Energy could join the RSO by 2020, one year after the projected start-up date of the CAISO + PAC RSO.

(2) ***The study should include in 2030 a regional market footprint scenario that includes the Bonneville Power Administration and Western Area Power Administration and all the entities embedded in those Power Marketing Administrations.*** UNDERSTATED BENEFIT: The Southwest Power Pool has already executed with WAPA language that enables WAPA to participate in SPP. Those same accommodations could be made for WAPA's operation in the Western Interconnection and for BPA.

e) The electricity system (production simulation) modeling

- i) ***A sensitivity case needs to be run to reflect less efficient unit commitment of generation in non-market areas BAs than the perfect unit commitment assumed in the current production simulation.*** NEEDED SENSITIVITY

ANALYSIS. (See comment 1.a.)

The SB 350 study should continue to acknowledge the real-world inefficiencies in the current operation of the western transmission grid. Additionally, CAISO should run a sensitivity analysis that reflects the impact of real-world inefficiencies in the existing operation of the transmission system. NEEDED SENSITIVITY ANALYSIS.

ii) The production cost modeling assumes away real-world inefficiencies in the operation of the transmission system. For example, as the SB 350 workshop slides report that:

- (1) Congestion on the California-Oregon border is \$60-\$150 million per year for 2012-14 but the production cost modeling assumes almost no congestion.
- (2) Analysis of 2012 WECC path-flow data (most recent year available), showing 5–25% of grid capacity remains unutilized during unscheduled flow (USF) mitigation.

Similarly, we understand that when modeling transfer capacity between BAs, the modeling assumes the lowest transfer capacity of any paths reaching the BA, thereby reducing the benefits of an RSO by not modelling how an RSO would fully utilize transmission capacity that is physically available.

The SB 350 study should retain this list of shortcomings in production cost modeling and, where feasible, estimate the size of the impact of these modeling shortcomings on RSO benefits. UNDERSTATED BENEFIT. As noted in the workshop slide 92 below, production simulations assumed a level of operational efficiency that does not actually occur in current fragmented grid operation. Overstating the efficiency of current operations results in significantly understating the benefits an RSO can bring. Moreover, the limitations listed are enormous; even a general estimate expressing a range of benefits would be useful in understanding the magnitude of the market’s positive effect.

Production Cost Simulations and Results

Limitations of Production Cost Simulations

The production cost simulations are limited in capturing some benefits of regional market operations (which yields a conservative estimate of benefits)

1. Simulated only “normal” weather, hydro, and loads for entire WECC
2. No transmission outages or operational de-rates; no extended generation outages
3. No unusual/challenging market conditions (such as Aliso Canyon impacts)
4. No improved regional optimization of hydro resources (almost identical hydro dispatch in “Current Practice” and “Regional” simulations)
5. Assumed perfectly competitive bidding behavior (does not capture competitive benefits)
6. Did not simulate benefit of regional market operations in addressing uncertainties in real-time load and renewable generation (which are only partly addressed through EIM)
7. Used only “generic” TEPPC and CEC plant and fuel cost assumptions, which understate the true variance in plant efficiencies and fuel costs (and thus the benefit of optimized regional dispatch)
8. Assumed all BAs in WECC already utilize an ISO-like optimized security-constrained economic unit commitment and dispatch even in the Current Practice Scenarios
9. Did not simulate less efficient utilization of existing grid in bilateral market (which shows flowgate capacity underutilized by 5–25%; see end of Appendix A)
10. Simulations do not capture inefficiency of bilateral trading blocks (25 MW 6x16 HLH vs. LLH), contract path scheduling, and unscheduled flows

- iii) ***The SB 350 study should acknowledge that modeling improvements to better reflect reduced transaction costs may not affect current CAISO customers but would benefit California utilities that do not presently participate in CAISO and PAC and other regional market participants.*** UNDERSTATED BENEFIT: A regional market will reduce counterparties' transactions costs compared with Current Practice. This RSO benefit is real but not quantified. For example, Xcel, which operates in the bilateral Western Interconnection, in MISO and in SPP must detail its most experienced traders to Public Service of Colorado's bilateral trading desk because of the complexities of bilateral trades compared with the simplicity of power trades in MISO and SPP. The assumed hurdle rates in production simulation do not adequately account for this.
- f) **The reliability benefits and integration of renewable energy resources (See matrix, below, for a more detailed evaluation of reliability and integration benefits.)**
- i) ***The SB 350 study should continue to acknowledge the unquantified reliability benefit of more rapidly and efficiently forecasting and adjusting for abnormal weather and loads.*** UNDERSTATED BENEFIT: As noted in 2.b.iv above, the SB 350 study assumes normal weather and normal loads in all Balancing Areas (i.e., no diverging or extreme weather events that would create abnormal regional flows). As climate change increasingly impacts our region, this is an overly conservative assumption. An RSO can more rapidly and efficiently forecast and adjust for abnormal weather and loads.
- ii) ***The SB 350 study should continue to acknowledge the unquantified RSO reliability redispatch benefits.*** UNDERSTATED BENEFIT: Similarly, the SB 350 study assumes a fully intact transmission system (i.e., no transmission outages that would create N-2 conditions or more severe transmission constraints than those specified). An RSO control can more quickly and economically dispatch around an N-2 event than the current bilateral system.
- iii) ***The SB 350 study should acknowledge this unquantified frequency response procurement discount benefit.*** UNDERSTATED BENEFIT: An RSO lowers frequency response procurement costs to comply with upcoming NERC requirements. At present the CAISO is planning to issue an RFP to acquire frequency response capabilities from outside its current footprint.
- g) ***The SB 350 study should acknowledge that these substantial economic activity and jobs benefits will continue to grow past 2030.***
- i) We believe the CAISO has done an admirable job of evaluating economic benefits. There will be substantial growth in economic activity and total jobs in California from the formation of an RSO.
- h) **The environmental and environmental justice analysis: *The SB 350 study should acknowledge the unquantified benefit from reduction in upstream methane emissions***

due to the lower gas burn with an RSO. CAISO should provide the total gas burn in Current Practice and in each of the scenarios so that readers can apply their own estimates of GHG savings from reduced upstream methane emissions

- i) UNDERSTATED BENEFIT. The study assumes no new carbon constraints in California or in other states beyond those in current law or required by the Clean Power Plan. Reality is that greater carbon constraints are likely and an RSO offers the benefit of lowering cost of integrating new low carbon generation.
- i) The study omits the GHG benefit from reduced upstream methane leakage due to lower gas burn with a regional market. **We request that:**
 - i) *The SB 350 study acknowledges the unquantified benefit from reduction in upstream methane emissions due to the lower gas burn with an RSO.*
 - ii) *CAISO provide the total gas burn in Current Practice and in each of the scenarios so that readers can apply their own estimates of GHG savings from reduced upstream methane emissions.*

3. Other

Comment on conservative assumptions and unquantified benefits:

Conservative assumptions and unquantified benefits result in the SB 350 studies significantly understating benefits of an RSO in all scenarios studied. The graph below shows the quantified benefits (in black) and the estimated unquantified benefits to California in scenarios 1A, 2 and 3. Following the graph is a matrix showing the estimated size of the unquantified benefits and explanatory notes for each row in the matrix.

Comment on regional net benefits analysis:

The signatories to these comments appreciate the amount of work and information sharing that has gone into the development and presentation of the SB 350 studies and results. While we understand that the requirements of SB 350 called for specific analysis focused primarily on California impacts, we believe that California's undertaking has provided insight into the type of analysis necessary for more regional net benefit analysis. Specifically, we believe that it is critical to quantify, to the maximum extent possible, the understated benefits itemized herein, particularly the *near term impacts* (2020 timeframe), in order to create a comprehensive near term net-benefits analysis.

Estimates of the Size of Unquantified Benefits in the SB350 Study						
	1. 2020 ISO+PAC regional market		2. 2030 Regional - PMAs and current procurement		3. 2030 Regional - PMAs and regional procurement	
	CA only	PAC	CA only	West-wide	CA only	West-wide
1. Increased system reliability due to creating a larger Western market that improves pricing, congestion management, generation commitment, real-time operations, and system visibility/monitoring						
1.1 The study does not quantify the improved reliability that an RSO brings. Greater visibility into the system and the RSO's ability to rapidly respond across a large footprint will reduce the number, duration and severity of blackouts. Control of a large RSO transmission system and rapid redispatch improves the capability of the system to respond to contingencies. An RSO that consolidates BAAs will also lower the cost of complying with NERC reliability standards.						
1.2 An RSO lowers frequency response procurement costs to comply with upcoming NERC requirements. At present the CAISO is planning to issue an RFP to acquire frequency response capabilities from outside its current footprint.						
1.3 The study assumes normal weather and normal loads in all Balancing Areas (i.e., no diverging or extreme weather events that would create abnormal regional flows). An RSO can more rapidly and efficiently forecast and adjust for abnormal weather and loads.						

Estimates of the Size of Unquantified Benefits in the SB350 Study						
	1. 2020 ISO+PAC regional market		2. 2030 Regional - PMA's and current procurement		3. 2030 Regional - PMA's and regional procurement	
	CA only	PAC	CA only	West-wide	CA only	West-wide
1.4 The study assumes fully intact transmission system (i.e., no transmission outages that would create N-2 conditions and more severe transmission constraints than those specified). An RSO redispatch can more quickly and economically dispatch around an N-2 event than the current bilateral system.						
1.5 The study imposes a 25% local minimum generation requirement in LADWP. Eliminating this constraint lowers costs.						
1.6 The study assumes current LADWP operating reserve requirements. LADWP is not presently part of any reserve sharing group. Should LADWP join the RSO, the benefits would include reduced reserve costs that were not captured in the SB 350 studies						
2. Improved use of the physical capabilities of the existing grid both on constrained WECC transmission paths and within the existing WECC balancing areas						
2.1 The assumed direct transfer capacity between CAISO and PAC (776 MW) does not account for the big boost in transfer capacity if other utilities (e.g., NV Energy) join the RSO. Increases in transfer capacity limits enable greater economic flows across the RSO footprint.						

Estimates of the Size of Unquantified Benefits in the SB350 Study						
	1. 2020 ISO+PAC regional market		2. 2030 Regional - PMAs and current procurement		3. 2030 Regional - PMAs and regional procurement	
	CA only	PAC	CA only	West-wide	CA only	West-wide
2.2 The study uses existing WECC path limits that constrain flows below the physical capability of the system. Path limits and path flows would increase under an RSO. Additionally, the presently fragmented operation of the western grid makes it very difficult to implement new technologies. The experience with other RTOs is path limits and ATC increase.						
3 An RSO can avoid construction of redundant transmission projects. Planning transmission over a bigger footprint reduces the likelihood that redundant or undersized transmission gets built. Under the current balkanized transmission planning and construction system transmission lines have been built that would not have been needed if planning and construction had occurred over a broader footprint.						
4. Improved risk mitigation from a more diverse resource mix and larger integrated market that can better manage the economic impacts of transmission and major generation outages and better diversify weather, hydro, and renewable generation uncertainties						
5. The study assumes no improved efficiency and availability of power plants. Experience in other RTOs is that competition improves power plant efficiency and availability.						

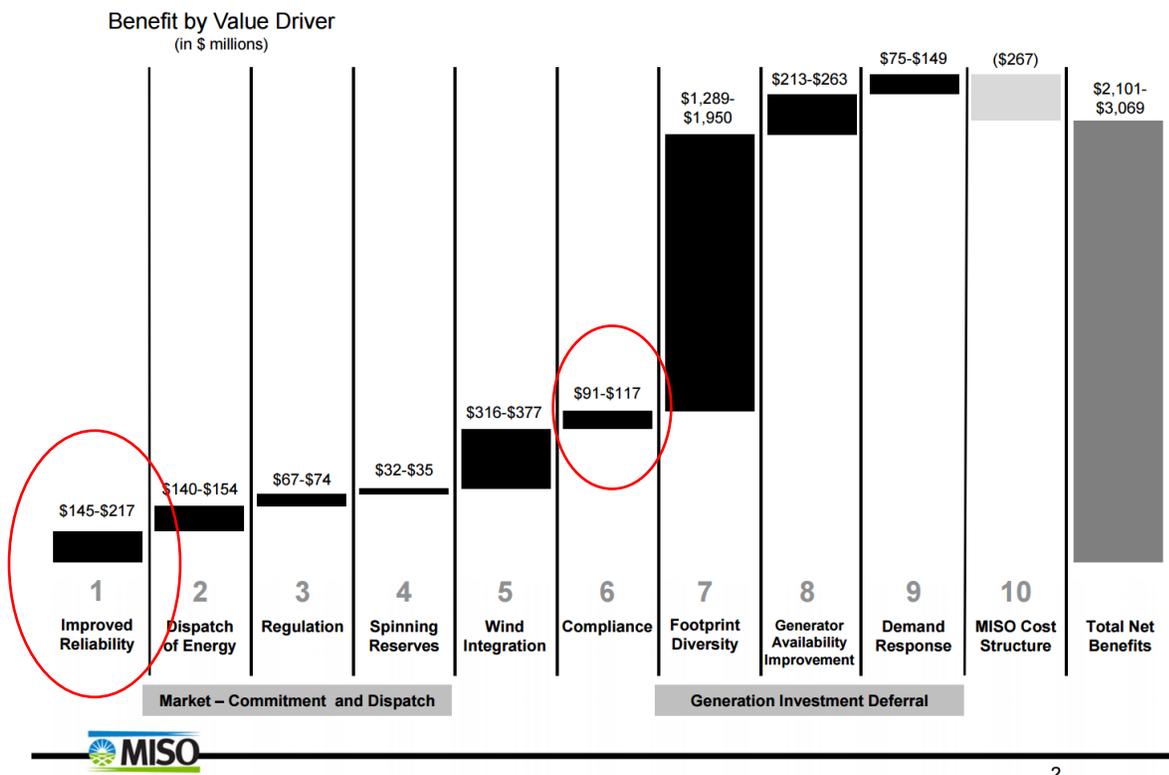
Estimates of the Size of Unquantified Benefits in the SB350 Study						
	1. 2020 ISO+PAC regional market		2. 2030 Regional - PMAs and current procurement		3. 2030 Regional - PMAs and regional procurement	
	CA only	PAC	CA only	West-wide	CA only	West-wide
6. The level of renewable that will be built outside of CA beyond those required to meet current RPSs or contained in current utility IRPs is unrealistically low. There is a high probability that renewables beyond those required by RPSs will be built and that the benefits of an RSO in lower integration costs will be larger than estimated.						
7. Assumed coal retirements are limited to those in 2024 TEPPC common case and current IRPs. More coal retirements mean more available existing transmission that would: enable delivery of power from renewable rich areas thus increasing savings from an RSO's ability to efficiently integrate renewables; and increase dispatch flexibility.						
8. The study assumes that all new transmission to reach out-of-state renewables for CA RPS compliance will be paid for by CA consumers. In reality, with bigger footprint, transmission built by an RSO will capitalize on economies of scale in transmission construction to access distant renewables which would benefit consumers inside and outside CA.						
9. The study assumes no new carbon constraints in California or in other states beyond those in current law or required by the Clean Power Plan. Greater carbon constraints are likely and an RSO offers the benefit of lowering cost of integrating new low carbon generation.						

Estimates of the Size of Unquantified Benefits in the SB350 Study						
	1. 2020 ISO+PAC regional market		2. 2030 Regional - PMAs and current procurement		3. 2030 Regional - PMAs and regional procurement	
	<i>CA only</i>	<i>PAC</i>	<i>CA only</i>	<i>West-wide</i>	<i>CA only</i>	<i>West-wide</i>
10. Because of transparent pricing in an RSO, hydro operators are likely to improve the economic efficiency of their dispatch. This benefit would grow substantially above \$50 million per year if Power Market Administrations were part of the RSO.						
High (more than \$50 million/year)						
Medium (\$10-50 million/year)						
Low (less than \$10 million/year)						

Notes on Rows in Matrix

Row 1.1: See [Federal Energy Regulatory Commission staff paper Qualitative Assessment of Potential Reliability Benefits from a Western Energy Imbalance Market](#), 2/26/2013 and Appendix E from the CAISO May 24 SB 350 study results slides. Our estimate of the unquantified system reliability benefits (\$0-\$10 million each for California and PacifiCorp in the ISO+PAC 2020 scenario and \$10-\$50 million for California and \$50 million+ west-wide in the 2030 scenarios) may be conservative given MISO’s experience. The graph below from [MISO’s 2015 Value Proposition](#) shows reliability benefits of between \$145-\$217 million.

The MISO 2015 Value Proposition



Row 1.2: CAISO is beginning the process of acquiring frequency response capability from other BAAs. CAISO may also have untapped frequency response capability in its existing footprint (e.g., DWR resources). Smaller BAAs may not have available frequency response capabilities.

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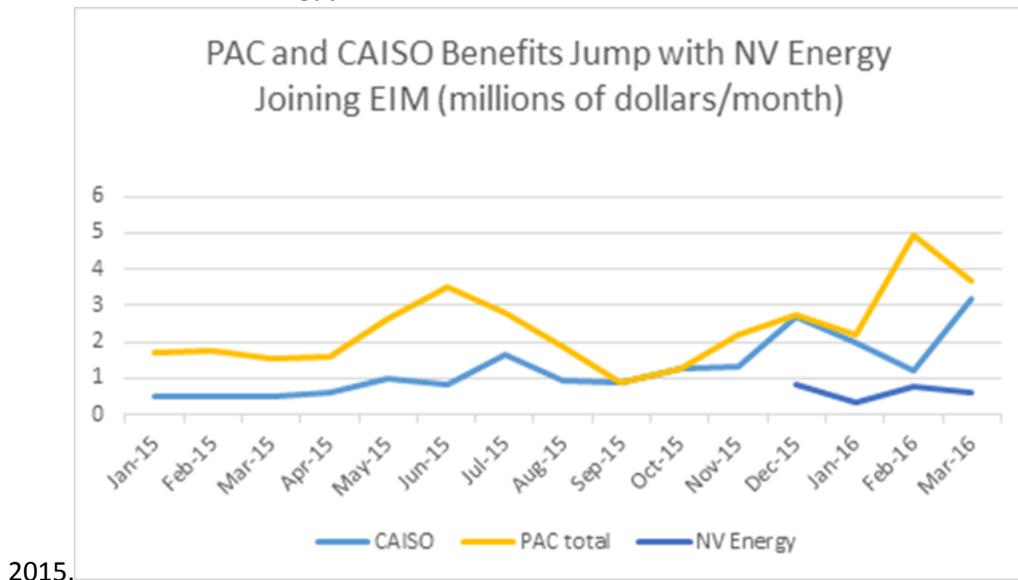
Row 1.3: Extreme weather events are more likely given climate change. A broad footprint RSO can have more tools to respond to extreme weather events and the capability to rapidly redispatch generation over that broad footprint.

Row 1.4: Estimates of benefits from RSO greater ability to respond to outages will vary widely, particularly given infrequent, but extraordinarily costly cascading outages (e.g., 2011 Southwest Outage). Of course, the EIM will also help respond to unplanned outages in real time, which is why unquantified incremental benefits in this category are limited to \$0-10 million.

Row 1.5: While the SB 350 study treats LADWP as part of the CAISO; it does not eliminate an artifact of current operations, namely a requirement that 25% of LADWP’s generation is local. This assumption limits the benefits in all RSO scenarios by \$0-\$10 million annually. [Production Cost Study Assumptions and Methodology \(Early-Release\)](#), p.3

Row 1.6: LADWP would have lower reserve requirements if it were part of a reserve sharing arrangement, which is what an RSO provides. We estimate that this would reduce reserve costs between \$0-10 million annually.

Row 2.1: The assumed limits on transfer capacity between CAISO and PacifiCorp (776 MW) do not reflect the possibility that other utilities (e.g., NV Energy) would join the RSO. Just adding NV Energy to the RSO would increase transfer capacities from the CAISO by more than 4,000 MW, even without construction of many proposed big projects that would vastly increase transfer capacity (e.g. TransWest Express, Cross-Tie, Gateway, Zephyr, and LS Power’s SWIP North). This potential increase in PAC and CAISO benefits from NV Energy participation is illustrated in the graph below, which shows benefits increased when NV Energy joined the EIM in December



Therefore, we believe the CAISO/PacifiCorp scenarios underestimates benefits of an RSO by more than \$10-50 million annually in the 2020 scenario (and by a greater amount in 2030). We assume the study results accurately capture the value of increased transfer capacity in the west-wide scenario. The benefits of increases in transfer capacity have been found when other RSO were formed. ([Summary of Other Regional Market Impact Studies](#), p. 13.)

Row 2.2: By assuming current path ratings the study underestimates transfer capacity over the existing wires when the system is run by an RSO.

- Unlike what happens today with the current fragmented operation of the grid, an RSO could:
 - Make greater use of Remedial Action Schemes (RAS); and
 - Eliminate existing of transfer limits because of greater coordinated operation (e.g., coordinated operation of the AC and DC Pacific Interties), reduce simultaneous path limits (e.g., West of Borah) and make greater use of dynamic ratings.
- With an RSO new technologies can be efficiently applied within the RSO footprint that will increase transfer capacity over existing wires (e.g., FASTC or dynamic path rating methodology, strategic placement of storage devices in the bigger grid to address voltage issues).
- The RTO West Study (2002) suggests that an RTO would increase the effectively Available Transmission Capacity (ATC) over major transmission lines. While this study may be generally dated, the conclusions have relevance today in that better system utilization is generally accepted to provide additional capacity. The benefits associated with increased ATC are incremental to the production cost savings that result from de-pancaked transmission charges and region-wide security-constrained dispatch. ([Clean Energy and Pollution Reduction Act Senate Bill 350 Study Summary of Other Regional Market Impact Studies \(Early-Release\)](#))
- The Basin/WAPA study (2013) makes the qualitative point that—because congestion management based on point-to-point transmission reservations and the curtailment of scheduled transactions is less efficient than how congestion is managed in production cost simulations—the savings associated with participation in an RTO would be underestimated. Ibid.
- Similarly, the SPP/Entergy Cost-Benefit Analysis (2010) describes that the inefficiencies at the seam between the Entergy and the SPP systems in the “Not Joint-RTO” case, if fully simulated, would increase the value of integration compared to model results. Ibid.
- The extent to which markets can utilize the existing grid more fully has been documented by analyzing how much of the available transmission capability remains unutilized in traditional bilateral markets. For example, an analysis of RTO market benefits by the Department of Energy (DOE) assumed that improved congestion management and internalization of power flows by ISOs result in a 5–10% increase in the effective transfer capabilities on transmission interfaces. Ibid.
- Similarly, a study of congestion management in MISO’s “Day-1” market found that, during 2003, available flowgate capacities were underutilized by between 7.7% to 16.4% on average within MISO subregions during curtailment (so-called “TLR”) events. Ibid.

Increase transfer capacity on the existing grid will increase RSO benefits by \$0-10) million for both California and PAC in the 2020 scenario and by more than by \$50 million+ in all the 2030 scenarios.

Row 3: Any progress in eliminating unneeded construction of new transmission will yield large benefits because the cost of building new transmission is high. See table from [CAPITAL COSTS FOR TRANSMISSION AND SUBSTATIONS, Updated Recommendations for WECC Transmission Expansion Planning](#), 2014.

Table 2-1 Baseline Transmission Costs

LINE DESCRIPTION	NEW LINE COST 2014 (\$/MILE)
230 kV Single Circuit	\$959,700
230 kV Double Circuit	\$1,536,400
345 kV Single Circuit	\$1,343,800
345 kV Double Circuit	\$2,150,300
500 kV Single Circuit	\$1,919,450
500 kV Double Circuit	\$3,071,750
500 kV HVDC Bi-pole	\$1,536,400
600 kV HVDC Bi-pole	\$1,613,200

Assumptions: Aluminum Conductor Steel Reinforced (ACSR), Tubular (230 kV)/ Lattice (345 kV – 600 kV), > 10 miles

We estimate the savings from RSO broad regional transmission planning to be greater than \$50 million annually in 2030 for both California and the rest of the West.

Row 4: A broad footprint RSO has greater capabilities to economically respond to generation and transmission outage than do 38 separate BAs. This enhanced response capability will be increasingly valuable as the generation mix moves toward weather dependent wind and solar. It will also improve the capability of California and the region to address drought caused shortages in hydro production, an increasingly likely occurrence with climate change.

Row 5: For example, the 2015 MISO Value Proposition report includes “Generator Availability Improvement” as a benefit of operating within the RTO and estimates its magnitude by using observed increases in availability since the start of market operations. The study found that availability improved by 1.5% from 2000 to 2014 and estimated associated savings of \$210–\$260 million/year. Other informal assessments, including ones conducted by the Electric Power Supply Association, NYISO, and Navigant, report increased power plant efficiency coincident with the introduction of markets. The Navigant study reported that the availability of nuclear units operating in NYISO, MISO, and PJM had increased from 81% in 1996 (before regional markets were implemented) to 93% in 2007 (after Day-2 markets were established in all these regions.).

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If these plant efficiency and availability gains materialize due to the increased transparency and competition of a regional market, the potential effects on California and the rest of the WECC could be significant. While power plants in California are already operating in such a market environment, the rest of the region is not. For example, the 2002 National RTO study evaluated a scenario featuring a 6% improvement in fossil generation efficiencies and a 2.5% increase in fossil unit availability. That study found that the assumed efficiency and availability improvements associated with market integration reduced production cost by an additional 4.5%. While California generators already are subject to strong market-based incentives, given California's dependence on imports it would benefit from the efficiency improvements across the WECC. ([Summary of Other Regional Markets Impacts](#), p. 7)

Row 6: Given declining wind and solar costs, the assumption that few renewables other than those needed to meet current RPSs is highly unlikely. Costs will continue to decline due to global market conditions, and economies of scale to supply the developing world. Below are useful references:

- <http://bit.ly/28LHtmf>. A Year for the Record Books, *Year for the Record Books*, Tracking the Energy Revolution—Global 2016 edition, February 2016, © 2016 Clean Energy Canada ISBN: 978-0-9950609-0-6
- [“U.S. Solar Growth Will More Than Double in 2016, Study Finds,”](#) Ryan, Joe, *Bloomberg News*, March 8, 2016.

In some areas outside CA, wind is already the lowest cost new resource. An RSO would provide significantly higher benefits as the penetration of renewable generation increases. PacifiCorp's [2016 update](#) to its 2015 IRP highlights additional likely reductions in fossil fuel generation (e.g., Naughton 3 gas conversion eliminated, accelerated retirement of Cholla 4, new RPS requirements in Oregon, and plans to capitalize on extension of federal renewable tax credits). This trend may lead to greater than expected acquisition of wind and solar by PacifiCorp in the near-term adding between \$10-\$50 million in benefits in 2020 and more than \$50 million in 2030 due to lower integration costs with an RSO. Policy drivers enacted recently by states (including Oregon SB 1547) are also affecting this trend. West-wide in 2030 we are likely to see significantly more wind and solar generation than assumed in the SB 350 study. This will result in annual savings of more than \$50 million due to lower integration costs.

Row 7: The CAISO study assumes the level of coal retirements in the WECC 2024 Common Case and in current utility IRPs. It is likely that additional retirement will occur due to low gas prices, emission reduction requirements due to the EPA Regional Haze regulation, GHG regulation and state policies (e.g., Oregon, Washington) to eliminate coal from rate base. Many existing coal power plants are located far from load centers and often in high wind and solar resource areas. Additional coal retirements will free up transmission to move low cost wind and solar to load centers. The freed-up transmission capacity will also enable greater dispatch flexibility for the RSO. Lowering renewable integration costs and increasing dispatch flexibility will provide an additional estimated RSO benefit to California and PacifiCorp of \$0-10 million each in 2020 and more than \$50 million in each of the 2030 scenarios.

Row 8: The construction of major new transmission by 2030 is likely to provide benefits to more than just CAISO. Thus it is unrealistically conservative to assume that the cost of such transmission is borne solely by the current CAISO footprint. Indeed, the CAISO TAC straw proposal would allocate the cost of

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RSO-approved transmission projects to all beneficiaries of such projects. The CAISO straw proposal also notes that projects built to serve RPS needs in California are likely to generate additional benefits to parties outside of California. The study assumption that CAISO pays for all new RSO transmission that provides some benefits to the current footprint results in an understatement of benefits of more than \$50 million in all 2030 scenarios. (Assumption that California pays all new transmission cost comes from [*Stakeholder Comment and ISO Responses from February 8, 2016 Study Proposal*](#), p. 12).

Row 9: It is likely, particularly by 2030, that we will experience additional limits on carbon emissions, beyond existing limits in California and those required by the Clean Power Plan. For that reason we believe omitted benefits will exceed \$50 million in the CAISO + PAC and West-wide scenarios in 2030.

Row 10: Our estimate of California's gains from more efficient dispatch of hydro generation (less than \$10 million for California in the 2020 and 2030 cases and \$10-50 million west-wide) would increase significantly if the Power Marketing Administrations (WAPA and BPA), which dispatch most of the hydro in the U.S. portion of the Western Interconnection, were included in the analysis.