Transmission Planning at the California ISO

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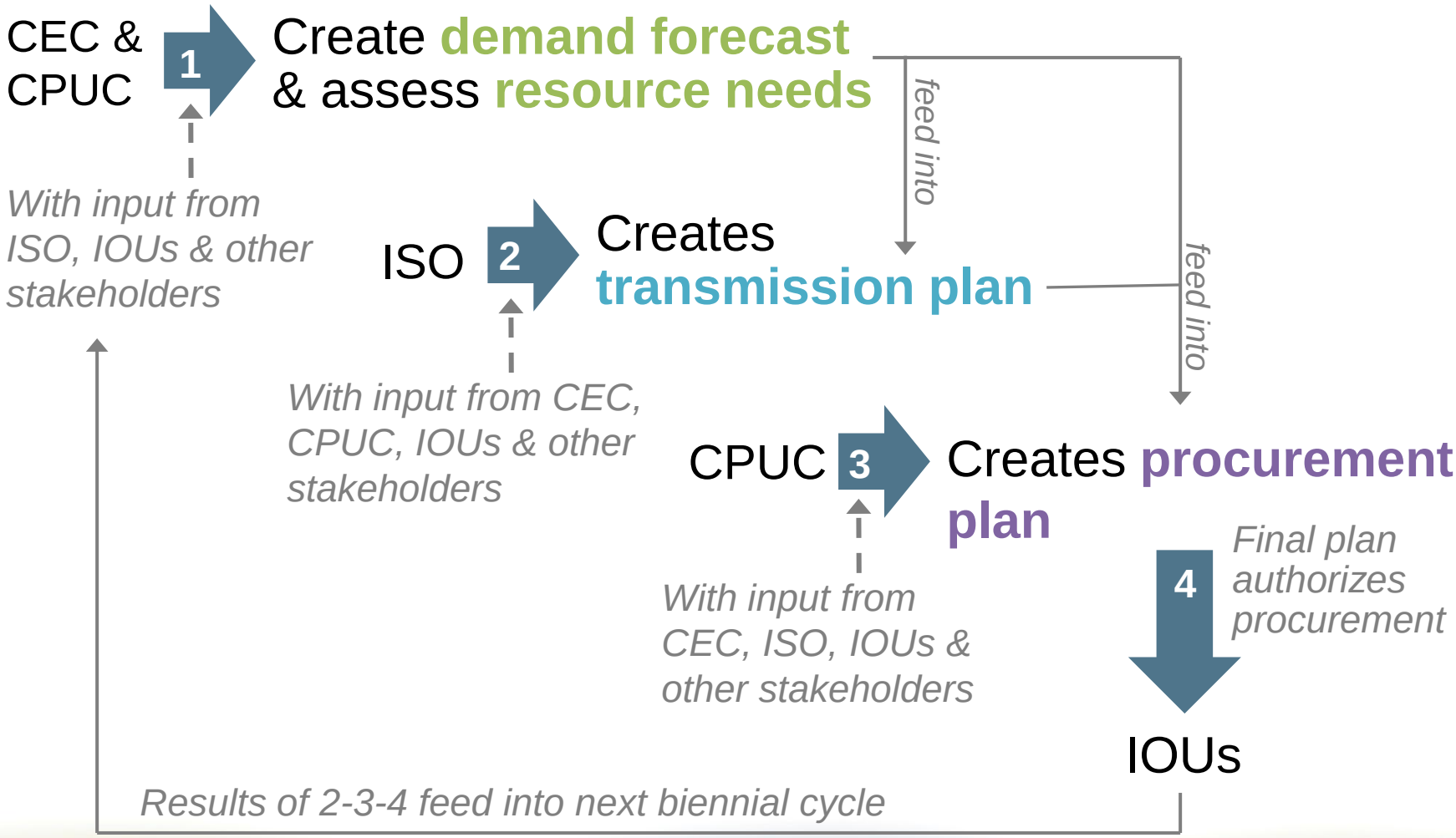
Energy Committee of the Western Regional Partnership
Webinar
April 23, 2015

The California ISO service area:

- **58,698** MW of power plant capacity
- **50,270** MW record peak demand (July 24, 2006)
- **26,500** market transactions per day
- **25,627** circuit-miles of transmission lines
- **30 million** people served

Transmission planning is coordinated with state processes:



What are the…

Demand forecast & resource needs

The **demand forecast (CEC)** projects peak-hour & annual energy demand 20 years forward, adjusted for energy efficiency, rooftop solar and demand response

Resource needs (CPUC) reflect RPS mandates, plus system adequacy, local area reliability and flexible capacity needs

Transmission plan

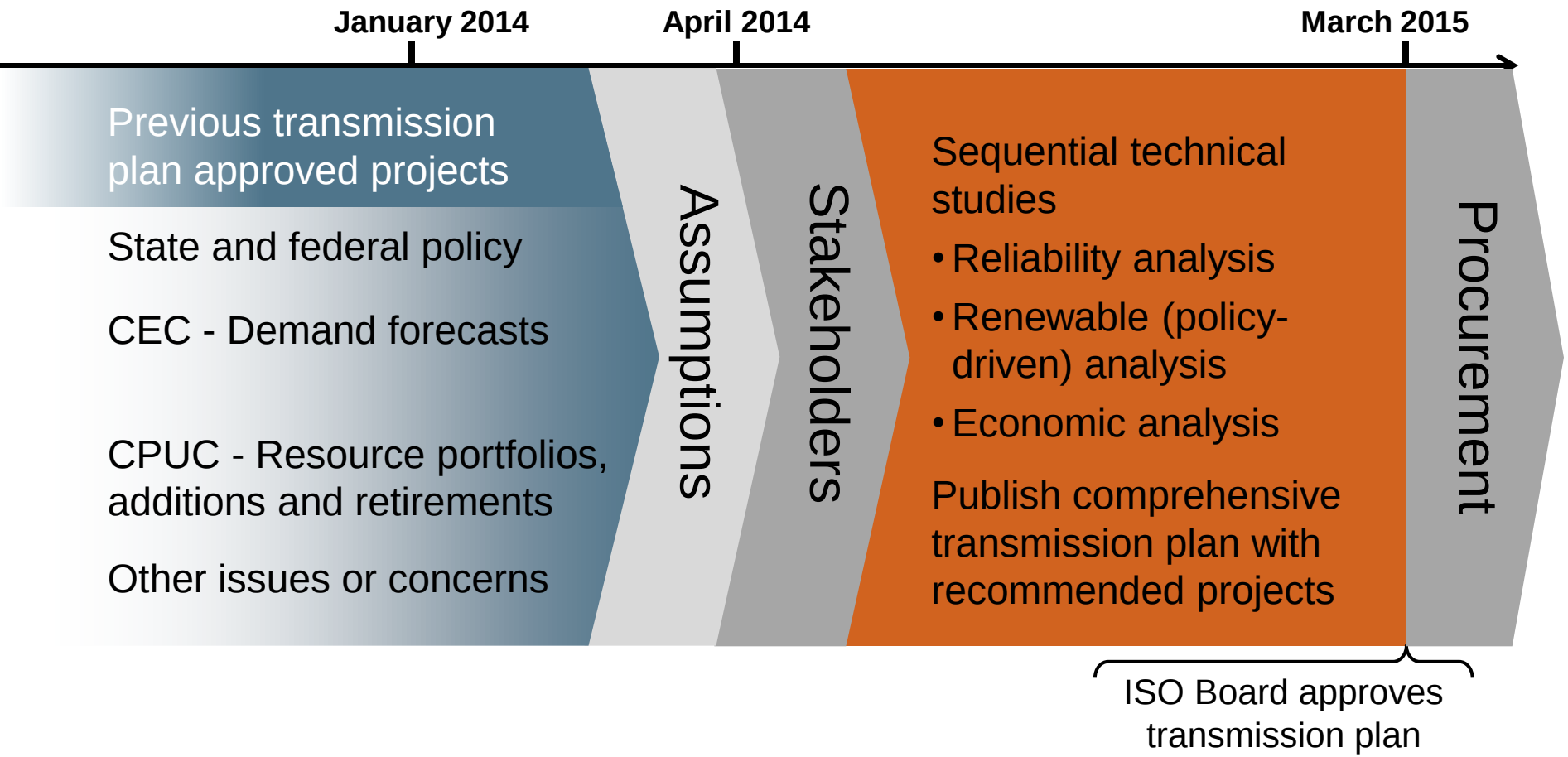
The **transmission plan (ISO)** specifies the set of new transmission lines, upgrades to existing lines or non-transmission alternatives needed to support the **resource needs** and **demand forecast**

Procurement plan

The **procurement plan (CPUC)** tells each IOU what it is authorized to procure to meet the **demand forecast** and **resource needs**, given the projects approved in the **transmission plan**

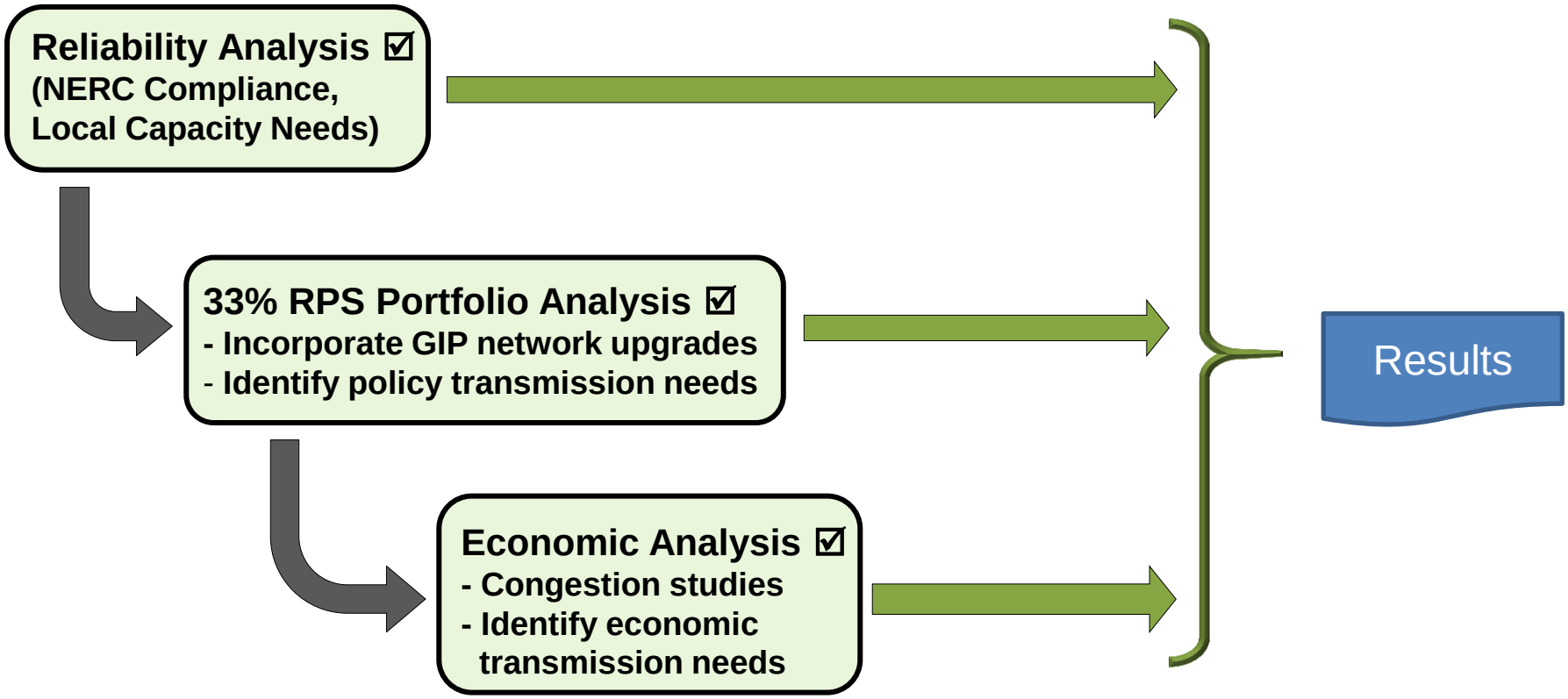
The **procurement plan** includes renewable & conventional resources, plus demand response, energy efficiency and distributed resources

The ISO “regional” annual transmission planning process results in approval of necessary projects each March.

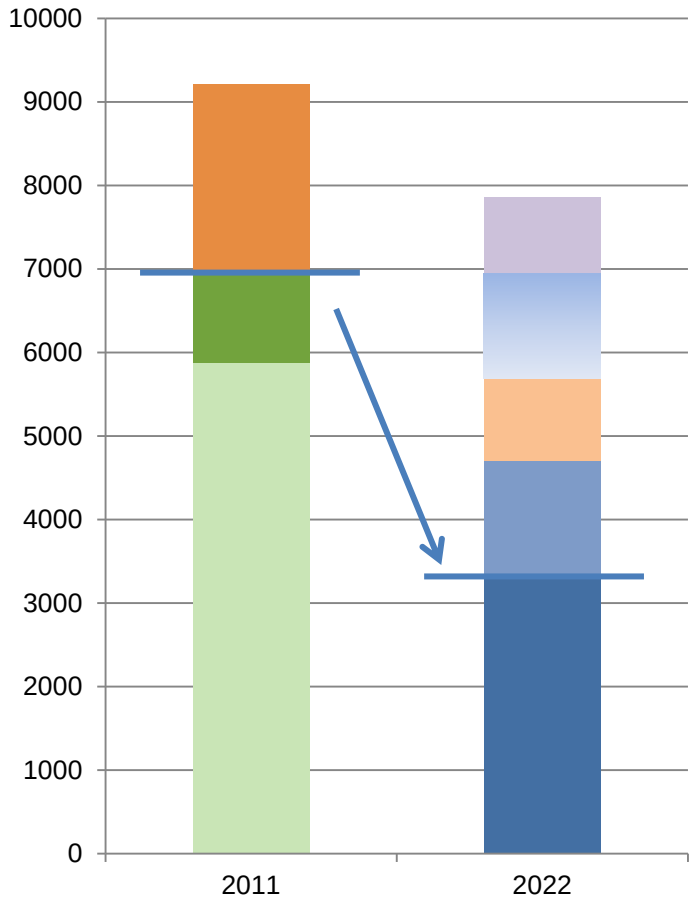


Iterative process repeats annually

The ISO planning process considers all aspects of transmission system needs:



Less than half of the gas-fired generation retiring in the LA Basin / San Diego area is being replaced with new gas generation – despite 3,000 MW of projected net load growth* and SONGS retirement.



- Maximum residual need
- Incremental Transmission Benefits
- Additional Achievable Energy Efficiency
- Other Preferred Resources and Storage
- Nuclear (SONGS)
- New Gas Resources

New Gas Generation

Walnut Creek	500
El Segundo Energy Center	550
Track 1 SCE - LA Basin Request	1200
Track 4 SCE - LA Basin (gas)	200
Track 1 SDG&E (Pio Pico/Escondido)	308
Track 4 SDG&E Request	550
Total	***3308***

Gas Retirements (2011-2022)

Encina	946
El Segundo #3	335
El Segundo #4	335
Alamitos	2011
Huntington Beach	904
Redondo	1342
Etiwanda	640
Long Beach	260
Cabrillo Power II	188
Total	***6961***

** The 2012 net load forecast growth in the LA Basin and San Diego already relies on approximately 2400 MW of incremental energy efficiency from approved programs and standards.*

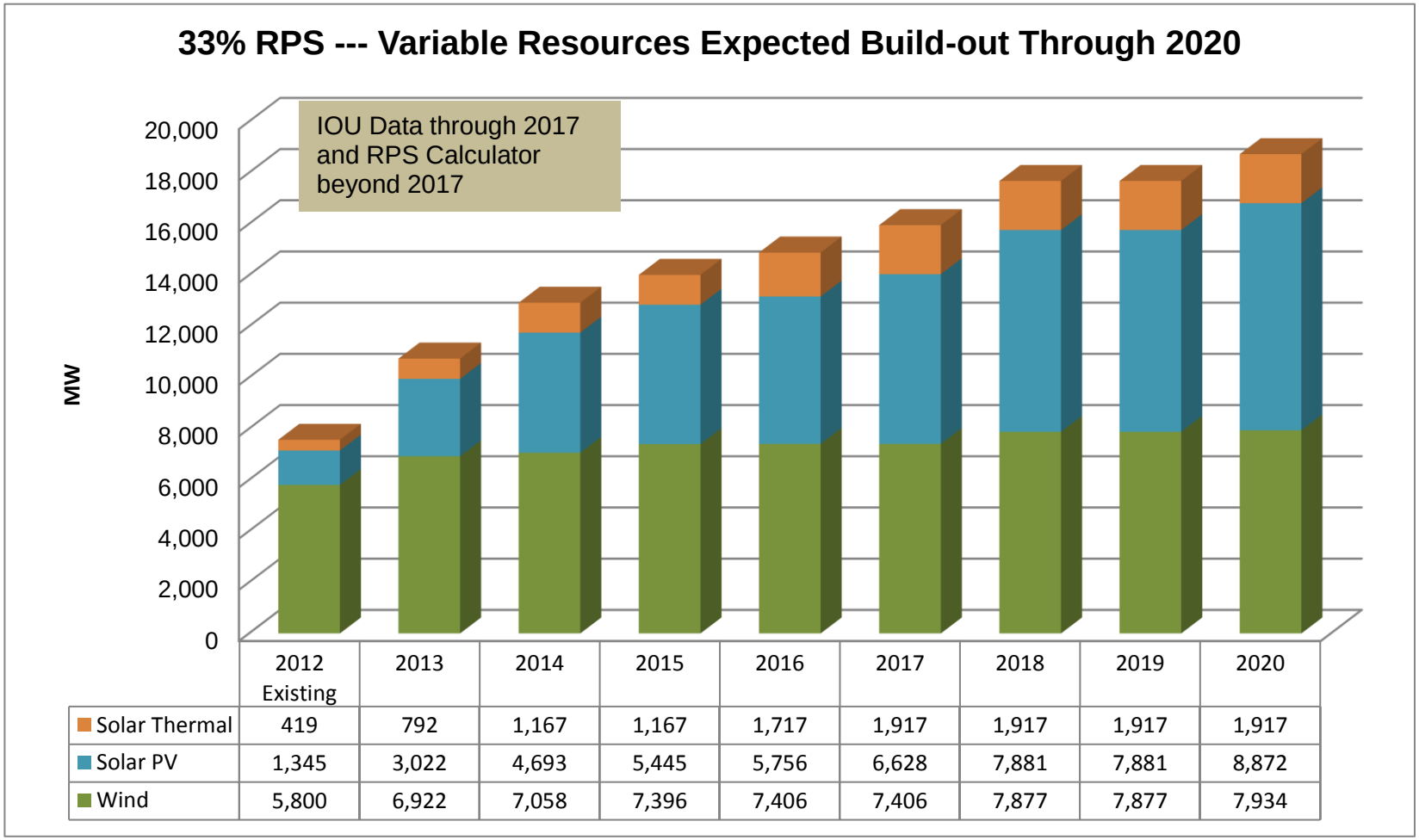
Transmission underway to meet 33% RPS in 2020

$6.5 B

	Transmission upgrade	Approval status		Online
		ISO	CPUC	
1	Carrizo-Midway	LGIA	NOC effective	energized
2	Sunrise Powerlink	Approved	Approved	energized
	Suncrest dynamic reactive	Approved	Not needed	2017
3	Eldorado-Ivanpah	LGIA	Approved	energized
4	Valley-Colorado River	Approved	Approved	energized
5	West of Devers	LGIA	Pending	2019
6	Tehachapi (segments 1, 2 & 3a of 11 completed)	Approved	Approved	2015
7	~~Cool Water-Lugo~~	~~LGIA~~	~~Pending~~	~~2018~~
8	South Contra Costa	LGIA	Not yet filed	2015
9	Borden-Gregg	LGIA	Not yet filed	2015
10	Path 42 reconductoring Imperial Valley C Station	Approved Approved	Not needed Not needed	2014 2015
11	Sycamore-Penasquitos	Approved	Not yet filed	2017
12	Lugo-Eldorado line reroute	Approved	Not yet filed	2015
13	Lugo-Eldorado and Lugo-Mohave series caps	Approved	Not needed	2016
14	Warnerville-Bellota recond.	Approved	Not yet filed	2017
15	Wilson-Le Grand recond	Approved	Not yet filed	2020

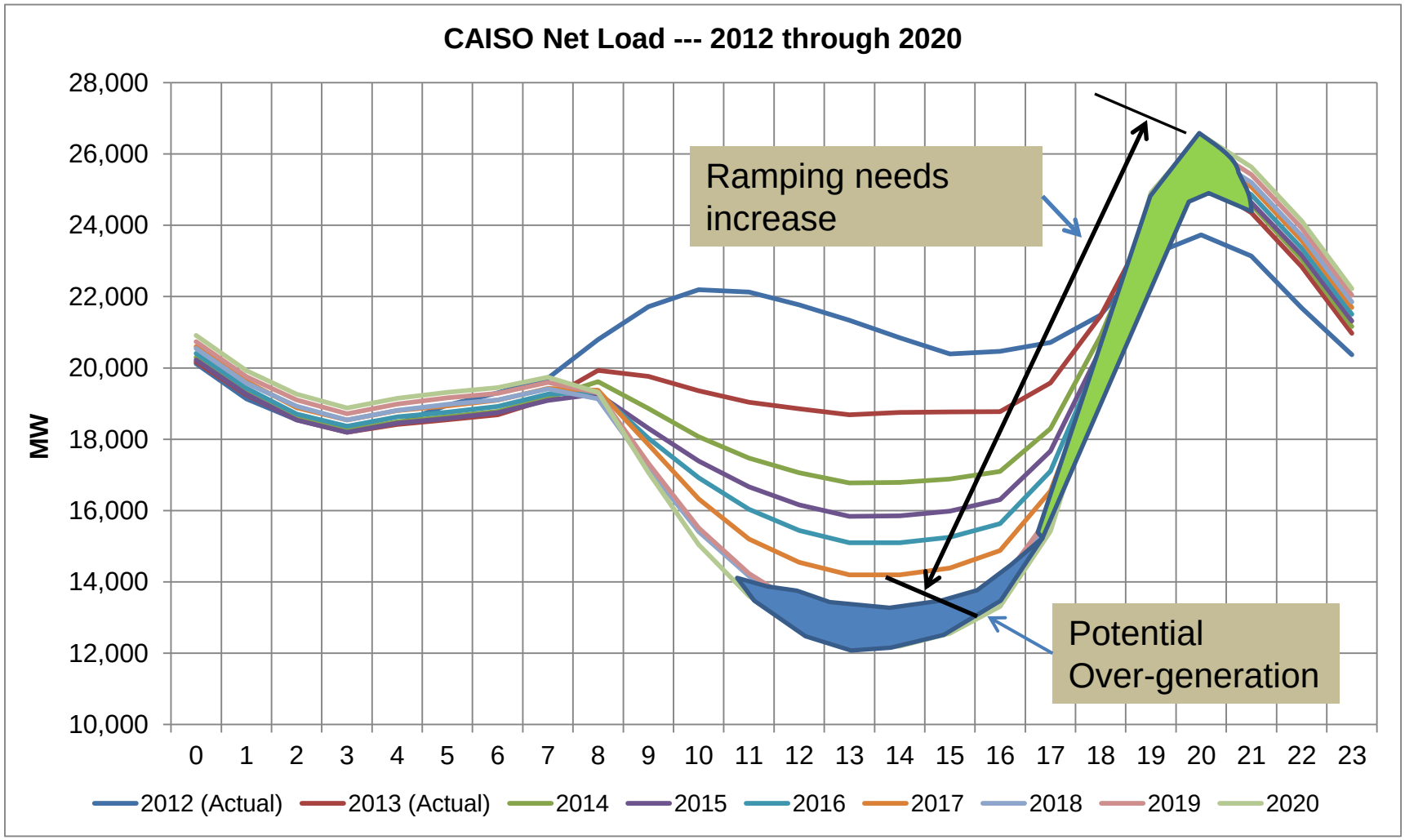
Based on 2013/14 Transmission Plan

Future Challenge – impact of 33% Renewable Portfolio Standard build-out through 2020



	2012 Existing	2013	2014	2015	2016	2017	2018	2019	2020
Solar Thermal	419	792	1,167	1,167	1,717	1,917	1,917	1,917	1,917
Solar PV	1,345	3,022	4,693	5,445	5,756	6,628	7,881	7,881	8,872
Wind	5,800	6,922	7,058	7,396	7,406	7,406	7,877	7,877	7,934

New tools and new approaches will be need to address potential over generation and ramping challenges



The 2014-2015 planning cycle was challenging:

- Further enhancements to the coordination with state energy agencies
- Continued emphasis on preferred resources, and increased maturity of study processes
- Continued analysis and contingency planning in the LA Basin and San Diego area
- Restoration of deliverability in Imperial area to pre-SONGS retirement levels
- Sensitivity analysis of Imperial area deliverability and the interaction with LA Basin/San Diego reliability needs.
- San Francisco Peninsula extreme event analysis
- “Over Generation” frequency response assessment
- Finalizing projects in the 2013-2014 cycle requiring further study :
  - Delany-Colorado River
  - Harry Allen –Eldorado (2013-2014 further study)

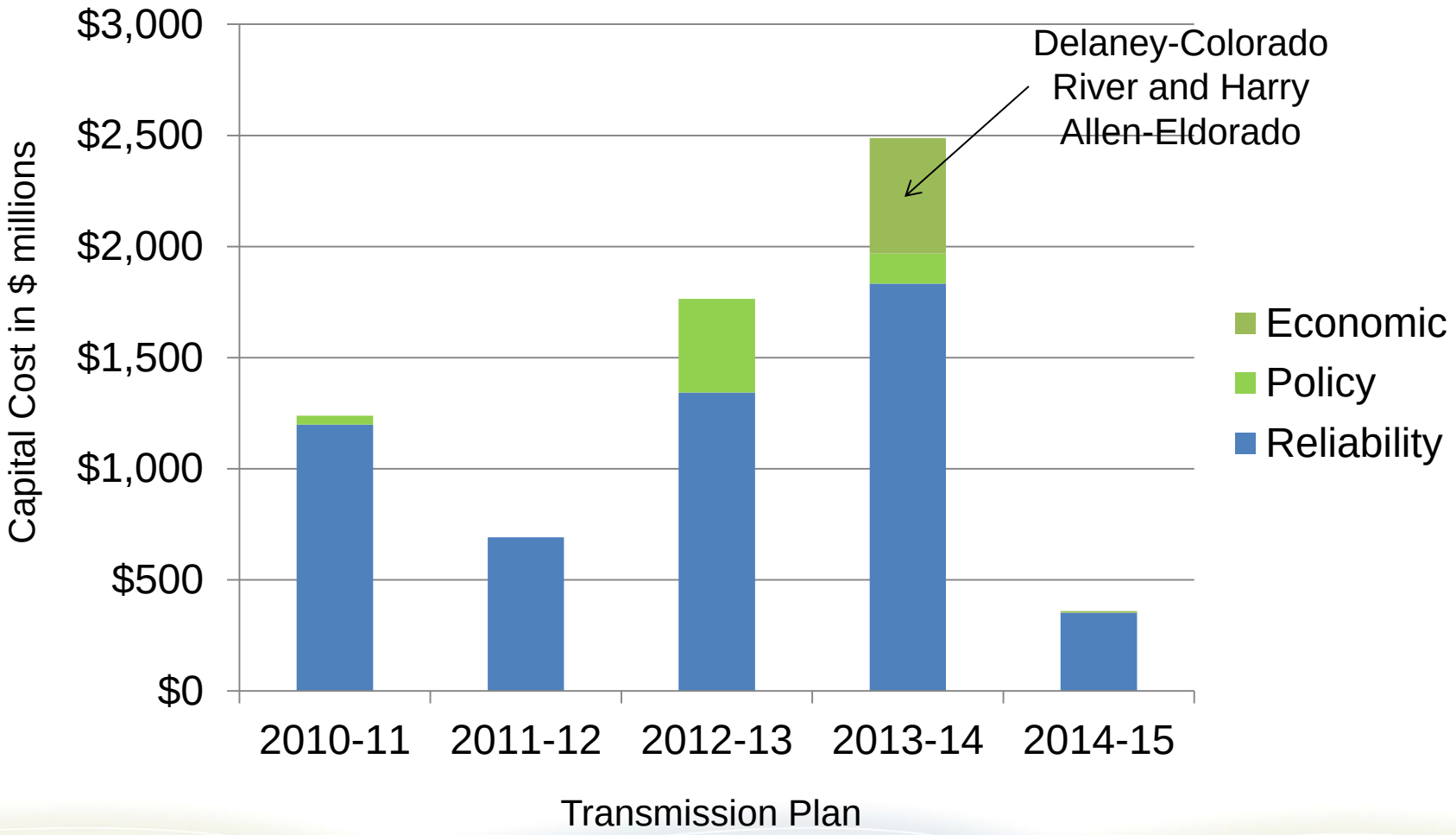
Summary of Needed Reliability Driven Transmission Projects

Service Territory	Number of Projects	Cost (in millions)
Pacific Gas & Electric (PG&E)	2	$254
Southern California Edison Co. (SCE)	1	$5
San Diego Gas & Electric Co. (SDG&E)	4	$93
Valley Electric Association (VEA)	0	0
Total	7	$352

Policy and Economic driven solutions:

- There were no policy-driven solutions identified
- One economically driven element has been identified:
  - Lodi-Eight Mile 230 kV Line
- Note that the Harry Allen-Eldorado and Delaney-Colorado River Projects were approved during 2014 based on further study in the 2013-2014 planning process

Transmission approvals over the last 5 years – over 30 projects a year until 2014-2015:



The CAISO's 2015-2016 transmission planning process is currently underway

- Transmission Planning Process Unified Planning Assumptions and Study Plan was finalized on March 31
- Study plan can be found at:

http://www.caiso.com/Documents/StakeholderInputfor2015-2016UnifiedPlanningAssumptions.htm

2015-2016 Plan challenges

- Monitor LA Basin and San Diego – depending on transmission, new conventional generation and preferred resources
- Confirm path for 33% Renewables Portfolio Standard
- Over generation, frequency response, voltage control
- New interregional transmission planning process
- New mandatory planning standards - TPL-001-4 in particular!
- Preparatory “informational” work on 50% Renewable Energy Goal for 2030

Governor Brown's announcement of a 50% renewable energy goal for California:

- The 50% renewable energy goal target date is 2030
- Considerable detail about the goal and how it will be assessed remains to be resolved
- It is not yet a formal state approved policy requirement, so in accordance with the ISO tariff, the ISO cannot use it as a basis for approving policy-driven transmission
- The ISO and the state energy agencies want to explore informational analysis to understand potential transmission implications of increased grid connected renewable generation – to the extent the goal ultimately calls for such generation

The ISO is therefore coordinating with the CPUC to perform a special study in the 2015-2016 TPP:

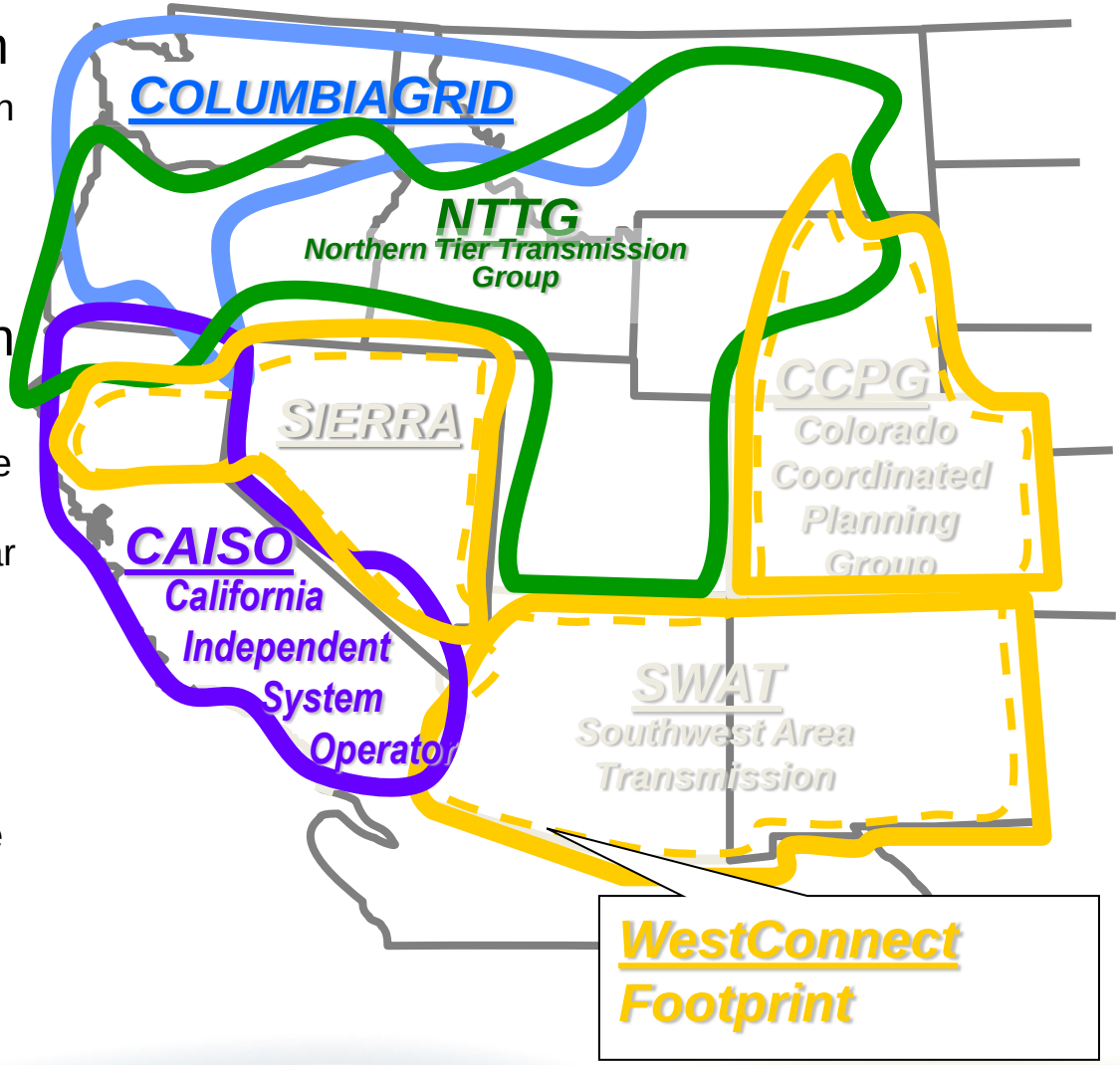
- The special study will:
  - be for information purposes only - will not be used to support a need for policy-driven transmission in the 2015-2016 planning cycle;
  - provide information regarding the potential need for public policy-driven transmission additions or upgrades to support a state 50% renewable energy goal; and
  - will help inform the state's procurement processes about the cost impacts of achieving 50% renewable energy goal
- The CPUC raised this study and discussed underlying issues in the recent February 10th and 11th RPS Calculator workshop

The Special Study will build on the 33% RPS work, but explore different approaches:

- Purely as a “boundary” study assumption, the ISO anticipates receiving a sensitivity portfolio based on a 50% RPS
- Transmission needs for 33% RPS have been based on providing full capacity deliverability status, which reduced but did not preclude possible curtailment
- In going beyond 33%, the special study will explore a new approach and assume the incremental renewable generation to be energy-only.
  - The study will estimate the expected amount of congestion-related curtailment of renewables that would likely result.
  - The study will also consider what transmission could then be rationalized based on cost effectively reducing renewables curtailment (from a customer perspective)

The ISO and our neighbors have an interregional coordination framework approved by FERC:

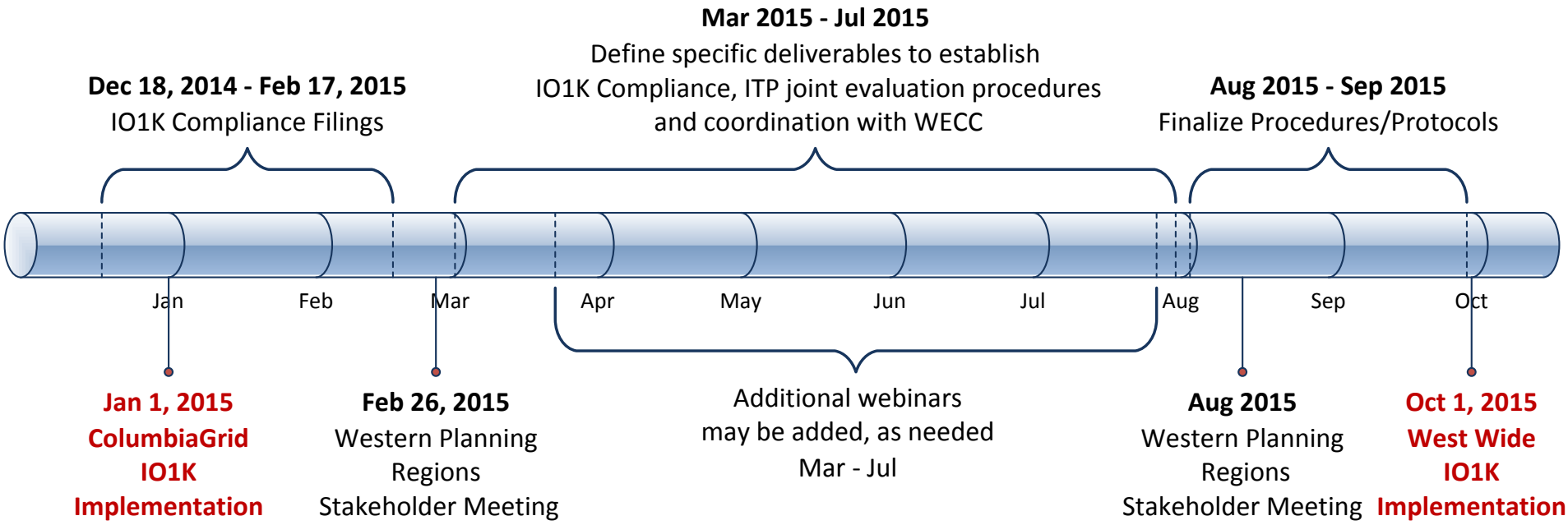
- Interregional coordination
  - Annual exchange of information
  - Annual public interregional coordination meeting
- Joint evaluation of interregional transmission projects
  - Biennial cycle; projects must be submitted no later than March 31st of any even-numbered year
- Interregional cost allocation
  - Each region determines (1) if project meets any regional needs and (2) if project is more cost effective or efficient than regional solution(s)
  - Costs shared in proportion to each region's share of total benefits



The ISO and other Western Planning Regions are currently planning under Order 1000 regional processes

- FERC Regional Orders have been issued for the California ISO and NTTG
- FERC Interregional Orders were issued on December 18, 2014
- Regions submitted compliance filings February 18, 2015
  - No comments were filed with FERC
- Regions are currently developing the process details for planning coordination
  - Details will be vetted through an ***open stakeholder process*** prior to west-wide Order 1000 IR implementation on October 1, 2015

Interregional Order 1000 Implementation Timeline & Stakeholder Input



* IO1K = Interregional Order 1000

Thank you

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