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Renewable Energy Transmission Initiative v2.0

Western Outreach Project

Portland Workshop

August 12, 2016

Bonneville Power Administration

Portland, Oregon

Brian Turner

RETI 2.0 Project Director

California Natural Resources Agency

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RETI 2.0 objectives and structure, California renewable energy goals, Transmission Assessment Focus Areas, and the Western Outreach Project

Renewable Energy Transmission Initiative v2.0
Objectives

- Statewide, non-regulatory planning effort to help meet statewide GHG and renewable energy goals.
- Explore combinations of renewable generation resources in California and throughout the West that can best meet goals
- Build understanding of transmission implications of renewable scenarios, and identify common transmission elements
- Identify land use and environmental opportunities and constraints to accessing these resources
- Accelerated, agency-driven, high-level assessment to inform future planning and regulatory proceedings

RETI 2.0 Policy Context

Governor's Executive Order B-30-15

- Established **40% GHG reduction goal by 2030**
- Mandates state agencies to **pursue with all statutory authority**

Clean Energy and Pollution Reduction Act of 2015 – SB 350

- CPUC and CEC increase **Renewable Portfolio Standard** from 33% by 2020 to **50% by 2030**
- Require **resource optimization** and an **Integrated Resource Planning (IRP) process**
- Ensure **utility progress toward economy-wide 40% GHG reduction** goal by 2030
- Encourages **widespread Transportation Electrification**

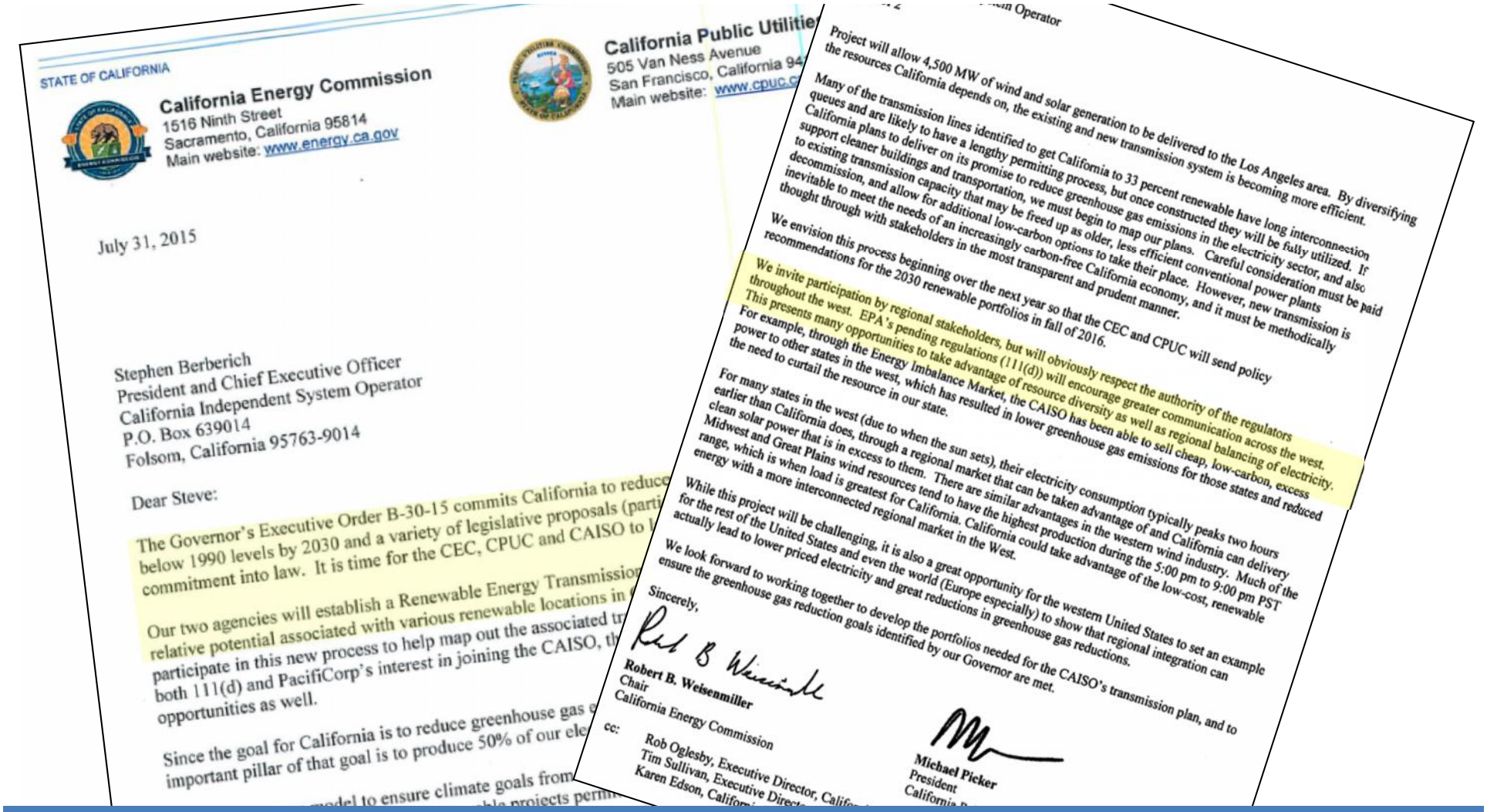
California Independent System Operator Transmission Planning

- Transmission Planning complete for 33%; "considerable work" necessary to plan for 50%
- FERC Order 1000 Interregional Transmission Planning
- Regional expansion proposal ongoing

Western developments

- Clean Power Plan
- Federal renewable energy tax credit extension
- State (OR, WA, NV, etc) RPS and GHG policy developments
- FERC Order 1000 Interregional Transmission Planning

RETI 2.0 Policy Context



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California Energy Commission
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Sacramento, California 95814
Main website: www.energy.ca.gov

California Public Utilities
505 Van Ness Avenue
San Francisco, California 94
Main website: www.cpuc.c

July 31, 2015

Stephen Berberich
President and Chief Executive Officer
California Independent System Operator
P.O. Box 639014
Folsom, California 95763-9014

Dear Steve:

The Governor's Executive Order B-30-15 commits California to reduce
below 1990 levels by 2030 and a variety of legislative proposals (parti
commitment into law. It is time for the CEC, CPUC and CAISO to

Our two agencies will establish a Renewable Energy Transmission
relative potential associated with various renewable locations in
participate in this new process to help map out the associated tr
both 111(d) and PacifiCorp's interest in joining the CAISO, th
opportunities as well.

Since the goal for California is to reduce greenhouse gas e
important pillar of that goal is to produce 50% of our ele

odel to ensure climate goals from
ble projects perm

Operator

Project will allow 4,500 MW of wind and solar generation to be delivered to the Los Angeles area. By diversifying the resources California depends on, the existing and new transmission system is becoming more efficient.

Many of the transmission lines identified to get California to 33 percent renewable have long interconnection queues and are likely to have a lengthy permitting process, but once constructed they will be fully utilized. If California plans to deliver on its promise to reduce greenhouse gas emissions in the electricity sector, and also support cleaner buildings and transportation, we must begin to map our plans. Careful consideration must be paid to existing transmission capacity that may be freed up as older, less efficient conventional power plants decommission, and allow for additional low-carbon options to take their place. However, new transmission is inevitable to meet the needs of an increasingly carbon-free California economy, and it must be methodically thought through with stakeholders in the most transparent and prudent manner.

We envision this process beginning over the next year so that the CEC and CPUC will send policy recommendations for the 2030 renewable portfolios in fall of 2016.

We invite participation by regional stakeholders, but will obviously respect the authority of the regulators throughout the west. EPA's pending regulations (111(d)) will encourage greater communication across the west. This presents many opportunities to take advantage of resource diversity as well as regional balancing of electricity. For example, through the Energy Imbalance Market, the CAISO has been able to sell cheap, low-carbon, excess power to other states in the west, which has resulted in lower greenhouse gas emissions for those states and reduced the need to curtail the resource in our state.

For many states in the west (due to when the sun sets), their electricity consumption typically peaks two hours earlier than California does, through a regional market that can be taken advantage of and California can delivery clean solar power that is in excess to them. There are similar advantages in the western wind industry. Much of the Midwest and Great Plains wind resources tend to have the highest production during the 5:00 pm to 9:00 pm PST range, which is when load is greatest for California. California could take advantage of the low-cost, renewable energy with a more interconnected regional market in the West.

While this project will be challenging, it is also a great opportunity for the western United States to set an example for the rest of the United States and even the world (Europe especially) to show that regional integration can actually lead to lower priced electricity and great reductions in greenhouse gas reductions.

We look forward to working together to develop the portfolios needed for the CAISO's transmission plan, and to ensure the greenhouse gas reduction goals identified by our Governor are met.

Sincerely,

Robert B. Weisenmiller
Chair
California Energy Commission

Michael Picker
President
California P

cc: Rob Oglesby, Executive Director, Calif
Tim Sullivan, Executive Direct
Karen Edson, Californ

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RETI 1.0 and 2.0

RETI 1.0

- 2008-2010 Stakeholder-driven process when CA RPS going from 20% to 33%
- Built exhaustive GIS/economic model of renewable resource potential and cost
- Identified numerous potential transmission options
- Institutionalized in CPUC RPS Calculator and CAISO Policy-driven Transmission Planning

RETI 2.0

- Accelerated, agency-driven, RETI reprise
- Leverage existing studies – no new models
- Emphasis on long-term resource portfolio optimization and GHG reduction in Western context

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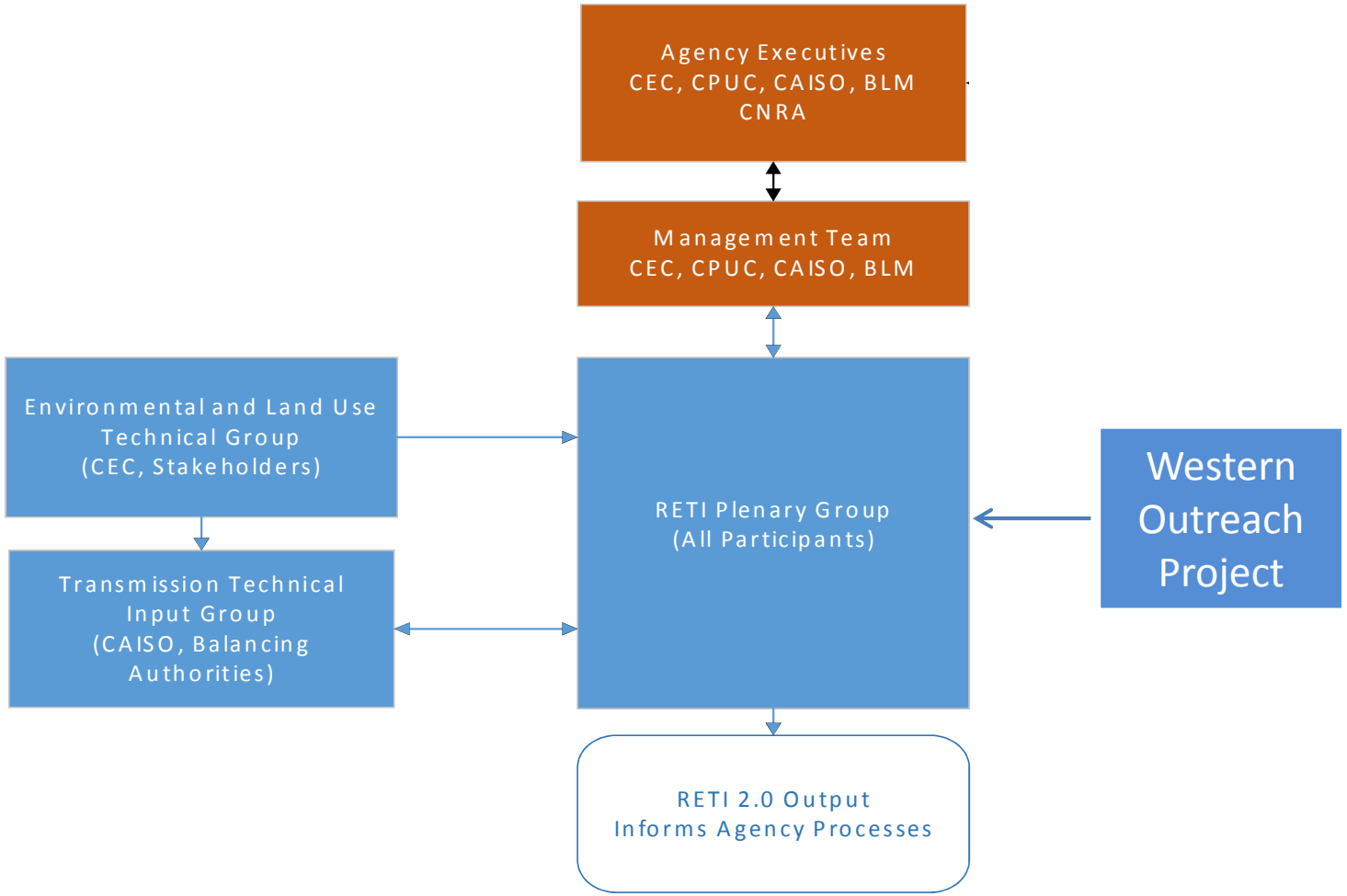
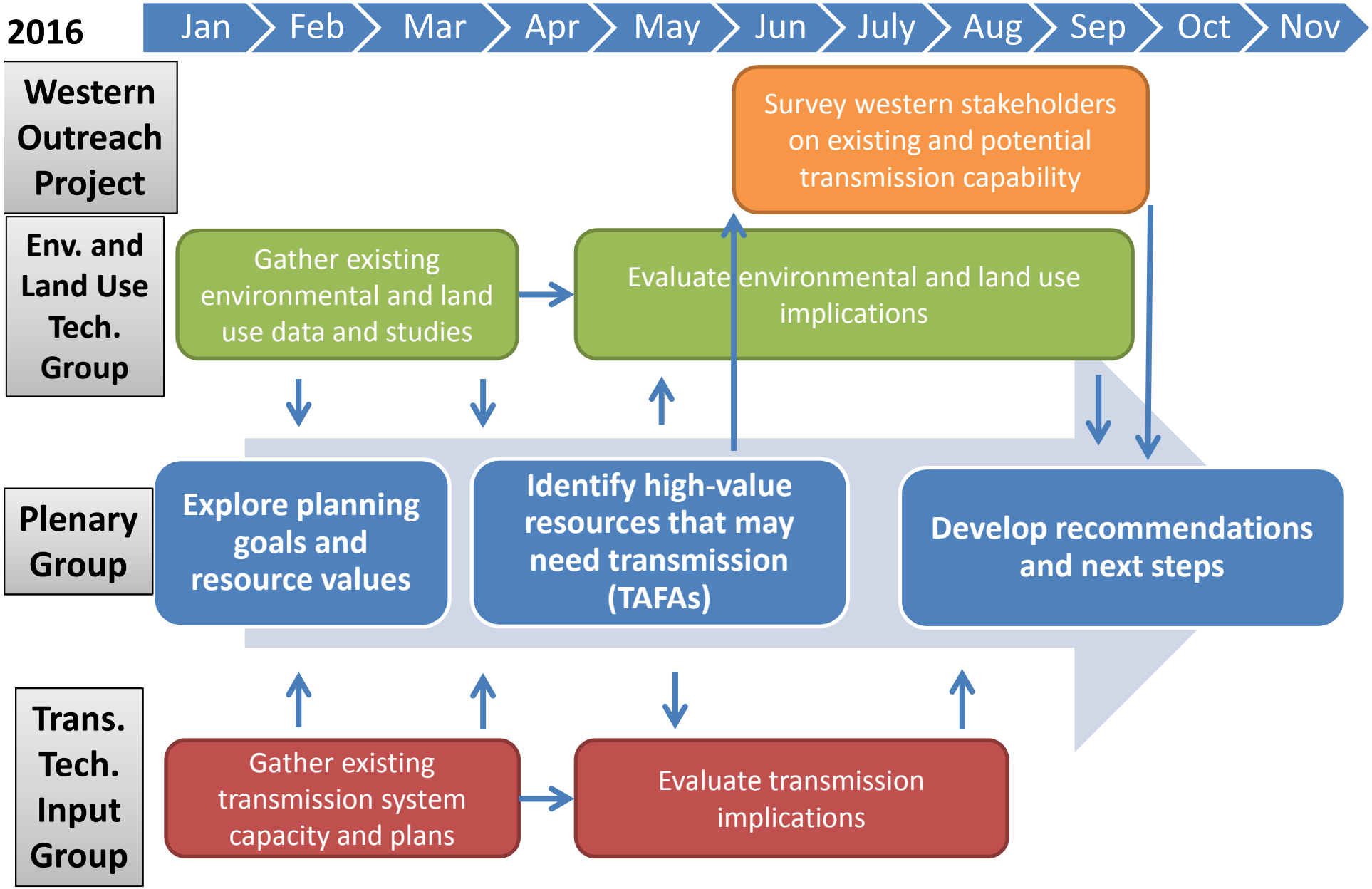
RETI 2.0 Organizational structure



RETI 2.0 Process and Timeline



Transmission Assessment Focus Area: Approach

Explore planning goals and resource values

1. How much renewables might we need?
2. Which resources might be important by 2030?

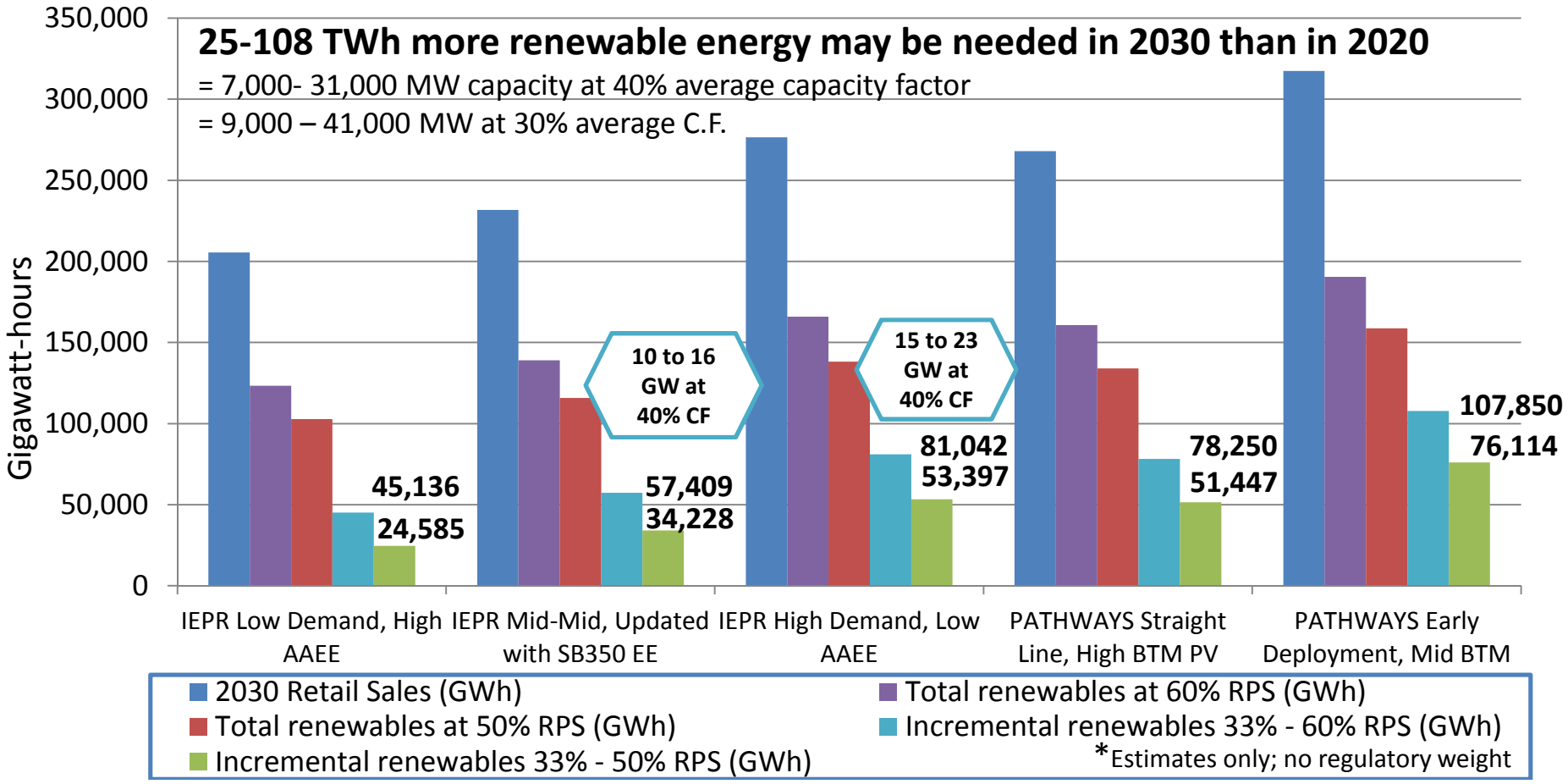
Identify high-value resources that may need transmission

3. How much renewables might come from different areas?
4. Might this level of renewables require new transmission?

How much renewable energy might California need to meet 2030 goals?

- Used projections of total statewide electricity demand, RPS compliance "net short", and GHG compliance scenarios to estimate *incremental renewable energy demand* by 2030 beyond the renewable energy projected to meet 33% in 2020
- No regulatory weight or status; Used to the scale the hypothetical renewable energy demand from individual Transmission Assessment Focus Areas
- Primary data sources:
  - California Energy Commission's Energy Demand Forecast, extrapolated to 2030 and adjusted to approximate SB 350 energy efficiency goals
  - California PATHWAYS modeling project performed for California agencies by Energy & Environmental Economics (E3) in 2014-15
- Critical variables:
  - Energy efficiency, behind-the-meter solar PV, electric vehicles and other electrification
  - 40% economy-wide GHG reduction could require equivalent of 55-60% RPS

Potential 2030 Renewable Energy Demand under different scenarios



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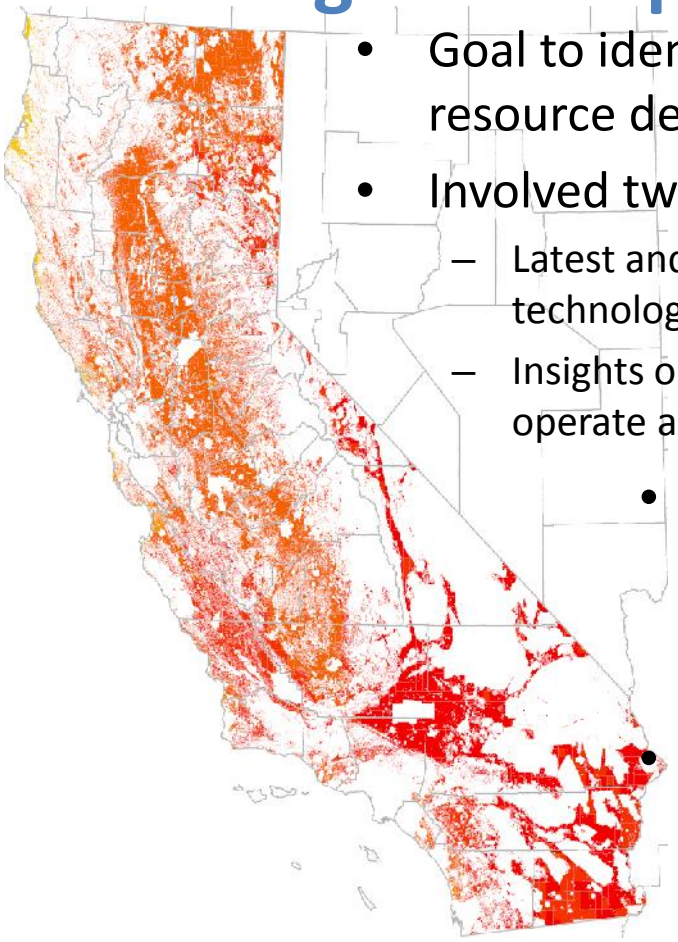
Which renewable resources, and where, might be important to reach 2030 goals?



- Goal to identify locations of potential large-scale renewable resource development that could help meet 2030 need
- Involved two basic questions:
  - Latest and greatest on costs and value of different renewable technologies in different areas
  - Insights on the portfolio of different resources that may be necessary to operate a majority-renewables grid at lowest cost
- Collected data from:
  - Agency and academic databases
  - Commercial (developer and utility) interest
  - Analyses of long-term portfolios
- Built off of existing studies
  - 2014 Desert Renewable Energy Conservation Plan
  - 2016 San Joaquin Valley Solar Convening

Resource Conclusions

- Low cost solar is ubiquitous in California, but raises long-term integration challenges
  - Many integration options
  - Geographic and technology diversity and exports are among the cheapest
- Many of best in-state wind areas have been developed
  - For remaining in-state wind areas, determining environmental feasibility and transmission access is a priority
- Geothermal may offer important benefits by 2030 but costs and benefits need further work
  - Transmission access one important component
- Environmental and land use constraints tend to favor in-state solar and out-of-state wind
- Broad support for further assessment of Out-of-state resources
  - High-quality, low-cost resources with complementary profiles
  - Quality and timeliness of data does not match in-state
  - Options for access by existing transmission largely un-assessed
  - Export options very important

In-state TAFA Map

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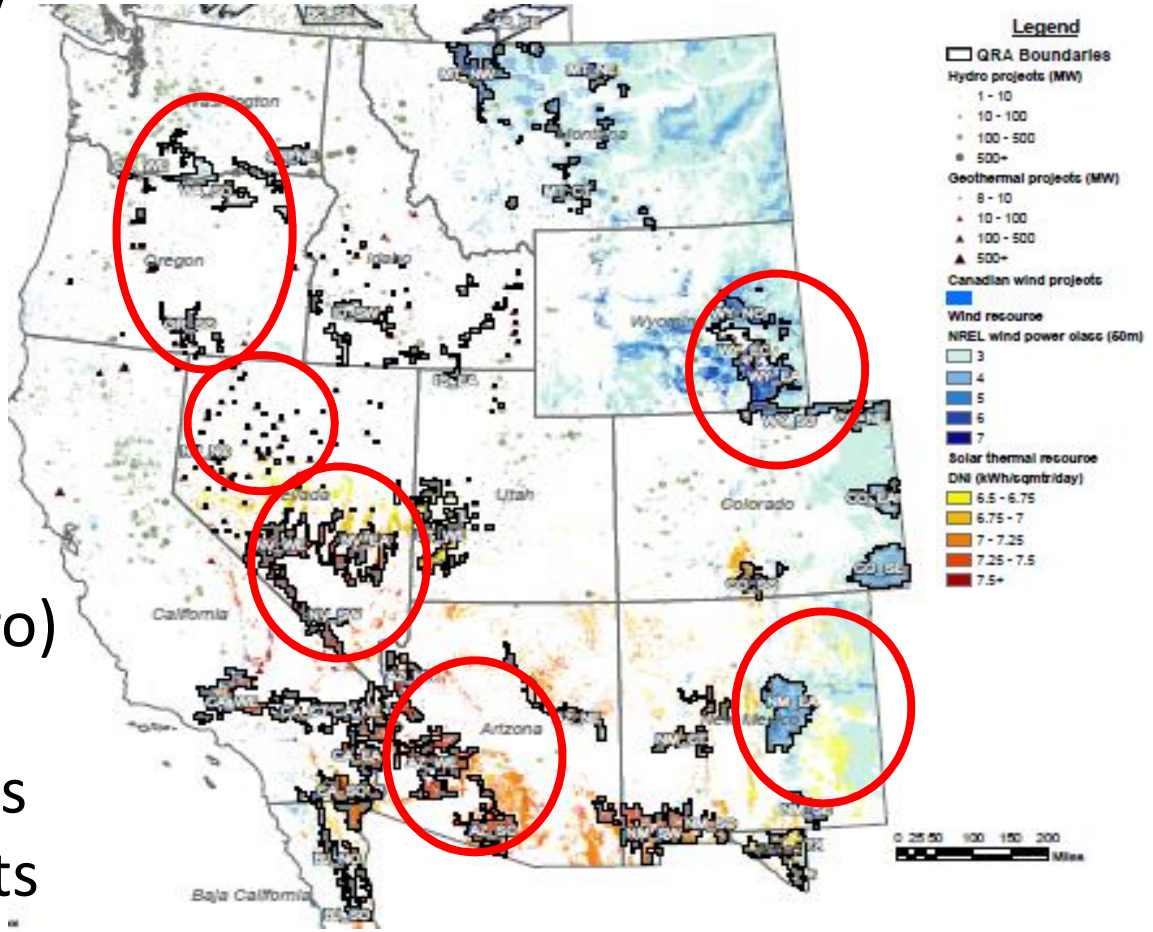
Western TAFAs

Areas/Issues identified by stakeholders

- WY and NM wind
- NV and AZ solar
- NV geothermal
- NW wind and geothermal
- Resource changes in other states (coal, hydro)
- Markets for CA surplus
- OOS “Delivery” projects
- OOS “Network” projects



Western Outreach Project

- Goals
  - Understand western renewable energy resources, markets, and development
    - Status, costs, activity, prospects
  - Understand renewable energy trading opportunities between California and West
    - Complementary daily and seasonal patterns
    - Changing generation mix and transmission utilization
  - Understand needs, options, and costs for transmission to realize opportunities
    - Capability of existing capacity, institutional improvements, and non-wires alternatives
    - California and system-wide impacts of proposals for new transmission and environmental/land use implications
- Issues
  - California RPS Compliance and California ISO expansion
    - RETI 2.0 is primarily about the physical infrastructure of transmission, not about how renewable energy is treated in compliance in any state's RPS or GHG policy, nor about the operation of the transmission on which it travels. To the extent reasonable, stakeholders are asked to provide input that is focused on the capability of the physical transmission system, noting where relevant the impact that existing RPS compliance issues or potential ISO expansion could have on the practical capability of the transmission system.
  - Geographic Scope
    - Geographically, the focus questions for the western outreach project should be thought to refer to the availability/deliverability of renewable resources to/from the major import/export paths into/out of California