



2015-2016 Transmission Planning Process: Follow-up Stakeholder Call

February 26, 2016

Today's Agenda

Topic	Presenter
Opening	Kim Perez
Large Scale Energy Storage Special Study <ul style="list-style-type: none"><li data-bbox="193 592 579 635">• Some observations	Shucheng Liu
Economic Planning Study Final Recommendation	Yi Zhang
Wrap-up and Next Steps	Kim Perez



A Bulk Energy Storage Resource Case Study with 40% RPS in 2024

Shucheng Liu

Principal, Market Development

*2015-2016 Transmission Planning Process: Follow-up Stakeholder
Meeting*

February 26, 2016

Some observations

- Original 40% RPS portfolio is solar-dominant (53% in capacity)
- Wind overbuild increases diversity of the RPS portfolio and shows more benefits than solar overbuild
 - Requires less overbuild than solar due to less incremental curtailment from the overbuild
 - Has lower CO₂ emission and production costs than solar due to less steep ramping

Some observations (cont.)

- Bulk storage brings benefits in all cases
 - Reduced curtailment, CO₂ emission, production costs and overbuild of renewables to achieve the 40% RPS target
- Bulk storage is better utilized with solar-dominant RPS portfolio than more diversified
 - Capturing more renewable curtailment in midday
 - Moving more energy to the evening and morning
 - Reducing more production cost and CO₂ emission

Some observations (cont.)

- Bulk storage benefit to cost ratios dependent on
 - Storage costs
 - Mix of renewable resources
 - Renewable curtailment price
 - Other assumptions

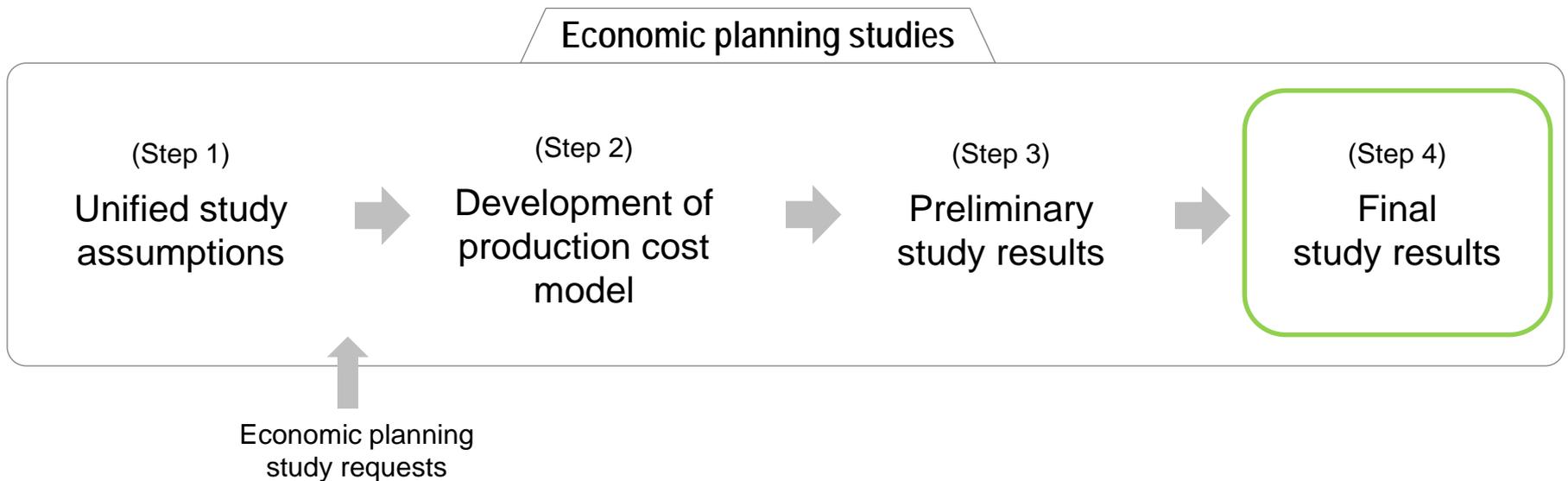


Economic Planning Study Final Recommendations

Yi Zhang
Regional Transmission Engineer Lead

2015-2016 Transmission Planning Process Stakeholder Meeting
February 18, 2016

Steps of economic planning studies



Major changes since last stakeholder meeting

- Modeled additional contingencies identified in reliability and policy studies
- Updated contingencies with SPS as identified in operating procedures and in reliability and policy studies
- Modeled Panoche-Oro Loma 115 kV upgrade

Congestions

No	Aggregated congestion	2020		2025	
		Costs (k\$)	Duration (hr)	Costs (k\$)	Duration (hr)
1	Path 26	6,885	564	3,421	226
2	POE-RIO OSO	1,329	85	1,429	75
3	Exchequer	946	631	1,113	599
4	Path 45	616	366	1,022	245
5	Delevan-Cortina	1,723	111	510	36
6	Path 15/CC (Central California)	141	21	376	20
7	COI	736	286	255	97
8	PG&E LCR (aggregated)	354	43	128	38
9	Inyo-Control	17	16	21	19
10	Lugo - Victorville	0	0	14	1
11	Path 24	0	0	5	5
12	Path 25	5	9	3	4
13	SCE LCR (aggregated)	3,565	75	0	0
14	Vincent bank	24	1	0	0
15	WARNERVL - WILSON	141	40	0	0
16	West of Devers	27,321	621	0	0

Evaluating economic planning study requests

- Nine study requests have been accepted and evaluated
- Evaluations followed the ISO Tariff Section 24.3.4.1
- Detail evaluation results can be found in the transmission plan report

High priority studies

Selected study	Reasons for selection
Path 26	Recurring congestion with relatively high cost
Exchequer	High congestion cost
POE-RIO OSO	High congestion cost
Path 15/Central California	Recurring congestion with relatively high cost
COI	Recurring congestion with increasing congestion cost

Path 26 and Path 15/CC studies

- Evaluation
 - These two congestions were identified in the previous planning cycles
 - No economic justifications were seen for network upgrades before
 - No significant changes in the system models in these two congestion areas
- Conclusion
 - No detailed production simulation and economic assessment
 - Will monitor and assess in the future cycles

Exchequer and POE-RIO OSO

- These two congestions are in hydro-rich areas
- Evaluation
 - Modeled generic projects that were assumed to increase the ratings to mitigate the congestions
 - Production cost simulations and economic assessments
- Conclusion
 - No economic benefits to ISO ratepayers based on the current production cost model
 - Will continuously monitor and assess these congestions in the future planning cycles

COI

- Evaluation
 - Congestion cost increased from the last planning cycle, but not material comparing with the cost of any potential upgrade
 - SWIP-North, a study request, was evaluated since it provides a parallel path to COI
- Conclusion
 - SWIP-North project does not bring sufficient benefit to the ISO's ratepayer
 - COI congestion will be re-evaluated in the future planning cycles

Summary

- No economic upgrade recommended for approval in the 2015~2016 planning cycle
- Several paths and related projects will be monitored in future planning cycles to take into account
 - Improved hydro modeling
 - Further consideration of suggested changes to ISO economic modeling
 - Further clarity on 50% renewable energy goal

Next Steps

Date	Milestone
March 3	Stakeholder comments to be submitted to regionaltransmission@caiso.com
No later than March 17	Post Revised Draft 2015-2016 Transmission Plan
March 24-25	Present Revised Draft Plan to ISO Board of Governors
No later than March 28	Post Final 2015-2016 Transmission Plan