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Renewable Energy Transmission Initiative v2.0

Draft Plenary Report Presentation

Plenary Group Webinar and Meeting

January 3, 2017

STATE OF CALIFORNIA resources AGENCY

California Public Utilities Commission

California Energy Commission

California ISO

Purpose of this meeting

- To present the draft RETI 2.0 Plenary Report and answer questions
- To discuss draft Plenary Report conclusions and recommendations
- To invite written comments on the draft report (due January 10)

Presentation Outline

- RETI 2.0 and Plenary Report Background (5 slides)
- Part 1: California's Climate and Renewable Energy Goals (7 slides)
- Part 2: Transmission Assessment Focus Areas (12 slides)
- Part 3: Conclusions and Recommendations (6 slides)

RETI 2.0 Background

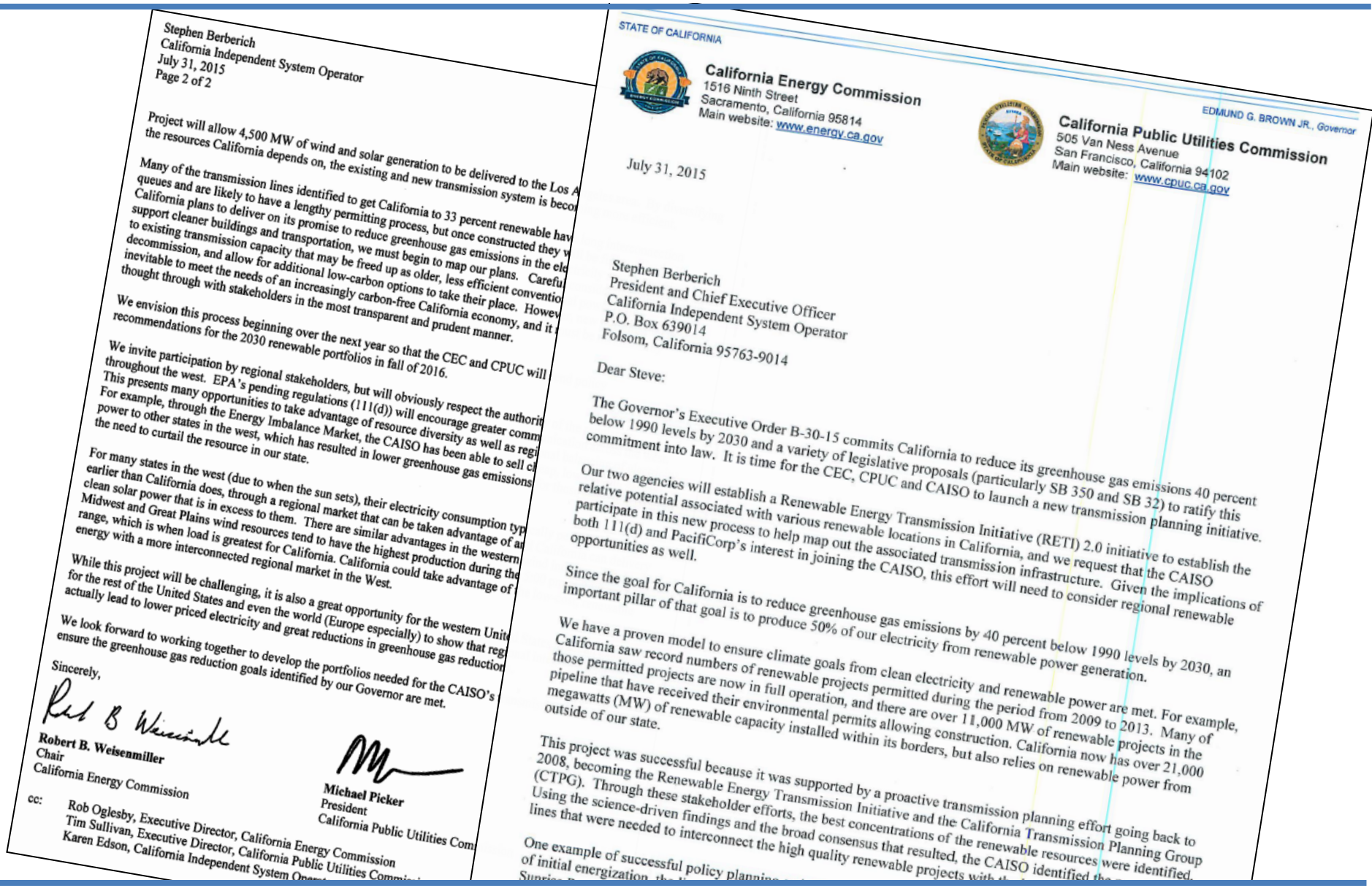
RETI 2.0 is:

- A high-level, non-regulatory review of the utility-scale renewable energy potential in California and the West.
- An assessment of transmission and environmental implications and options for developing and delivering renewable energy from different areas.
- A series of "what if" questions.
- Based on existing data and studies.
- Used to inform planning and regulatory processes in 2017 and beyond.

RETI 2.0 is NOT:

- A preference for utility-scale renewable energy over other strategies to meet renewable energy and GHG reduction goals.
- A projection or goal for any total quantity of renewable energy.
- A projection or goal for renewable energy development in any specific areas.
- A projection or goal for any level of additional transmission.
- An endorsement of any specific development proposal, plan, or project.

RETI 2.0 Background



Stephen Berberich
California Independent System Operator
July 31, 2015
Page 2 of 2

Project will allow 4,500 MW of wind and solar generation to be delivered to the Los A
the resources California depends on, the existing and new transmission system is beco

Many of the transmission lines identified to get California to 33 percent renewable hav
queues and are likely to have a lengthy permitting process, but once constructed they w
California plans to deliver on its promise to reduce greenhouse gas emissions in the ele
support cleaner buildings and transportation, we must begin to map our plans. Careful
to existing transmission capacity that may be freed up as older, less efficient conventio
decommission, and allow for additional low-carbon options to take their place. Howev
inevitable to meet the needs of an increasingly carbon-free California economy, and it
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
recommendations for the 2030 renewable portfolios in fall of 2016.

We invite participation by regional stakeholders, but will obviously respect the authorit
throughout the west. EPA's pending regulations (111(d)) will encourage greater comm
This presents many opportunities to take advantage of resource diversity as well as regi
For example, through the Energy Imbalance Market, the CAISO has been able to sell c
power to other states in the west, which has resulted in lower greenhouse gas emissions
the need to curtail the resource in our state.

For many states in the west (due to when the sun sets), their electricity consumption typ
earlier than California does, through a regional market that can be taken advantage of a
clean solar power that is in excess to them. There are similar advantages in the western
Midwest and Great Plains wind resources tend to have the highest production during the
range, which is when load is greatest for California. California could take advantage of
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 Unit
for the rest of the United States and even the world (Europe especially) to show that reg
actually lead to lower priced electricity and great reductions in greenhouse gas reductio

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

Sincerely,

Robert B. Weisenmiller
Chair
California Energy Commission

Michael Picker
President
California Public Utilities Com

cc: Rob Oglesby, Executive Director, California Energy Commission
Tim Sullivan, Executive Director, California Public Utilities Commi
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July 31, 2015

Stephen Berberich
President and Chief Executive Officer
California Independent System Operator
P.O. Box 639014
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Dear Steve:

The Governor's Executive Order B-30-15 commits California to reduce its greenhouse gas emissions 40 percent below 1990 levels by 2030 and a variety of legislative proposals (particularly SB 350 and SB 32) to ratify this commitment into law. It is time for the CEC, CPUC and CAISO to launch a new transmission planning initiative.

Our two agencies will establish a Renewable Energy Transmission Initiative (RETI) 2.0 initiative to establish the relative potential associated with various renewable locations in California, and we request that the CAISO participate in this new process to help map out the associated transmission infrastructure. Given the implications of both 111(d) and PacifiCorp's interest in joining the CAISO, this effort will need to consider regional renewable opportunities as well.

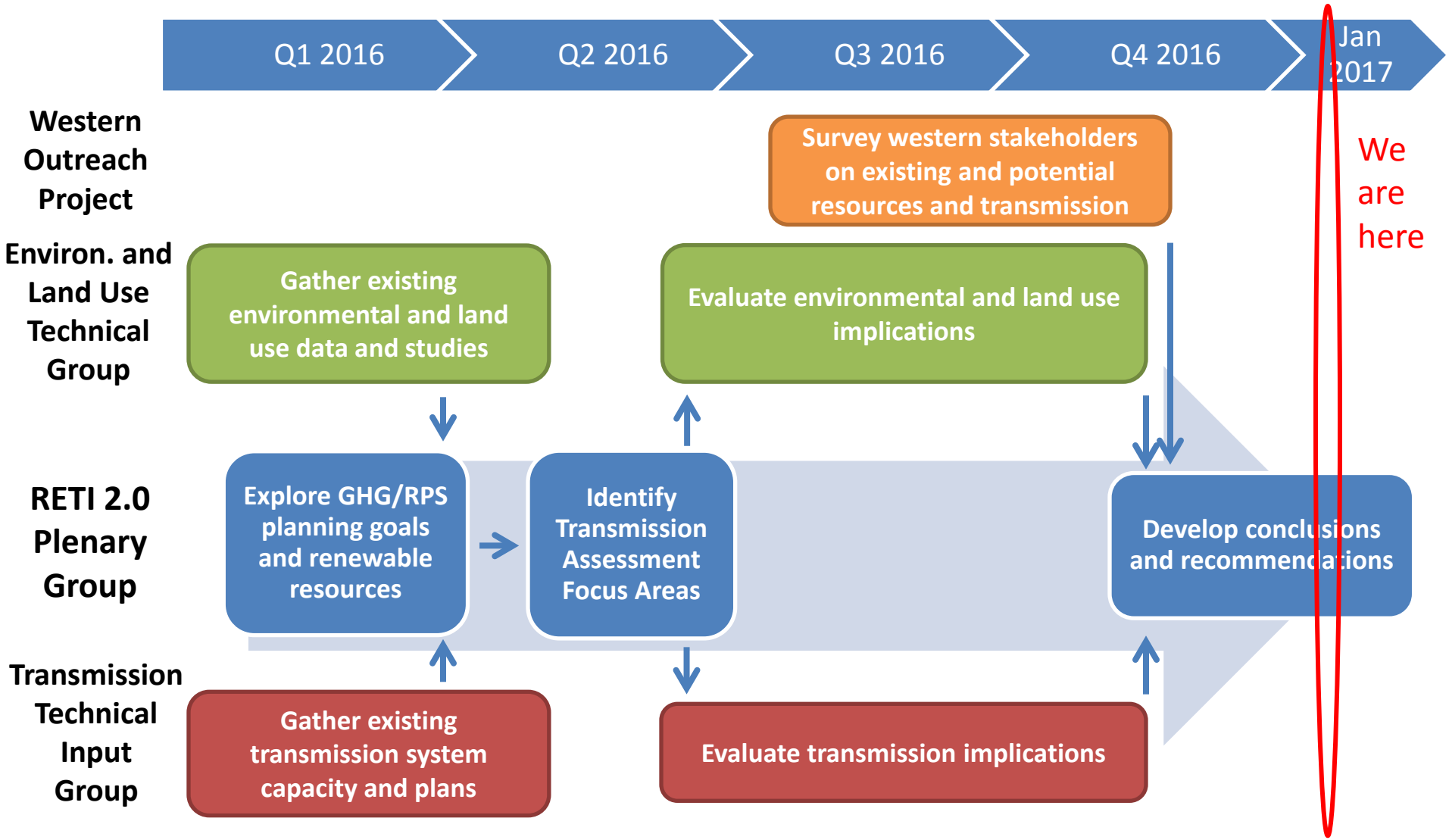
Since the goal for California is to reduce greenhouse gas emissions by 40 percent below 1990 levels by 2030, an important pillar of that goal is to produce 50% of our electricity from renewable power generation.

We have a proven model to ensure climate goals from clean electricity and renewable power are met. For example, California saw record numbers of renewable projects permitted during the period from 2009 to 2013. Many of those permitted projects are now in full operation, and there are over 11,000 MW of renewable projects in the pipeline that have received their environmental permits allowing construction. California now has over 21,000 megawatts (MW) of renewable capacity installed within its borders, but also relies on renewable power from outside of our state.

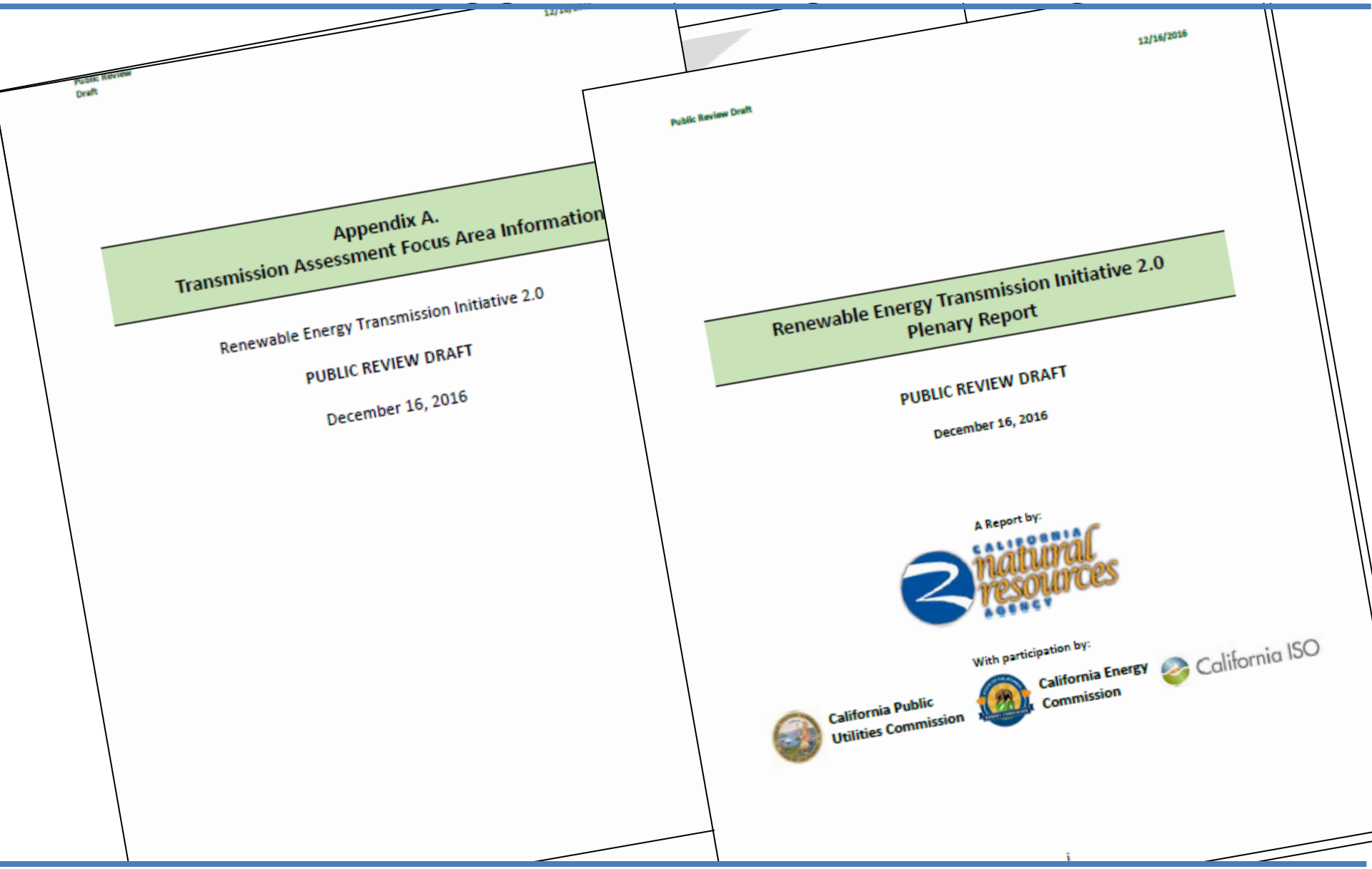
This project was successful because it was supported by a proactive transmission planning effort going back to 2008, becoming the Renewable Energy Transmission Initiative and the California Transmission Planning Group (CTPG). Through these stakeholder efforts, the best concentrations of the renewable resources were identified. Using the science-driven findings and the broad consensus that resulted, the CAISO identified the lines that were needed to interconnect the high quality renewable projects with

One example of successful policy planning
of initial energization, the
Sunrise

RETI 2.0 Process Timeline



RETI 2.0 Reports



Draft Plenary Report Acknowledgements

The RETI 2.0 process has only been possible because of the dedicated effort of the dozens of participating agencies, companies, associations, and individuals that gave generously of their time and expertise in the Plenary Group process or in one of the three Input Group reports. This draft Plenary Report is based on all of this input.

The draft RETI 2.0 Plenary Report was prepared through an interagency team effort. The California Natural Resources Agency led the team, with the assistance of the California Energy Commission, California Public Utilities Commission, U.S. Bureau of Land Management California Office, and the California Independent System Operator. Aspen Environmental Group provided technical support. The members of the Renewable Energy Transmission Initiative (RETI) 2.0 agency staff team included:

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Part 1: California's climate and renewable energy goals

Energy demand-based renewable energy goals

Integrated Energy Policy Report

2030 RPS-eligible sales and 50% RPS estimates*

RPS Eligible Retail Sales w/AAEE (GWh)			
Year	**High Demand, Low AAEE**	**Mid Demand, Mid AAEE**	**Low Demand, High AAEE**
2020	257,061	**247,441**	236,893
2030	276,454	**243,081**	205,519
33% RPS 2020	84,830	**81,655**	78,175
50% RPS 2030	138,227	**121,541**	102,760
(2020)-(2030)	53,397	**39,866**	24,585

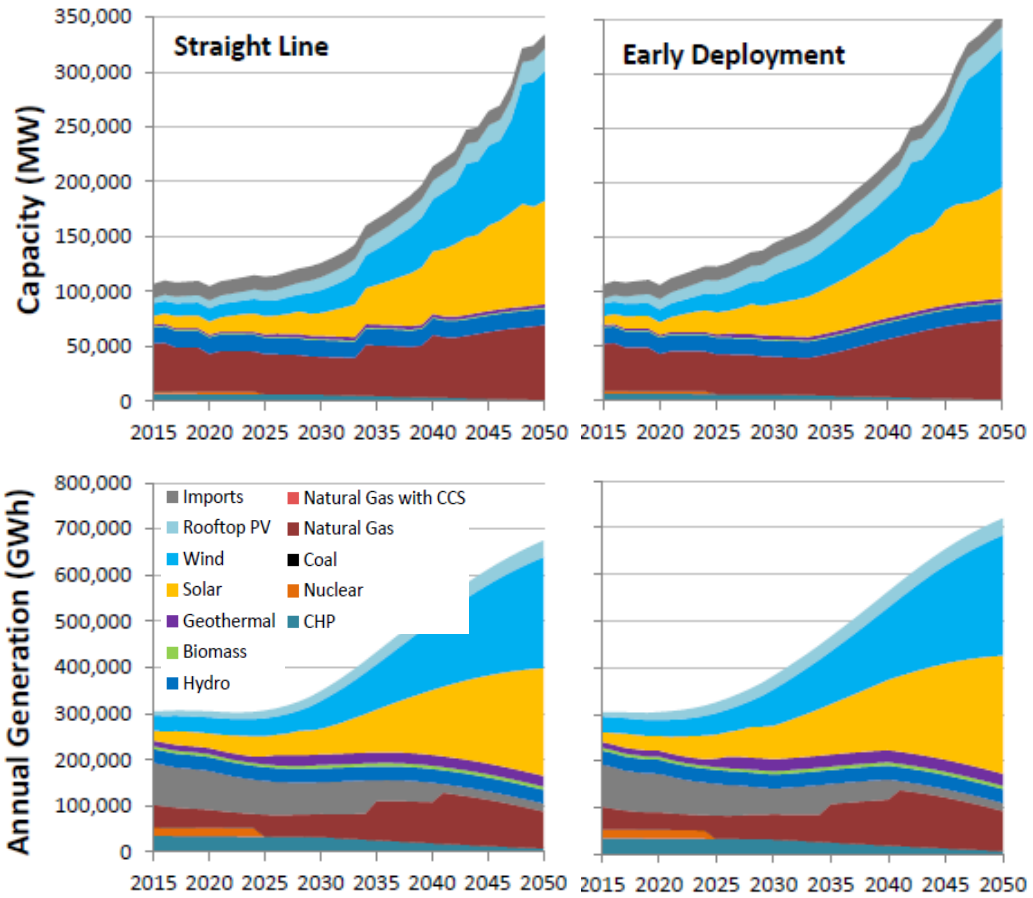
*California Energy Commission; Estimates only, circa March 2016; no regulatory weight

GHG-based renewable energy goals

California PATHWAYS State Agencies' Project

Electricity and renewables findings

- 2015 study examined California-wide scenarios to meet GHG reduction targets
- Electricity sector findings broadly consistent with in-progress CARB Scoping Plan
- By 2030, scenarios suggest potential need for more than 300 TWh of generation, of which 75-80% may need to be carbon-free.



RETI 2.0 estimates of potential renewable energy needs

Table ES-1. Summary of Planning Goals and Scale of Renewable Energy Needed*						
		IEPR Low Demand	IEPR Mid Demand	IEPR High Demand	PATHWAYS Straight-Line	PATHWAYS Early Deployment of Electrification
Electricity Demand (TWh)						
2020 Retail Sales		237	247	257	—	—
2030 Retail Sales		206	243	276	268	317
Renewable Energy Needed (TWh)						
33% RPS 2020		78	82	85	83	83
50% RPS 2030		103	122	138	134	159
50% RPS by 2030, Incremental to 2020	Renewable Energy Needed (TWh)	25	40	53	51	76
	New Capacity (MW) (30% Cap. Factor)	9,400	15,200	20,300	19,600	29,000

*Estimates only; no regulatory weight

Diverse and balanced portfolios and optimal integration

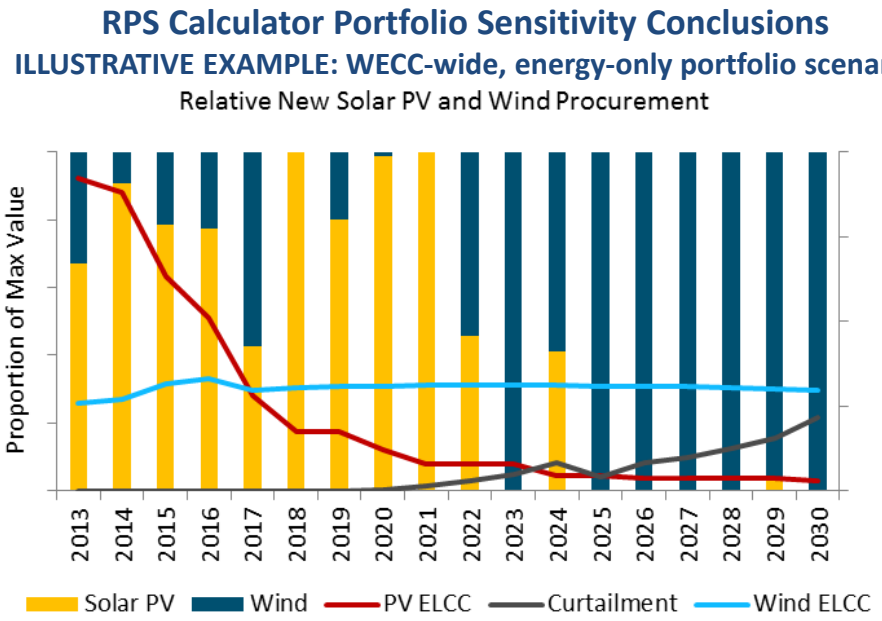
SB 350 requires that, beginning in 2017, California's investor owned utilities file integrated resource plans to show compliance with GHG targets and a "diverse and balanced portfolio of resources needed to ensure a reliable electricity supply that provides optimal integration of renewable energy in a cost-effective manner."

The draft Plenary Report reviews several studies of high-renewable portfolios and integration to identify metrics and priorities for renewable resources to meet 2030 goals. These studies and metrics include:

Studies/Reports

- CPUC RPS staff special study for 2030 (2016)
- NREL/CEERT Low Carbon Grid Study (2016)
- CPUC staff concept paper on Integrated Resource Planning (2016)
- E3 Investigating a Higher RPS in California (2014)
- Individual utility resource plan presentations (2016)
- E3 Identifying High-Value Renewable Resources (2016)
- CPUC Beyond 33% Renewables staff white paper (2015)
- NREL Western Wind and Solar Integration Study (2013)

Cost Metrics



Operational Metrics

- **Short, steep ramps** – when operators must bring on or shut down generation resources to meet an increasing or decreasing electricity demand quickly, over a short period.
- **Oversupply risk** – when more electricity is supplied than is needed to satisfy real-time needs.
- **Decreased frequency response** – when fewer resources are operating and available to adjust electricity production automatically to maintain grid reliability.

Draft conclusions re: resources and portfolios

Renewable energy potential:

- Low-cost, utility-scale solar photovoltaic (PV) is cost-competitive across much of California.
- Many of the highest-quality wind resources in California have already been developed or are constrained by environmental and permitting barriers. However, wind turbine technology improvements allow for a greater range of wind resources to be developed cost-effectively.
- Geothermal technologies have made important strides in development cost reduction and generation flexibility, and development in the Salton Sea area offers important co-benefits.

Diverse and Balanced Portfolios and Optimal Integration of Renewable Energy:

- Without integration solutions, continued growth in solar PV resources will lead to increased costs from a surplus of generation during high solar periods and a shortage of system and flexible capacity at other times.
- Technology and geographic diversity of renewable resources can reduce these costs by decreasing curtailment and increasing system capacity and (potentially) flexible capacity.
- Access to low-cost renewable resources both within California and out of state, especially wind and geothermal resources with generation profiles complementary to California solar generation, as well as access to energy markets outside California, can increase the diversity of renewable resources, provide markets for excess generation, and reduce ratepayer costs.

Questions for commenters: Goals and resource conclusions

- **Renewable energy needs:**
  - The Plenary Report presents a range of renewable need based on meeting 50% RPS under IEPR- and PATHWAYS-based demand projections. Are there other demand projections outside this range that should be cited*?
  - Is there a time dimension to when additional renewables are needed (e.g. existing contracts to mid-2020s) that should be noted?
- **Renewable resource potential:**
  - Broad conclusions regarding the cost and value of renewable resources are noted. Are the conclusions accurate? Are more specific conclusions warranted? Are important renewable resource conclusions missing?
- **Diverse and Balanced Portfolio:**
  - The report describes recent studies of optimal portfolios. Does the report draw accurate conclusions from these reports? Are important reports missing?
  - The report discusses different metrics of portfolio balance. Are these accurate, and are important metrics missing?
  - Are the conclusions regarding different resources' effects on balanced portfolios accurate? Are other conclusions warranted? How should these conclusions affect RETI 2.0 recommendations?

*No new analysis will be conducted

Part 2: Transmission Assessment Focus Areas

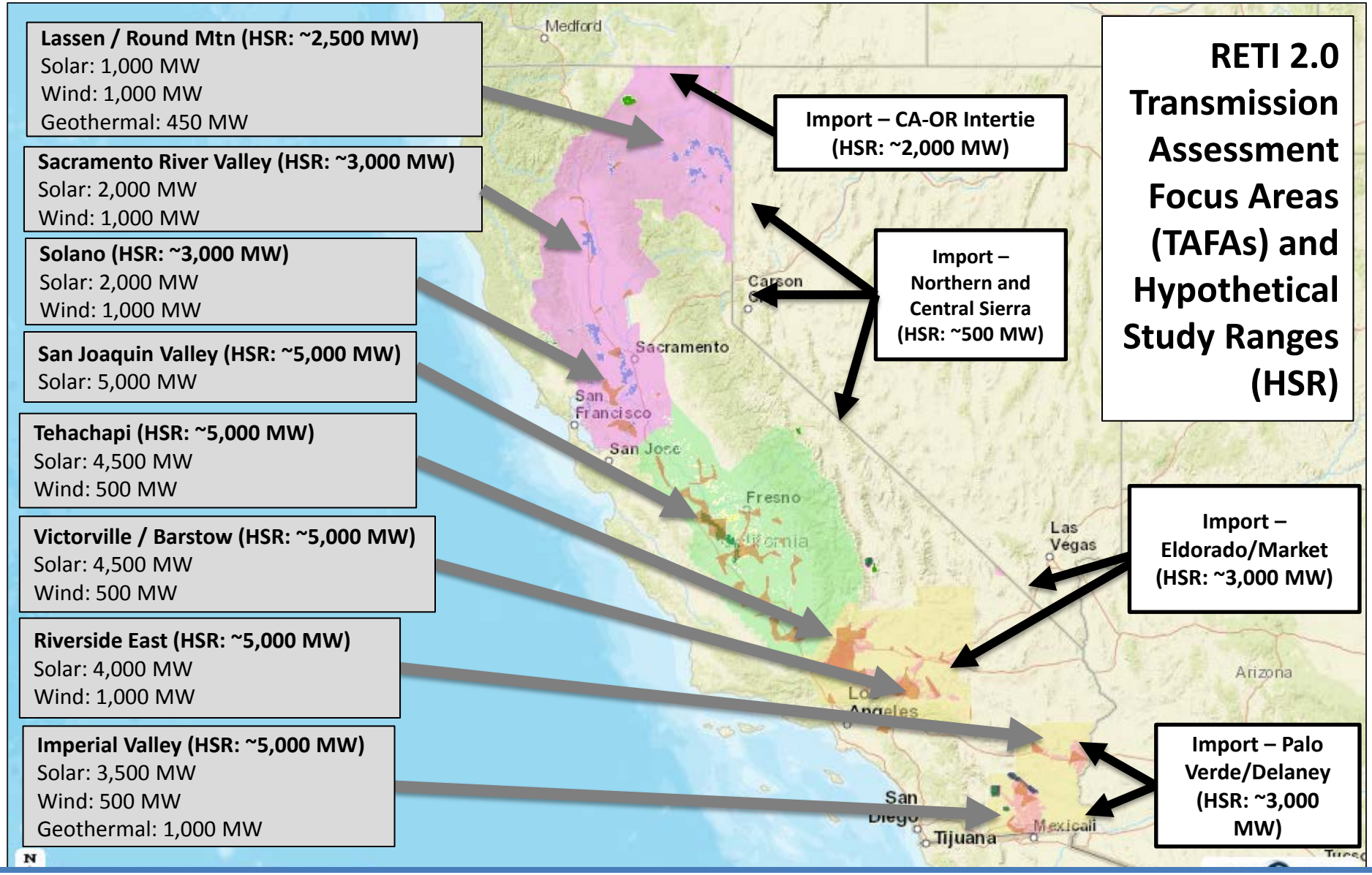
TAFAs are:

- General geographic areas with unique mix of renewable energy and transmission system characteristics.
- Assigned a hypothetical study range (HSR) representing a "what if" question of potential renewable energy development, to gather feedback on implications from stakeholders.
- Assessed individually, not as a scenario.
- Used to identify transmission constraints or environmental issues that may need to be addressed, if development is pursued.

TAFAs are NOT:

- A definitive geographic area or regulatory or technical boundary.
- A projection or goal for renewable energy development.
- A comprehensive accounting of renewable resource potential, transmission capability, environmental and land-use issues.
- Used in combination or as a scenario.
- Meant to identify transmission projects or environmental issues that should be addressed or that are recommended.

In-state and import-export TAFA map



RETI 2.0 Input Groups' TAFA assessments

Transmission Technical Input Group (TTIG)

- Group comprised of NERC-registered planners in CA
- Existing information and studies – no new studies
- Assessed transmission implications of hypothetical study range (HSR) in each in-state TAFA
- Characterize existing system capability; bulk system impacts of new generation/imports; potential constraints and conceptual mitigation options
- *TTIG Transmission Capability and Requirements Report** published October 2016

Environmental and Land Use Technical Group (ELUTG)

- Environmental / Land Use implications of hypothetical study range (HSR)
- Environmental: Known species and habitat issues and data gaps
- Land Use: survey of county and other land use planners
- Tribal outreach; Federal Section 368 Energy Corridor coordination
- *Environmental and Land Use Information to Support the RETI 2.0 Process** published November 2016

Western Outreach Project (WOPR)

- Western Interstate Energy Board and Energy Strategies LLC
- Extensive questionaire; Two regional workshops and comments
- Development potential, interest, and status of renewable resources around West
- Capability of existing transmission outside of the state to deliver renewable energy to and from California
- Summary and analysis of active proposals for new transmission
- *RETI 2.0 Western Outreach Project Report** published October 2016

*All reports available at www.energy.ca.gov/reti/reti2/documents

TAFA baseline information

Summary of existing and proposed generation and transmission capacity in in-state TAFAs and import-export paths

Table ES-2. Summary of Existing and Proposed TAFA Generation and Transmission

Transmission Assessment Focus Area (TAFA)	Renewable Generation (from CEC REAT database)		Estimated Existing Transmission Capacity	
	Existing Online (MW)	Approved Projects (MW)	Full Capacity Deliverability (MW)	Energy Only (MW)
Lassen/Round Mountain	229	58	0	1,250
Sacramento River Valley	460	135	Unknown	2,100
Solano	1,934	167	Unknown	880
San Joaquin Valley	1,952	6,030	1,823	3,131
Tehachapi	5,345	4,120	4,500	5,600
Victorville/Barstow	302	344	1,900*	3,300
Riverside East	1,296	2,275	2,450**	4,754
Imperial Valley	2,079	1,349	523(1); 2,300(2)	1,849

Table ES-3. Summary of TAFA Transmission Path Data

Import/Export Path	WECC Path Rating (MW Import)	Estimated Incremental Capacity Inside CA	Aggregate Capacity of Transmission Proposals for Delivery Through This Import Point
Path 66 (COI)	4,800	0 MW	0 MW
Path 76 (Alturas)	Not rated	0 MW	500 MW
Path 24 (Tahoe)	Not rated	0 MW	0 MW
Path 52 (Owens Valley)	Not Rated	0 MW	500 MW
Path 46 (Eldorado)	10,623 (combined)	5,500 to 8,500 MW (Desert Area Constraint)	7,500 MW
Path 46 (Palo Verde)			5,000 MW
Path 45 (Baja Norte)	800	523 MW	300 to 600 MW

Sources: WECC; TTIG; and WOPR.

*Victorville Full Capacity is subarea specific.
**Transmission capability provided for the Riverside East TAFA is based on the additional capacity provided by the West of Devers Upgrade Project as proposed by SCE and approved by the CPUC on August 18, 2016.
(1)Per California ISO, this number is subject to change. IID has recently provided the ISO with new study assumptions regarding its system that will require further study. The ISO 2016-2017 Transmission Plan under development will take into account the latest system conditions and provide information regarding additional deliverability expected to be available for IID and ISO connected Imperial area generation.
(2)Per IID, Imperial Valley North Full Capacity Deliverability is 1,100 MW and Imperial South Full Capacity Deliverability is 1,210 MW.

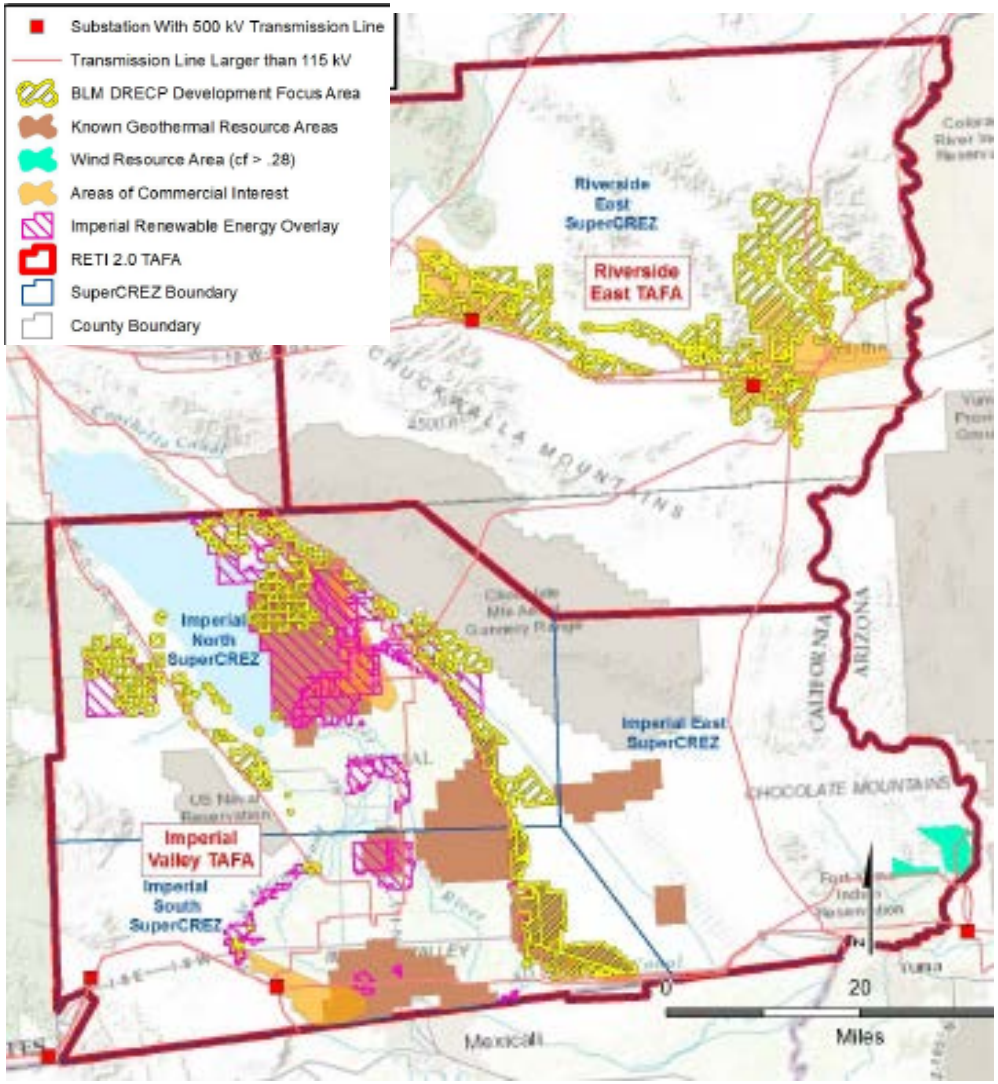
South Desert TAFAs: Map and draft conclusions

Imperial Valley TAFA:

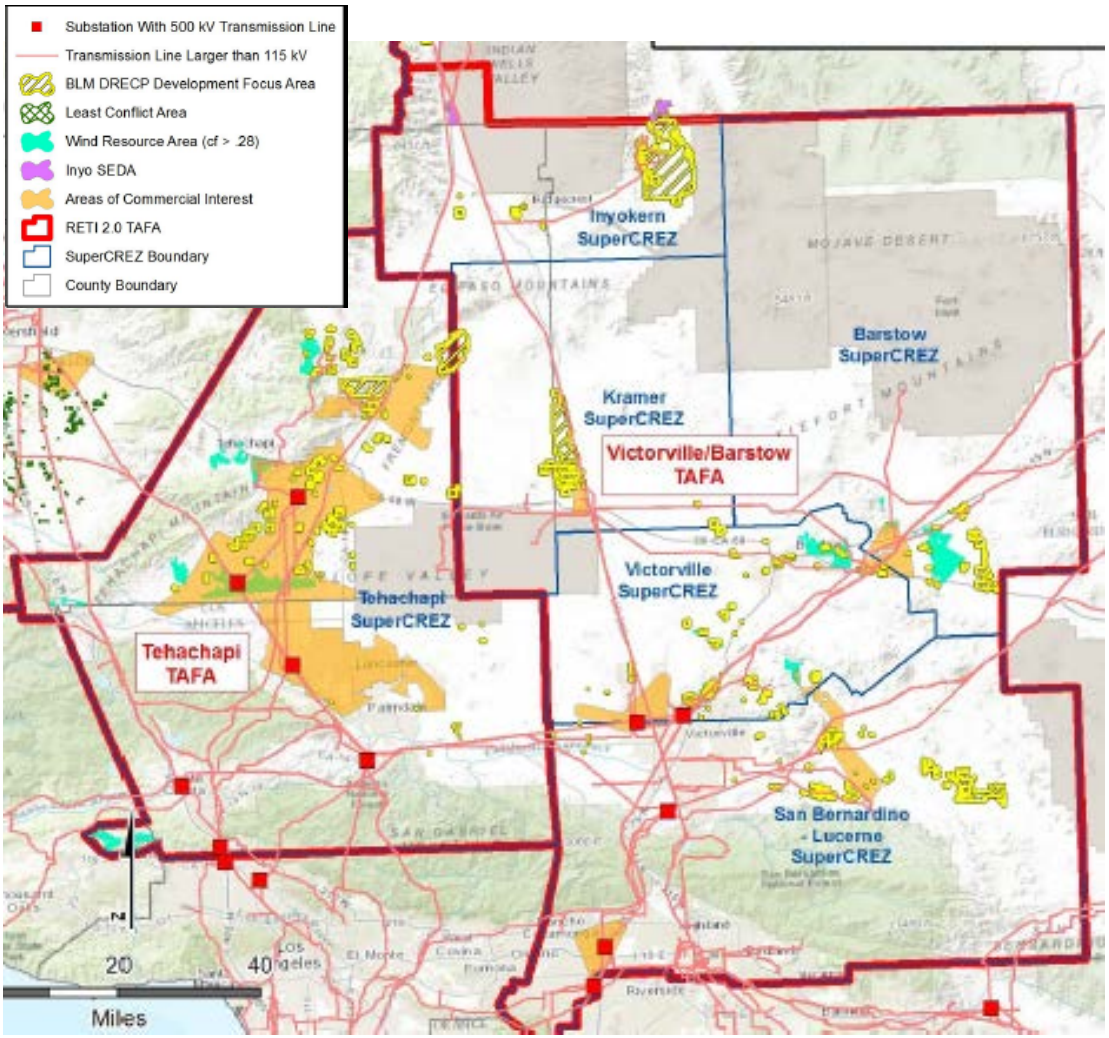
- Hypothetical study range (HSR) of 3,500 MW solar and 1,000 MW geothermal development feasible due to extensive land use planning within TAFA.
- HSR of 500 MW of wind energy may be less feasible because wind resources are outside of designated areas for renewable energy development.
- New transmission necessary to deliver full HSR.
- Transmission projects following existing corridors likely more viable, including IID Midway to Devers, and SDG&E conversion of existing North Gila-Miguel line to HVDC.

Riverside East TAFA:

- Development of the full HSR of 4,000 MW of solar energy is feasible due to extensive land-use planning on BLM land through the DRECP and Western Solar PEIS.
- Avoidance of culturally significant landscapes is challenging
- HSR of 500 MW-1,000 MW of wind energy may not be feasible due to environmental and land-use constraints.
- Existing transmission can likely deliver lower end of HSR, but higher end may require major new transmission line. Substantial existing transmission capacity to deliver mix of FCDS/EO resources. However, additional generation would contribute substantially to Desert Area Constraint depending on development/imports elsewhere.



North Desert TAFAs: Map and draft conclusions



Victorville / Barstow TAFA:

- Reaching total HSR of 4,500 MW of solar energy and 500 MW of wind energy appears challenging.
- Development feasibility and transmission needs are very sub-area specific within the TAFA
- Land use planning for solar energy in specific areas on private lands in Kern, Inyo, and San Bernardino Counties, and on BLM DFAs throughout the TAFA.
- Wind energy resource areas generally precluded.
- New transmission corridors challenging
- Given constraints to developing new transmission lines, advanced conductors and flow control technologies may be important options to accommodate future development.

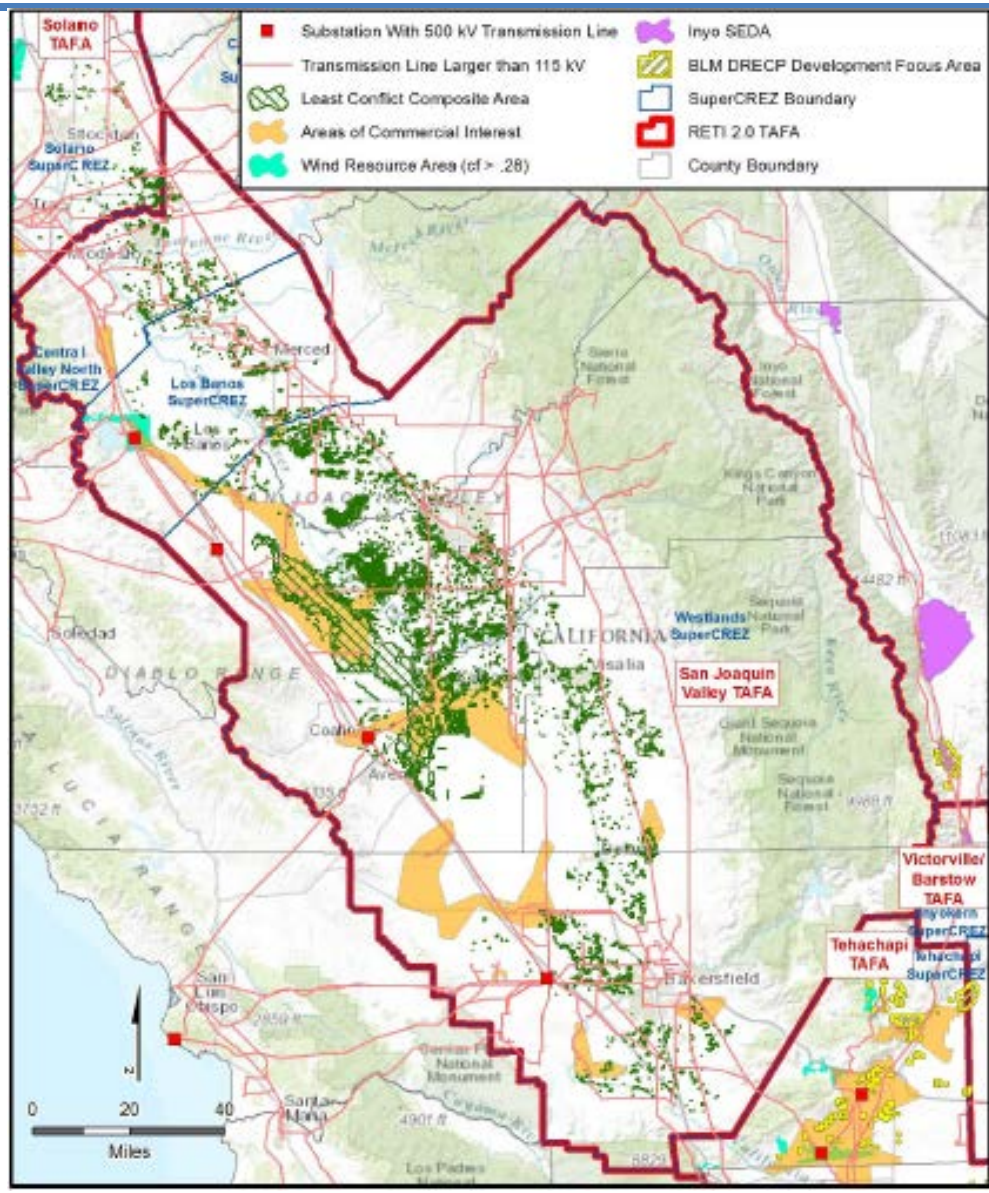
Tehachapi TAFA:

- Development of full HSR of 4,500 MW of solar energy and 500 MW of wind energy feasible due to county and BLM land use planning and permitting experience.
- Existing transmission capacity adequate for HSR of 4,500 MW solar and 500 MW wind.
- Numerous pending proposals may already account for this capacity.

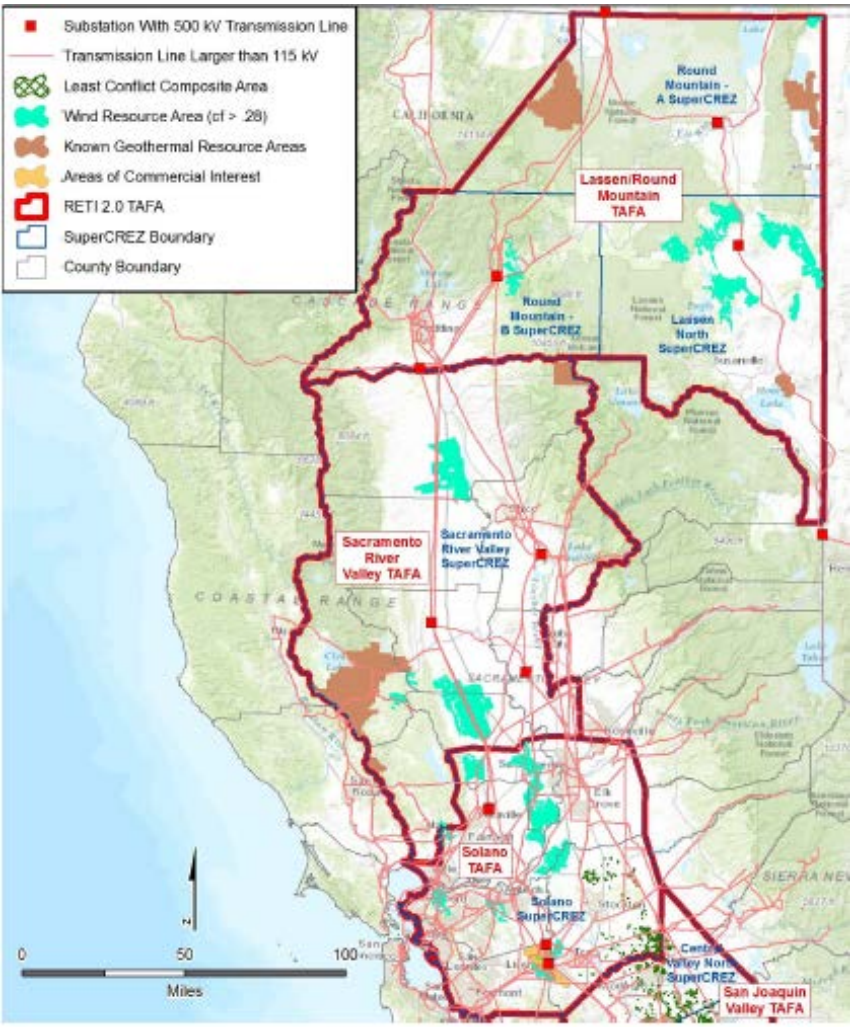
San Joaquin Valley TAFAs: Map and draft conclusions

San Joaquin Valley TAFA:

- Development of HSR of 5,000 MW solar energy appears feasible but substantial new transmission investments are necessary
- High resource value and high commercial interest
- Possible to avoid high-value environmental, cultural, and agricultural lands
- Opportunity for reuse of degraded lands
- Multiple upgrades to lower-voltage systems may be expensive for individual projects
- Analysis of interconnecting generation directly to the 500 kV system may show efficiencies.
- Advanced flow control technologies may be important



Northern California TAFAs: Map and draft conclusions



Solano TAFA:

- Development of HSR of 3,000 MW appears unlikely. Transmission very limited.
- List of potential issues includes environmental, agricultural, military, and scenic and recreation values
- Wide diversity among counties regarding potential and interest in utility-scale renewable energy development.
- Environmental data missing for some areas.
- Lack of existing interconnection facilities.
- Limited range of transmission mitigation concepts identified.
- Concentrated resource development (e.g. wind area) could connect to new 500 kV system; expense unknown.

Sacramento River Valley and Lassen/Round Mountain TAFAs:

- Development feasibility of HSR of 3,000 MW (each) is considered low because of limited environmental and land use planning
- Transmission for full HSR is not feasible due to COI congestion.
- Little commercial interest or experience with renewable energy development to date
- Environmental information missing for some areas.
- Some counties have expressed interest in further energy planning or are in the process of planning for renewable energy
- Little transmission study information available; TTIG doubtful that there is much existing capacity.
- New COI line not studied; may be challenging and costly
- Existing transmission could deliver some EO resources

Import-export paths: Draft conclusions

California-Oregon Intertie (COI)	▪ **HSR of 2,000 MW additional import not feasible without new 500 kV line from OR border to Tracy area** ▪ New line would be challenging long-term prospect ▪ New transmission elsewhere in West and dynamic line rating may increase capacity ▪ Regional coordination in resource planning, scheduling, and power products could increase utilization ▪ Some conditional firm/EO capacity may be available
Path 76 (Reno-Alturas)	▪ **HSR of 500 MW not feasible due to constraints at Reno and Alturas** ▪ Imports subject to COI constraint ▪ New transmission challenging
Path 24 (Reno-Truckee)	▪ **HSR of 500 MW not feasible due to constraints at Reno and low-capacity line** ▪ New transmission challenging
Path 52 (Owens Valley)	▪ **HSR of 500 MW not feasible due to low-capacity line and constraints at Kramer** ▪ New transmission potentially feasible yet costly
Path 46 (Eldorado/ Marketplace)	▪ **HSR of 3,000 MW additional import is achievable** ▪ If substantial development or imports in other TAFAs, could trigger Desert Area Constraint and require major new transmission line within California
Path 46 (Palo Verde/Delaney)	▪ **HSR of 3,000 MW additional import is achievable** ▪ If substantial development or imports in other TAFAs, could trigger Desert Area Constraint and require major new transmission line within California
Baja California Norte (BCN)	▪ **Near-term opportunity to increase wind energy from La Rumorosa area up to 1,000 MW, but requires East of Miguel solution** ▪ Ongoing Mexico energy sector reform, national energy strategy (incl. renewable goals), and North American Partnership, plus specific plans by CENACE to integrate BCN to national grid and explore EIM, suggest opportunities may develop further in coming years.

Western TAFAs: Draft conclusions

- **Renewable Resources**
  - WOPR generally confirmed western TAFAs. Thousands of MWs of geothermal, wind, and solar in development.
- **Resource Changes**
  - Changing hydroelectric operations due to new environmental regulations and impacts of climate change
  - Potential of coal unit retirement to a) make available formerly subscribed transmission capacity b) affect capacity and reliability of transmission system-wide, and c) create new markets for California oversupply.
- **Export Market Opportunities**
  - Export to the Southwest may be hindered by growth of solar supply during most of the same hours.
  - Northwest export markets may be more complementary during much of the year, except spring.
  - Potential for intra-day power-exchange between California and Northwest utilities.
- **Existing Transmission:**
  - Some capability for firm delivery to COI; very limited capability for new firm deliver to southern California.
  - Conditional firm transmission service from most areas is more available, but rarely used.
  - Limited capacity east of Phoenix for export of California oversupply to the Southwest.
  - Roughly 3,000 MW of long-term export capacity to Northwest markets available.
- **Proposed Transmission:**
  - WOPR described 12 transmission projects that propose to help deliver renewable energy to California.
  - Several projects propose to deliver power directly from high-quality wind resource areas to a California interconnection using high-voltage direct current technology.
  - Several projects connect one or more renewable resource-rich areas to the existing transmission network.
  - Each project or combinations has implications for renewable resources, export markets, and regional capacity

Proposed western transmission summary

Resource Area Developer / Project Name	Estimated Capacity to California (MW)	Cost Range per New Capacity ($million per MW)	Contingent on Existing OOS Transmission Capacity?	Potential Import/ Export Opportunities
Wyoming				
TransWest Express (HVDC)	3,000	1.00 to 1.07	No; Interconnects with California ISO.	Import: WY wind Export: PACE
DATC Zephyr HVDC	3,000	1.07 to 1.17	No; Interconnects with California ISO.	Import: WY wind Export: PACE
DATC Zephyr HVDC (to IPP)	1,900	1.05 to 1.35	No; Interconnects with LADWP.	Import: WY wind+storage Export: CAES storage
Wyoming, Nevada, Utah, Idaho				
PacifiCorp Gateway South, and TransCanyon Cross-Tie	1,500	1.05 to 1.43	Yes; Contingent on delivery from Robinson Summit	Import: WY wind; UT solar/wind/geo Export: NVE, PAC
PacifiCorp Gateway West, and LS Power SWIP North	1,500	2.21 to 2.47	Contingent from Robinson Summit	Import: WY wind; NV geo Export: NVE, PAC, IPCO
PacifiCorp Gateway (full), and LS Power SWIP North, and TransCanyon Cross-Tie	1,500	3.25 to 3.90	Contingent from Robinson Summit	Import: WY wind; NV geo; UT solar/wind/geo; NW wind and geo Export: NVE, PACE, IPCO, BPA
New Mexico, Arizona				
Hunt Power, Black Forest Partners Southline	1,000	0.80 to 0.93	Contingent from Saguaro/Tortolita	Import: NM wind; AZ solar Export contingent
Southwest Power Group SunZia	3,000	0.67 to 0.71	Contingent from Pinal Central	Import: NM wind; AZ solar Export contingent
Cleanline Centennial West HVDC	3,500	0.71 to 1.25	Interconnects with California ISO.	Import: NM wind Export: PNM
Lucky Corridor LLC Lucky Corridor	700	0.22 to 0.34	Contingent from Four Corners	Import: NM wind No export
Cleanline Western Spirit	1,000	0.20 to 0.25	Contingent from Four Corners	Import: NM wind No export
SDG&E Southwest Powerlink HVDC Conversion	750	1.27 to 3.23	Internal to California ISO	Import: AZ solar Export: APS

Questions for commenters: TAFA conclusions

- **Input group reports**
  - Stakeholders are encouraged to examine the reports from TTIG, ELUTG, and WOPR. Is there a more effective way to summarize or refer to the reports in the Plenary Report than through the information in the TAFA summaries and Appendix A?
  - Are the conclusions drawn from the reports the right ones? Are there conclusions that are missing?
- **TAFA conclusion summaries**
  - Are the in-state TAFA data maps (located in Appendix A) useful and accurate?
  - Are the conclusion statements regarding resource potential and environmental, land-use, and transmission implications accurate? Are important conclusions missing?
- **Proposed Western Transmission Summary:**
  - Are the conclusions regarding western renewable resources, resource changes, export opportunities, and existing transmission accurate and useful? Are there important conclusions missing?
  - Are the metrics for comparing projects or combinations (MW capacity, cost per MW of capacity, contingent on existing system, import/export opportunities) useful? What other metrics from the WOPR report are most useful for high-level comparison?

Part 3: Conclusions and Recommendations

Potential transmission constraints and conceptual mitigations

The TTIG report identified where potential transmission constraints may be encountered if the hypothetical study range of incremental renewable energy development were to seek full deliverability interconnection. The TTIG and stakeholder comments suggested conceptual mitigations to these constraints.

Each potential constraint and conceptual mitigation is hypothetical only based on a "what-if" question. These are NOT transmission needs identified by any transmission planning entity.

1. San Joaquin Valley
   - Extensive lower-voltage system upgrades
   - Option to aggregate generation to 500 kV system
   - Potential application of advanced technologies
2. California-Oregon Intertie
   - No existing south-bound firm capacity
   - Fourth 500 kV line from OR to Tracy
   - Not well studied, extensive permitting challenges
   - Alternatives include regional transmission elsewhere and operational/market innovations
3. Central and Northern Sierra
   - Two current conceptual projects identified (Paths 76 and 52)
   - Extensive permitting challenges and uncertain benefits
4. Desert Area Constraint
   - Affects generation or imports from vast area in southeast California
   - Next constraint at 5500-8500 MW incremental
   - Two identified major options: New Mira Loma-Red Bluff or Lugo-Eldorado 500 kV line
   - Each complex and expensive
5. Imperial Valley
   - Six identified major options with widely different costs, challenges, and benefits
   - May offer regional congestion and contingency relief and import/export capacity from/to Arizona and Mexico.
   - Potential application of advanced technologies
6. North of Kramer
   - Two known (and controversial) transmission options
   - Potential application of advanced technologies

Scenarios to inform resource and transmission planning

The draft Plenary Report identifies conceptual scenarios that would be valuable to inform future renewable resource and transmission planning efforts. The conceptual scenarios are suggested to capture the insights provided by Input Group reports and individual stakeholder comments. Stakeholders are encouraged to review and comment on the appropriateness and benefit of these conceptual scenarios.

1. Existing Capacity Scenarios
   - Test effect of Full Capacity Delivery / Energy Only mix in different areas on resource mix, capacity values, and total transmission need
2. Desert Area Constraint Scenarios
   - Examine portfolios across region that trigger constraint
   - Test alternative mitigation options
3. Western Transmission Expansion Scenarios
   - CPUC should perform “2030 Futures” studies based on one or more expanded configurations of western transmission
   - Examine diversity and cost of renewable resources, markets for California oversupply, regional congestion relief and capacity expansion
4. Multi-LSE Request for Information
   - Gather commercial-grade data on generators’ bid cost and proposed transmission service
   - Inform procurement planners and procurement/transmission models

Environmental, Cultural, and Land-Use Recommendations

The draft Plenary Report makes several recommendations regarding developing, analyzing, and integrating environmental, cultural resource, and land-use planning information to inform renewable resource and transmission decision-making as effectively as possible.

1. Environmental data
   - Gather and make available online complete data sets, data logic models*
   - Fill important data gaps (esp. certain areas and species/habitats)
   - Develop a Web-based, interactive environmental reporting tool
2. Cultural resource consultation
   - Early, frequent, and meaningful consultation
   - Re-use existing corridors to greatest extent feasible
   - Cultural resources include traditional land use and cultural landscapes beyond archeological presence
3. Local land-use planning for renewable energy
   - Gather and update more county land-use planning information online
   - Assist counties with renewable energy and conservation planning

*The ELUTG created a RETI 2.0 “Gateway” at the DataBasin web-based data repository and mapping tool https://reti.databasin.org

Questions for commenters: draft Conclusions and Recommendations

- **Potential constraints and conceptual mitigations:**
  - Are the summary descriptions* of potential transmission constraints accurate?
  - Are the conceptual mitigation options described accurately? What land use or environmental planning data (or data gaps) are relevant to the potential transmission mitigations?
  - Are there additional transmission mitigation options that should be referenced?
- **Scenarios to inform resource and transmission planning:**
  - Are the proposed conceptual scenarios tractable and would they be useful to study? What other conceptual scenarios (within RETI scope) would be useful to study? Which portfolio elements within scenarios would be most useful?
  - Would the Multi-LSE RFI proposal be a useful and productive exercise?
- **Environmental, cultural, and land-use recommendations:**
  - Are the environmental recommendations regarding data sets, logic models, and reporting complete and appropriate?
  - Are the recommendations regarding tribal consultation and cultural resources complete and appropriate?
  - Are the recommendations regarding local land-use planning complete and appropriate?

* The descriptions of potential transmission constraints are proposed conclusions of the Plenary Group based on the TTIG reports and other stakeholder comments. The TTIG report is final, and stakeholders are encouraged to comment on the conclusions drawn from this information.

Next Steps

- Draft RETI 2.0 Plenary Report released December 16, 2016.
  - Plenary Report and Appendix A available at http://www.energy.ca.gov/reti/reti2/documents
- Comment deadline January 10, 2017
- Final report targeted by January 31, 2017
- Thank you!