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# Appendix A.
# Transmission Assessment Focus Area Information

Renewable Energy Transmission Initiative 2.0

**PUBLIC REVIEW DRAFT**

December 16, 2016

# Contents of Appendix A

# Acknowledgements

This appendix was prepared by a subset of the Renewable Energy Transmission Initiative (RETI) 2.0 agency staff team. Aspen Environmental Group provided technical support. Contributors include:

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# Introduction

This appendix to the *RETI 2.0 Plenary Report* provides additional information for each transmission assessment focus area (TAFA). This information expands on the summary information and conclusions presented in Part 2 of the RETI 2.0 Plenary Report.

The appendix includes:

- **In-state TAFAs Assessments:** A description of each in-state TAFA, including a brief discussion of the renewable resource potential, environmental and land use issues associated with utility-scale renewable energy development, and transmission implications of transmitting up to the hypothetical study range of new renewable energy generation.

  The in-state TAFA Assessments also includes maps displaying renewable resource, transmission, and land use planning information relevant to the TAFA assessments.

- **Import-Export Path descriptions:** A summary of the import and export paths and the associated transmission issues.

- **Western TAFA and issues summary:** A summary of conclusions and recommendations from the WOPR regarding the renewable demand, supply, and transmission opportunities and constraints in the western United States outside California. A discussion of opportunities and issues associated with renewable energy imports from Baja California Norte, Mexico, is also included.

The information presented in this appendix is drawn primarily from the ELUTG, TTIG, and WOPR workshops, comments, and reports discussed in Part 1 of the RETI 2.0 Plenary Report. This information is supplemented with stakeholder comments to the RETI 2.0 Plenary Group, recent studies and press reports, and staff expertise. The summary statements and conclusions are proposed by staff; stakeholders are invited to comment on the accuracy of these summary statements.

The process by which TAFAs were identified, assigned a hypothetical study range of potential additional renewable energy development, and assessed for environmental, land use, and transmission implications is described in Part 1 of the RETI 2.0 Plenary Report.

**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

**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

# In-State TAFAs: Transmission and Environmental/Land-Use Implications

The following section describes at a high level each in-state TAFA, including the renewable resource potential, the environmental, land-use, and transmission issues that may be expected if further development occurred, and potential transmission expansion and mitigation options, where proposed. This overview summarizes the input received during the RETI 2.0 process, including the ELUTG, TTIG, and WOPR reports, public comments, stakeholder comments, staff literature review and interviews, and the expert knowledge of the RETI 2.0 technical support contractor, Aspen Environmental Group..

## In-State TAFA Data Maps

To illustrate some of the renewable energy resources, transmission infrastructure, and land use planning data used in the in-state TAFA evaluations, California Energy Commission prepared maps that display relevant data. These data are referenced in the TAFA assessment summaries. The eight in-state TAFAs were grouped into four maps.

| | |
|---|---|
| Figure A-1: Desert TAFAs South | Imperial Valley TAFA<br>Riverside East TAFA |
| Figure A-2: Desert TAFAs North | Victorville/Barstow TAFA<br>Tehachapi TAFA |
| Figure A-3: San Joaquin Valley TAFA | San Joaquin Valley TAFA |
| Figure A-4: Northern California TAFAs | Solano TAFA<br>Sacramento River Valley TAFA<br>Lassen/Round Mountain TAFA |

The TAFA region maps show RETI 2.0 TAFA boundaries and Super CREZ boundaries from the CPUC's RPS Calculator Version 6.2.[1] The information included on the maps also consists of:

- **Resource potential data:**
  - **Wind Resource Area (cf > .28):** The RETI 2.0 Wind Resource Areas are a subset of the wind resource areas defined for use in the CPUC RPS Calculator Version 6.2. The original data set was filtered to only include potential "wind projects" with expected capacity factors at or above 0.28 percent. This filtered data set was then reduced by various exclusion layers, including RETI Category 1 areas, DRECP BLM LUPAs and Sage Grouse habitat.[2]
  - **Known Geothermal Resource Areas:** California Department of Conservation Division of Oil, Gas, and Geothermal Resources data on Known Geothermal Resource Areas (KGRAs) are shown.[3]
  - Economic utility-scale solar PV energy potential is considered to be relatively ubiquitous within all TAFA areas and is not shown.

[1] http://www.cpuc.ca.gov/RPS_Calculator/

[2] https://databasin.org/datasets/64b8dab6dad34680baa6355851e1d9e0

[3] https://reti.databasin.org/datasets/71183ff7e09c44dfa35eae0251c648b4

- **Land-use planning data:**
  - **BLM DRECP Development Focus Areas:** Development Focus Areas (DFAs) from the U.S. Bureau of Land Management's Land Use Planning Amendment for the Desert Renewable Energy Conservation Plan (DRECP).[4]
  - **Imperial Renewable Energy Overlay:** Designated renewable energy overlay zones as specified in the County Of Imperial Renewable Energy And Transmission Element and County Land Use Ordinance, Division 17.
  - **Inyo SEDA:** Designated Solar Energy Development Areas (SEDA), as specified in the Inyo County Renewable Energy General Plan Amendment
  - **Least Conflict Composite Area:** The San Joaquin Valley TAFA map includes the composite layer of "least conflict" lands for potential solar development, as specified in the San Joaquin Valley Solar Study[5] which does not exclude Tribal Areas of Concern.[6]
- **Commercial interest data:**
  - **Areas of Commercial Interest:** These are GIS-generated polygons depicting areas with active renewable energy project proposals that have been approved, are under construction, or that are being studied for interconnection by the California ISO.[7]
  - The polygons are refined by removing areas with known land use constraints.
  - The polygons reflect relevant existing information and do not have any regulatory status and do not imply any opinion on the feasibility of these locations or other locations for development.
- **Transmission data:**
  - As an indicator of existing transmission corridors and infrastructure, transmission lines above 115 kV are shown, as are the general location of 500 kV substations.[8]

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[4] https://reti.databasin.org/datasets/15fbd81db7984c22be7fc144fc262c47

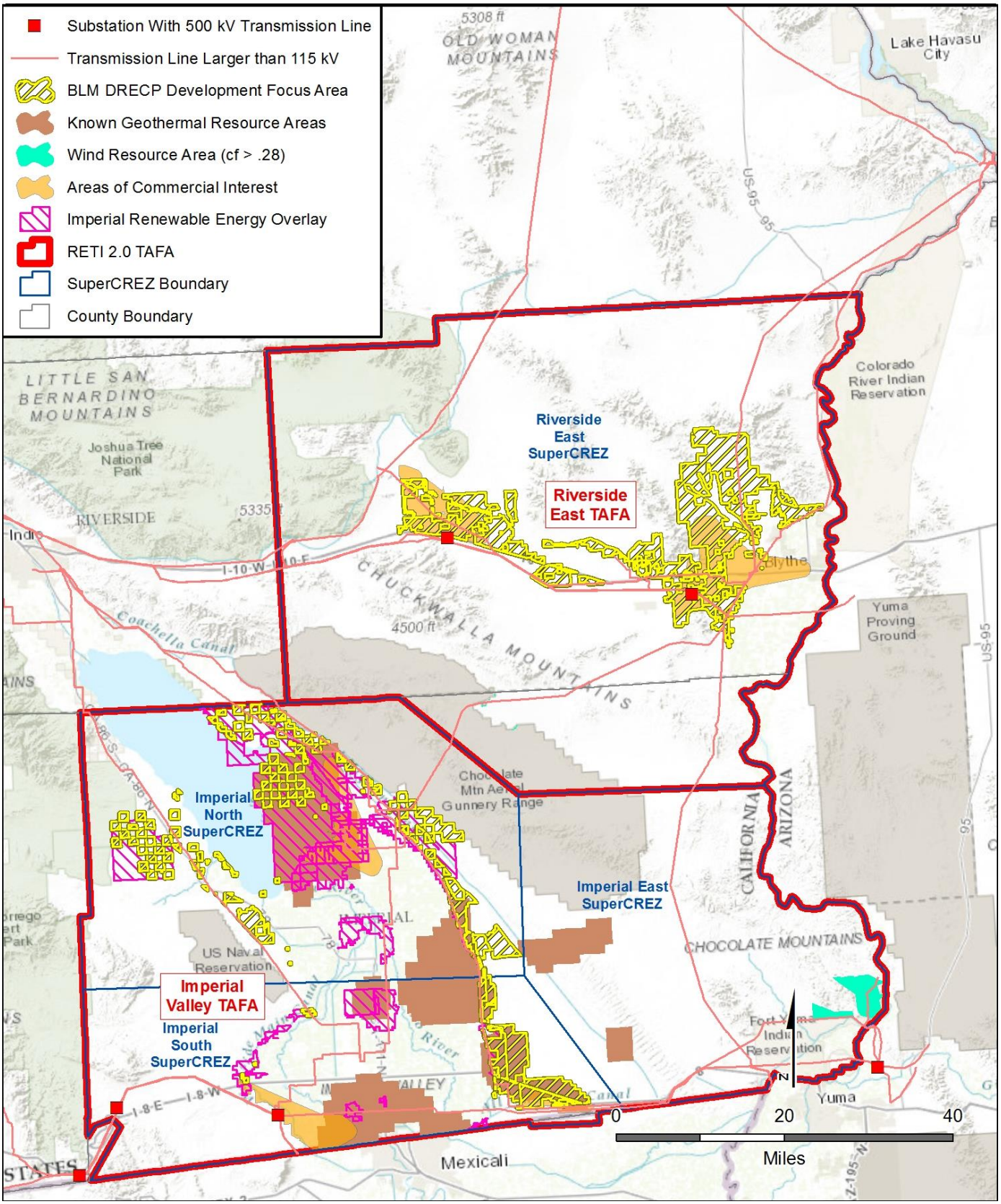
[5] https://sjvp.databasin.org/

[6] As discussed in *A Path Forward: Identifying Least-Conflict Solar PV Development in California's San Joaquin Valley*, tribes identified 258,000 acres of concern from the 471,495 acres of composite least-conflict lands. To maintain the confidentiality of Tribal Areas of Concern, RETI 2.0 uses the composite least-conflict lands prior to tribal consultation (471,495 acres) in the San Joaquin TAFA map. Future users of this information should review *A Path Forward*, to become more aware of potential conflict with tribal resources and interests in the San Joaquin Valley.

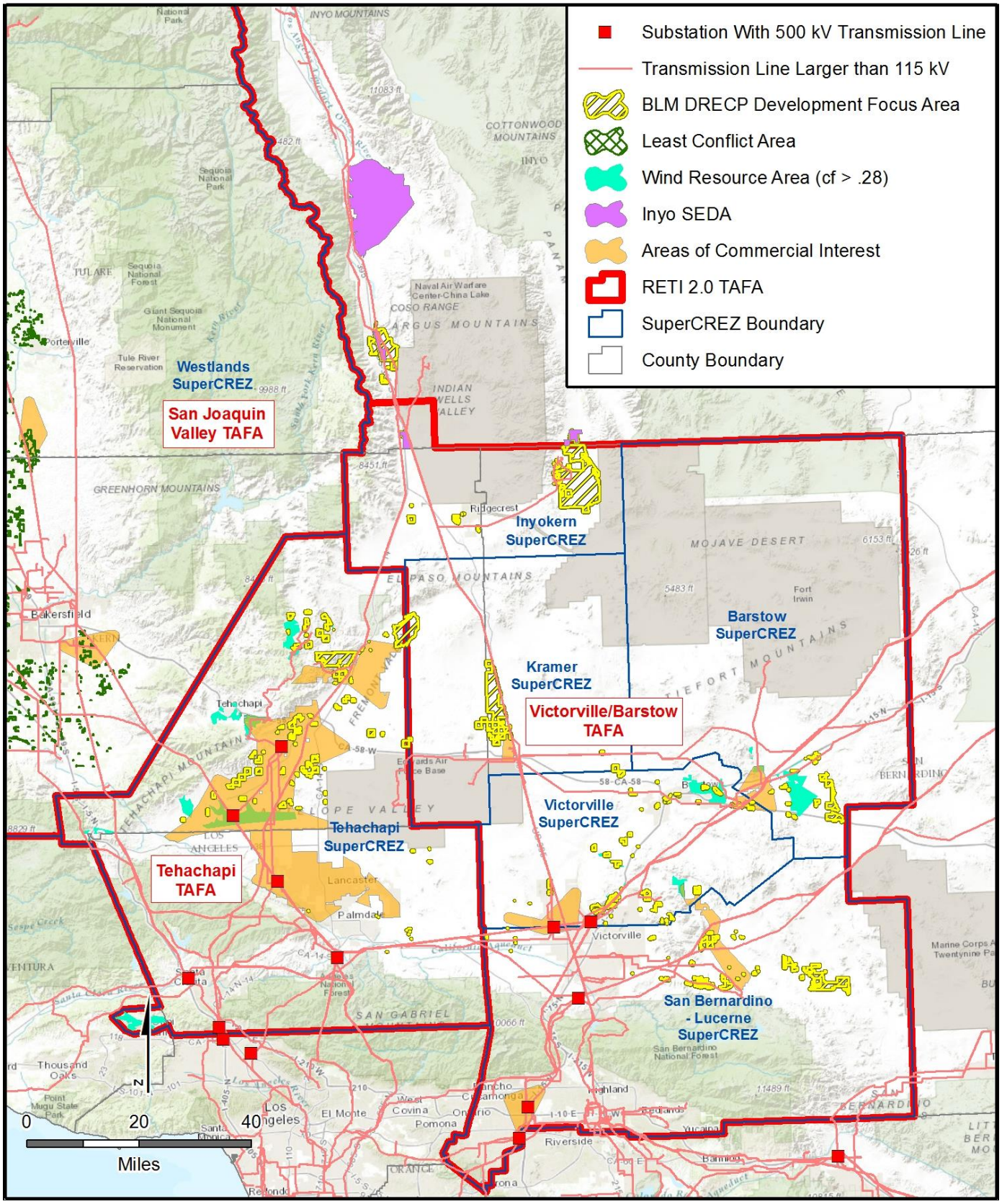
[7] The clusters illustrating commercial interest are based on data on "projects that are in review, approved, or under construction" from Energy Commission's Renewable Energy Action Team database and projects proposals in the California ISO interconnection queue (through Cluster 9). Using the "Aggregate Points" geoprocessing tool in ArcGIS, polygons were created around groupings of three or more project points within a 10-mile radius of one another with a 1-mile buffer. The shapes were further refined to account for known land use considerations such as exclusion layers (that is, RPS Calculator Version 6.2 RETI Category 1 Exclusion Areas, BLM DRECP LUPA conservation designations, and BLM sage grouse habitat).

[8] http://www.energy.ca.gov/maps/

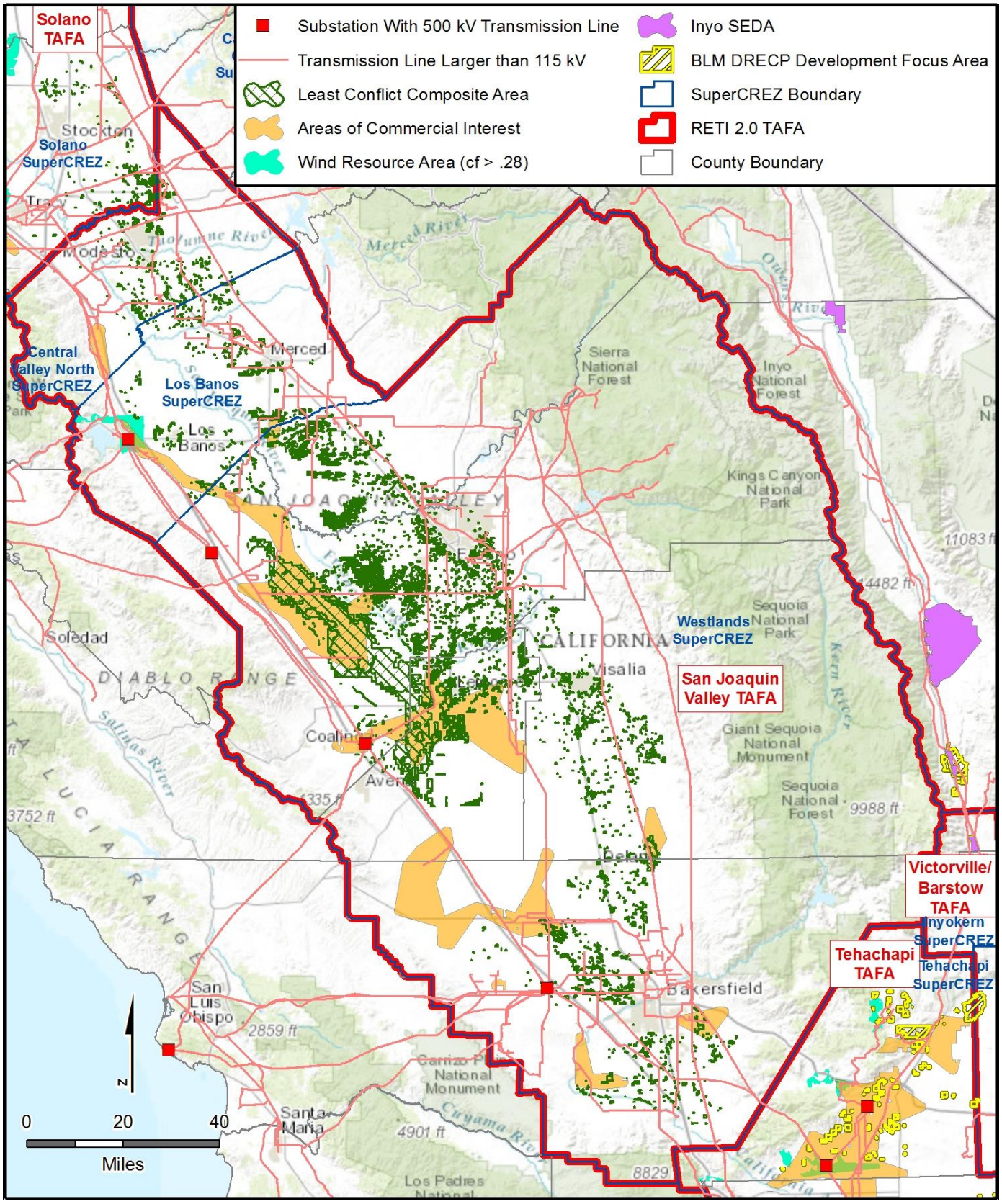
## Figure A-1. South Desert TAFAs: Imperial Valley and Riverside East



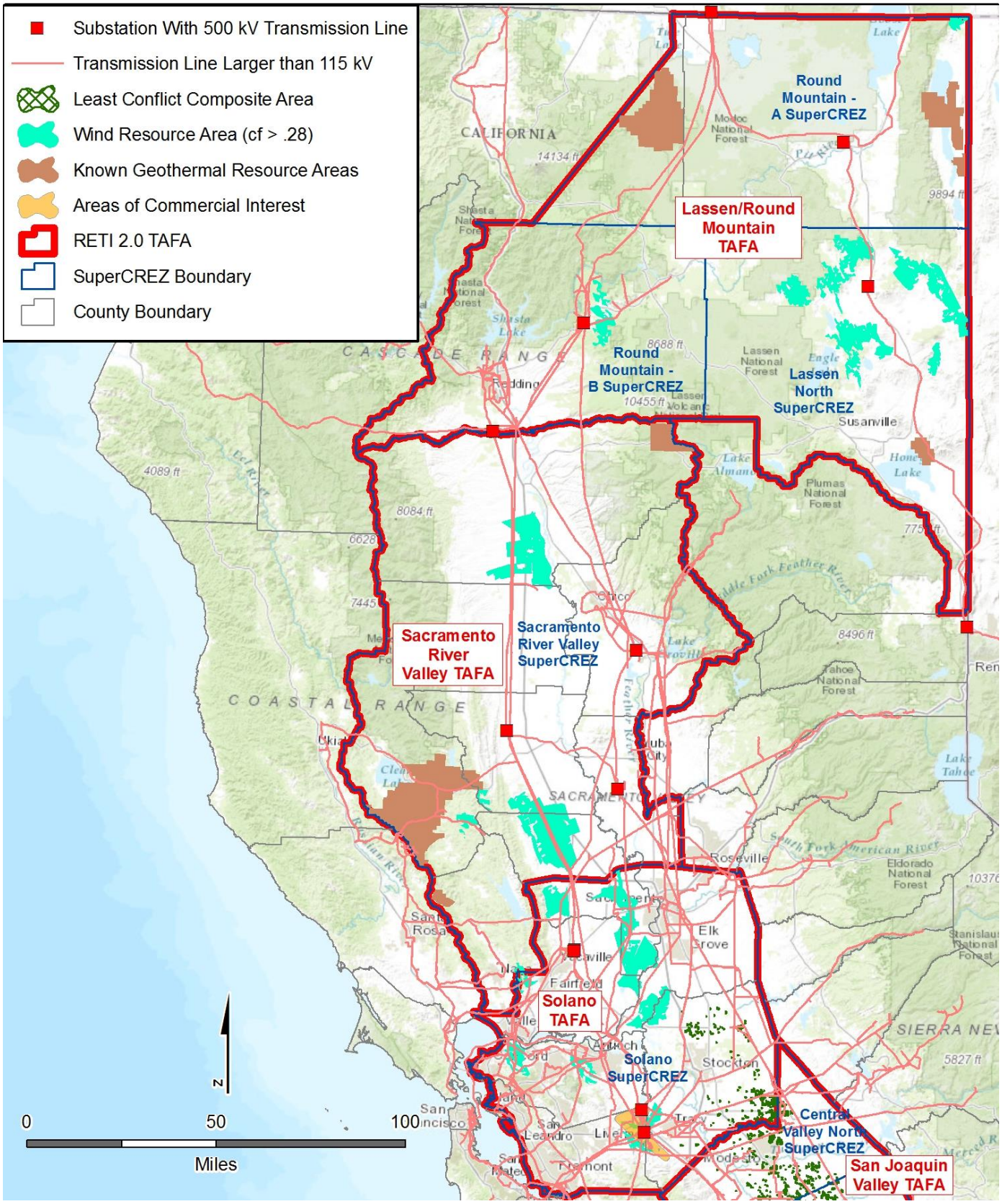
## Figure A-2. North Desert TAFAs: Victorville/Barstow and Tehachapi



## Figure A-3. San Joaquin Valley TAFA



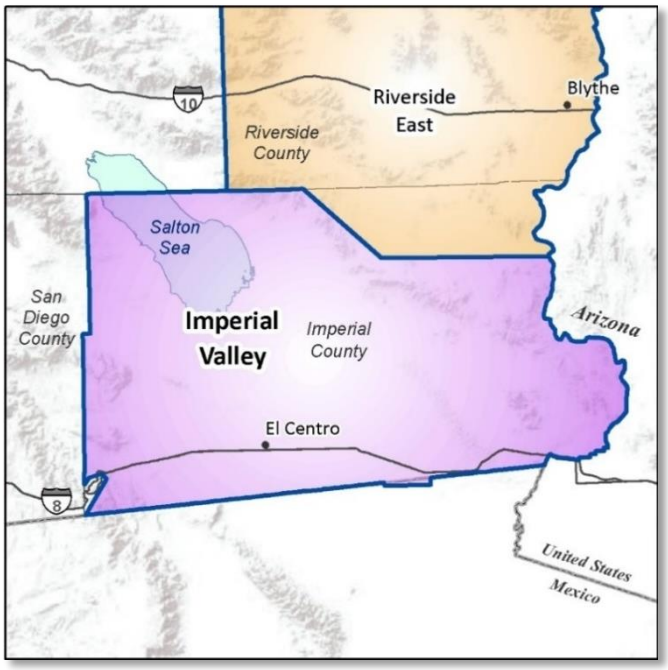
# Figure A-4. Northern California TAFAs: Solano, Sacramento River Valley, Lassen/Round Mountain



## Imperial Valley TAFA

As part of the RETI 2.0 process, the Plenary Group proposed a hypothetical study range (HSR) of up to 3,500 MW of new solar energy potential, up to 500 MW of new wind energy potential, and up to 1,000 MW of new geothermal energy potential.

*Figure A-5: Imperial Valley TAFA*




### Renewable Resource Potential Overview

The Imperial Valley TAFA (Figure A-2: Imperial Valley TAFA) covers the majority of Imperial County except for a section of the northeast corner of the county. Imperial County land use is primarily irrigated agriculture in the Imperial Valley, with federally managed desert surrounding the valley. There are more than a dozen utility-scale solar PV projects in this region that have been built in the last five years. Furthermore, there is a utility-scale wind energy project on land administered by the Bureau of Land Management (BLM) near Ocotillo in western Imperial County.

The CPUC's RPS Calculator presents an extremely large technical potential for solar PV in Imperial County (more than 100,000 MW). The RPS Calculator also identifies 750 MW of wind energy potential and almost 1,400 MW of geothermal energy potential. As part of the Desert Renewable Energy conservation Plan (DRECP), the BLM LUPA designates development focus areas (DFAs) in the Imperial Valley TAFA (shown on Figure A-1 above). Figure A-1 also presents the renewable energy overlay zones designated on private land by Imperial County.

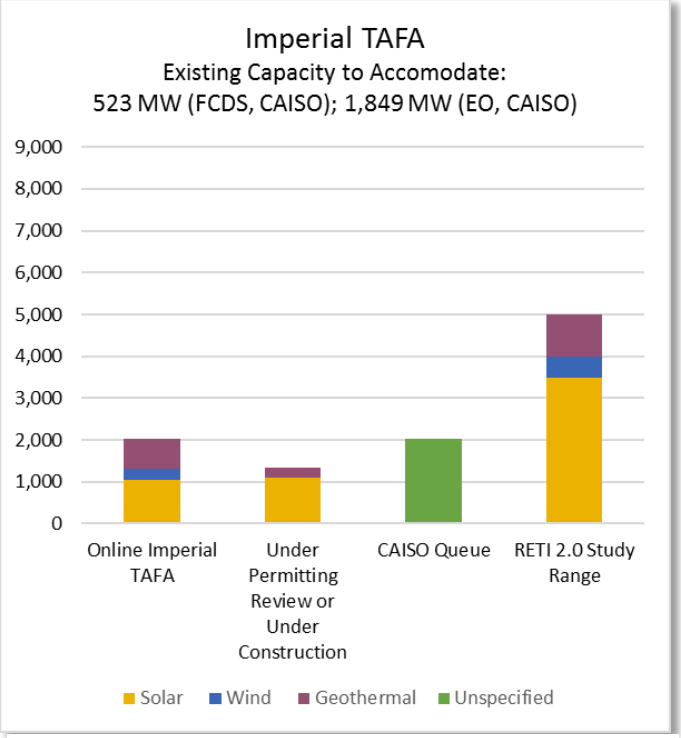



*Figure A-6: Imperial Valley TAFA Existing and Proposed Renewable Energy and Available Transmission Capacity*

Given the DFA designations and county renewable energy overlay zones many areas within the TAFA are available for solar and geothermal renewable development. The CPUC's RPS Calculator shows some wind energy potential in the eastern part of the TAFA that may be challenging to develop because the wind energy resources identified are outside of DFAs and the county renewable energy overlay zones.

Although the Imperial Valley TAFA has numerous sensitive resources, reaching a full 3,500 MW of solar energy and 1,000

MW of geothermal energy in this region would be feasible due to the large areas identified during renewable energy planning. Although some wind potential has been identified by the RPS Calculator in the Imperial Valley TAFA, most of the areas have been designated for conservation. Wind development in the Imperial TAFA would be environmentally challenging.

The Imperial Valley TAFA Chart (Figure A-6) shows the renewable generation that is already on-line, projects that are under permitting review, approved or under development, renewable MW in the California ISO interconnection queue and the hypothetical RETI 2.0 Study Range.

### *County Land-Use Considerations*

Imperial County received a Renewable Energy and Conservation Planning Grant from the California Energy Commission in 2013 and used it to prepare a renewable energy and transmission element and a conservation and open space element, adopted by the Imperial County Board of Supervisors in September 2015. The county also adopted a renewable energy overlay zone, shown on Figure A-1 above.

The renewable energy overlay zone is concentrated in areas that the county has determined to be most suitable for developing renewable energy facilities while minimizing the impact to other established uses. The overlay zones cover 200,796 acres and can accommodate a range of technologies (69,146 acres specifically for geothermal resources and 131,650 acres for a variety of renewable energy technologies).

A renewable energy project may be proposed for development outside the renewable energy overlay zone if:

- It is adjacent to the overlay zone and not located in a sensitive area, and it would not result in significant environmental effects, or
- It is not located adjacent to the overlay zone but is adjacent to an existing transmission source, it consists of the expansion of an existing renewable operation, and it would not result in any significant environmental effects.

An Imperial County representative participated on a panel during the March 2016 RETI 2.0 Plenary Group meeting and presented information at the July 2016 Environmental and Land Use Technical Group (ELUTG) public meeting. During his presentations to RETI 2.0, the county representative emphasized that renewable energy development brings economic and environmental benefits to Imperial County, a portion of the state with an unemployment rate that is five times greater than the U.S. unemployment rate.[9]

## Environmental and Land-Use Implications

The DRECP and the county planning processes identify areas within the Imperial Valley TAFA as appropriate for additional renewable energy development. Specifically, the DRECP Land Use Plan Amendment (LUPA) identified more than 110,000 acres of DFAs on BLM land in the Imperial Valley TAFA (primarily on the outskirts of the Salton Sea and on the eastern border of Imperial Valley). As noted above, Imperial County identified 200,000 acres as a renewable energy overlay for solar and geothermal energy development (surrounding primarily the Salton Sea and in certain areas of the Imperial Valley). As described below, the DRECP and county planning processes also identified potential environmental constraints to developing renewable energy in the Imperial Valley TAFA.

[9] Imperial County Perspective, Presentation by Andy Horne to RETI 2.0 Plenary Group meeting, March 16, 2016.

### *Salton Sea Management Program*

California's largest lake, the Salton Sea, is a dominant natural feature in Imperial Valley. Changing water inflows to the Sea are affecting the diverse environmental, ecological, public health, and recreational values the Sea provides. The Salton Sea also sits atop or adjacent to the Salton Sea Known Geothermal Resource Area, one of the largest in North America.

In May 2015, California Governor Edmund G. Brown Jr. established the Salton Sea Task Force that includes experts from the California Natural Resources Agency, Environmental Protection Agency, and State Water Board. The task force has sought input from tribal leaders, federal agencies, local water districts, local leaders, and other public and private stakeholders. In October 2015, the task force released an "agency action plan"[10] that included quantified habitat restoration goals as well as objectives to consider renewable energy development at the Salton Sea.

On August 31, 2016, President Obama and Governor Brown announced a memorandum of understanding[11] and a series of actions to promote water and habitat restoration at the Salton Sea, as well as development of geothermal energy resources. These actions include a request for information from the U.S. Department of Energy's Federal Energy Management Program, for developers to propose 100-250 MW of newly constructed geothermal energy projects.

### *Biological Considerations*

Primary biological concerns are flat-tailed horned lizard, a BLM special-status species; the Peninsular bighorn sheep; rare occurrences of marsh and perennial stream habitat in a desert environment; Critical Habitat for the desert pupfish; and Important Bird Areas. To protect these resources, the DRECP LUPA and other BLM land-use plans designate National Conservation Lands and Areas of Critical Environmental Concern (ACEC) within the TAFA, particularly in the areas outside the desert floor. Examples include the following:

- California Desert National Conservation Lands are part of a large contiguous unit creating an unbroken arc of specially designated landscapes from the lower Colorado River to Joshua Tree National Park and the Mojave Desert.
- East Mesa ACEC contains some of the largest contiguous range for the flat-tailed horned lizard, including high population densities.
- West Mesa ACEC includes important habitat for the flat-tailed horned lizard and supports rare plant populations and other sensitive wildlife including burrowing owl.

### *Land-Use Considerations*

Roughly 18 percent of Imperial County is irrigated agriculture land.[12] A goal of the Imperial County's Renewable Energy and Transmission Element is to develop overlay zones that would promote renewable energy development while preserving and protecting agriculture. Solar PV projects have already been approved on 21,000 acres of agricultural land in the county. Imperial County has attempted to balance the competing land uses (agriculture and renewable energy) by using its renewable energy overlay zone to direct renewable energy development to the most suitable areas.

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[10] California Natural Resources Agency and California Environmental Protection Agency "Salton Sea Task Force Agency Actions" http://resources.ca.gov/docs/salton_sea/Task_Force_Actions-151007.pdf

[11] https://www.doi.gov/sites/doi.gov/files/press-release/mou-doi-cnra-saltonsea-signed.pdf

[12] See Imperial County Overview presentation from July 21, 2016.

### *Cultural Resources Considerations*

The Imperial Valley is the site of the ancient Lake Cahuilla. Lake Cahuilla is culturally important in California history and to Native American tribes of the region. Because the ancient lake once filled the valley, segments of the ancient Lake Cahuilla lakeshore on both the west and east sides of the valley have extensive cultural resources from thousands of years of human occupation. Cultural resources will probably be found inward from the valley margins as well—Lake Cahuilla fluctuated in size over millennia, and tribal cultural resources are expectable at former lakeshores inside the maximum extent of the former lake. In addition to shoreline occupation sites and traditional uses, these areas include trails, rock art, and ceremonial and burial sites.[13]

## Transmission Implications

The Imperial Valley TAFA includes transmission operated by both the California ISO and the Imperial Irrigation District (IID). Transmission service is provided primarily by IID, which interconnects to facilities owned by San Diego Gas and Electric (SDG&E) and Southern California Edison (SCE), and some facilities within the TAFA are owned by Western Area Power Administration (WAPA).

During the TTIG assessment, the California ISO and IID provided independent assessments of the current transmission capacity available to interconnect resources to the electric grid, as well as the potential transmission implications and conceptual mitigation options necessary to accommodate the hypothetical study range. The California ISO and IID estimates of current or potential transmission capacity are not additive but rather reflect separate estimates that transmission operators have made for their respective systems.

### *California ISO Analysis*

The California ISO assessment for the Imperial Valley TAFA found that if the hypothetical study range of 5,000 MW of new generation were interconnected to the existing planned system, then areawide and local constraints would trigger transmission upgrades in the Imperial TAFA. The first of these constraints, the East of Miguel constraint, is encountered at an incremental level of generation of roughly 500 MW west of the Imperial Valley Substation. This level of additional generation may also result in increased renewable curtailment under certain operating conditions. Generation in the Imperial Valley also contributes to the Desert Area Constraint and the West of River Path Limitation. Conceptual mitigation examples that could address these constraints include the following.

**East of Miguel Constraint.** The East of Miguel constraint comprises an overload on Miguel 500/230 kV banks, ECO-Miguel 500 kV and Ocotillo-Suncrest 500 kV lines for N-1 contingencies in this area. One of the following options would mitigate this constraint and deliver more energy out of the Imperial TAFA:

- A new Imperial Valley (SDG&E) – Valley (SCE) 500 kV line
- A Midway (IID) – Devers (SCE) 500 kV AC Intertie
- A Hoober (IID) – San Onofre Nuclear Generating Station (SONGS) (SCE) HVDC line
- A DC conversion of North Gila–Miguel 500 kV line

**Lugo-Victorville 500 kV line Upgrade (Desert Area Constraint).** The Lugo-Victorville 500 kV line overload constraint is triggered by the outage of the Eldorado-Lugo 500 kV line or the simultaneous outage of the Eldorado-Lugo and Lugo-Mohave 500 kV lines. Generators east of the Lugo area would contribute to this constraint. Previous studies have indicated an upgrade of the Lugo-Victorville 500 kV line would mitigate

[13] DRECP LUPA Appendix A, Section A.4.5, Lake Cahuilla.

this constraint and provide about 2,000 MW of additional capacity. LADWP and California ISO are coordinating on this upgrade. The TTIG estimated the cost at $34 million.

**Base Case Thermal Overloads on 500 kV lines between Valley, Aberhill, and Serrano Substation (Desert Area Constraint):** Cluster studies have determined that the likely mitigation is either (i) a new series compensated Mira Loma-Red Bluff 500 kV line and reactive support at the Colorado River, Red Bluff, and Serrano Substations or (ii) a new Eldorado-Lugo 500 kV line. The TTIG estimates the cost for either of these conceptual mitigation options at $1 billion.

**West of the River Path Rating Limitation.** West of the River path rating limitation may be reached at this level of generation requiring exploration of path rating increase. Upgrades such as the conversion of the North Gila–Miguel 500 kV line from alternating current (AC) to direct current (DC) and Lugo-Victorville 500 kV upgrade may increase Western Electricity Coordinating Council (WECC) Path 46 rating.

***IID Analysis***

Within the IID-controlled area, IID contends that transmission and generation are best understood when the area is considered as “Imperial North” and “Imperial South” to reflect the transmission constraints between the two areas. Energy from new renewable generation in the Imperial North area (near the Salton Sea) will predominantly flow northwest on the Path 42 transmission, while generation in the IID South area will predominantly flow to the West and contribute the East of Miguel constraint.

IID has performed a study that shows that up to 1,500 MW of energy can be exported from Imperial North to California ISO using Path 42 without any transmission upgrades. To achieve the RETI hypothetical study range of 5,000 MW, WECC Path 42 would be constrained and in need of an upgrade. After using the available Path 42 capacity, conceptual mitigation could include the IID “STEP” in the form of a 500 kV intertie between IID’s Midway and SCE’s Devers substations, with an estimated cost of $388 million.

IID has performed a study that shows that up to 370 MW in the Imperial South region (all the area south of the Salton Sea) can be exported to California ISO using the IID/SDG&E interties at the Imperial Valley Substation. An additional 1,170 MW could be connected to California ISO from the IID Fern Substation with no IID upgrades. With 330 MW already contracted to deliver at these interconnections, IID estimates that 1,210 MW of transmission capacity is available to export to California ISO in the Imperial South area. However, these resources would still face constraints to deliverability within the California ISO system, namely the constraints on the ECO-Miguel lines identified previously.

As an alternative to the Midway-Devers STEP project identified above, IID has proposed a conceptual mitigation to address the increased amount of generation requesting interconnection in the Imperial South region to both California ISO and IID facilities.

Following the publication of the TTIG final report, IID identified the following options to increase the transmission export capacity from the Imperial Valley that are reflected in the RETI 2.0 Plenary Report:

- A North Gila-Midway-Devers (IID) 500 kV line
- The BLM-approved Desert Southwest Transmission Project (IID) - 500 kV from Blythe area to Devers Substation

***Transmission Options: Descriptions and Potential Permitting Challenges***

Table A-1 presents a summary description of each project defined in the Transmission Technical Input Group (TTIG) report and the associated potentially significant environmental and permitting constraints.

**Table A-1. Imperial Valley TAFA – Potential Transmission Project Descriptions and Permitting Challenges**

| Project Name/Cost | Miles | Routing Assumptions | Land Use or Permitting Issues |
|---|---|---|---|
| **SDG&E Imperial Valley – SCE Valley 500 kV**[14] ~$2 billion | ~165 miles | ▪ Assumed to be west of Salton Sea, following IID Imperial-Mirage-Devers corridors<br>▪ Then SCE 500 kV Devers-Valley | **Imperial Valley to Devers**:<br>▪ Acquisition of Right of Way (ROW) across private and/or agricultural land<br>▪ Routing around homes and active agricultural land in Coachella and Indio areas<br>▪ Crossing of Agua Caliente and Torres-Martinez tribal land<br>**Devers to Valley:**<br>▪ Residential development and National Forest wilderness might preclude space for third overhead 500 kV line following the SCE Devers-Valley route<br>▪ Crossing of about 6 miles of tribal land of the Morongo Band of Mission Indians<br>▪ Proximity to homes: Whitewater area, southern Banning, into Valley Substation<br>▪ Existing lines pass through constrained ROW within wilderness in San Bernardino National Forest |
| **IID Midway – SCE Devers 500 kV**[15] ~$338 million | ~86 miles | ▪ Follows IID 230 kV from IID Midway to Devers | ▪ Acquisition of ROW across private and/or agricultural land<br>▪ Expansion of existing ROW due to proximity of residences<br>▪ Crossing of Agua Caliente tribal land |

[14] This route was not studied in the Aspen SONGS reports, but the segment from Imperial Valley to La Quinta is assumed to follow Alternative 12 route evaluated in http://www.energy.ca.gov/2014publications/CEC-700-2014-002/CEC-700-2014-002-AD2.pdf.

[15] This route was evaluated as Alternative 10 in the Aspen SONGS report at http://www.energy.ca.gov/2014publications/CEC-700-2014-002/CEC-700-2014-002-AD.pdf.

**Table A-1. Imperial Valley TAFA – Potential Transmission Project Descriptions and Permitting Challenges**

| Project Name/Cost | Miles | Routing Assumptions | Land Use or Permitting Issues |
|---|---|---|---|
| **IID Hoober-SONGS HVDC**[16] ~$2 billion | ~190 miles | ▪ Follows IID 230 kV Imperial Valley–Devers, then SCE 500 kV Devers-Valley<br>▪ Underground segments assumed in locations where overhead line constraints exist. | **Imperial Valley to Devers:**<br>▪ Acquisition of ROW across private and/or agricultural land<br>▪ Expansion of existing ROW due to proximity of homes<br>▪ Crossing of Agua Caliente tribal land<br>**Devers to Valley (partially underground):**<br>▪ Crossing of about 6 miles of tribal land of the Morongo Band of Mission Indians<br>▪ Proximity to homes: Whitewater area, southern Banning, into Valley Substation<br>▪ Potential effects on the Potrero Core Reserve for Stephens' kangaroo rat<br>**Valley to SONGS (partially underground):**<br>▪ Existing buried utilities in road ROW<br>▪ Engineering considerations in design<br>▪ Expanded ROW through Camp Pendleton and into Talega Substation<br>▪ Expansion of ROW through Santa Margarita Ecological Reserve |
| **North Gila–Miguel Conversion to DC** ~$900 million | ~145 miles | ▪ Reconductoring of existing 500 kV Southwest Powerlink<br>▪ Converter stations at North Gila and Miguel Substations | ▪ Minor effects from reconductoring of existing towers and construction of converter stations |

Source: TTIG, Aspen Environmental Group

[16] This route was evaluated as Alternative 9 in the Aspen SONGS report at http://www.energy.ca.gov/2014 publications/CEC-700-2014-002/CEC-700-2014-002-AD.pdf.

## Riverside East TAFA

The Plenary Group proposed a hypothetical study range of 2,000–4,000 MW of new solar development and 500–1,000 MW of new wind energy development. This renewable energy is assumed to be located in the general vicinity of the Riverside East TAFA which includes the Riverside East Super CREZ, as shown on FigureA-2 above.

*Figure A-7: Riverside East TAFA*


### *Renewable Resource Potential Overview*

The Riverside East TAFA (Figure A-7) covers the eastern half of Riverside County and the northeast corner of Imperial County. This region has multiple existing and proposed solar PV and solar thermal projects, primarily on BLM-administered land near Desert Center and outside Blythe. The majority of these projects are many hundreds of MWs on several thousand acres of land. There are no renewable projects in the Imperial County portion of the TAFA. The RPS Calculator presents an extremely large technical potential for solar PV in Imperial County (more than 60,000 MW). While the RPS calculator identifies more than 500 MW of wind potential, the locations identified are designated as ACECs by the BLM so renewable energy development would be prohibited in these regions.

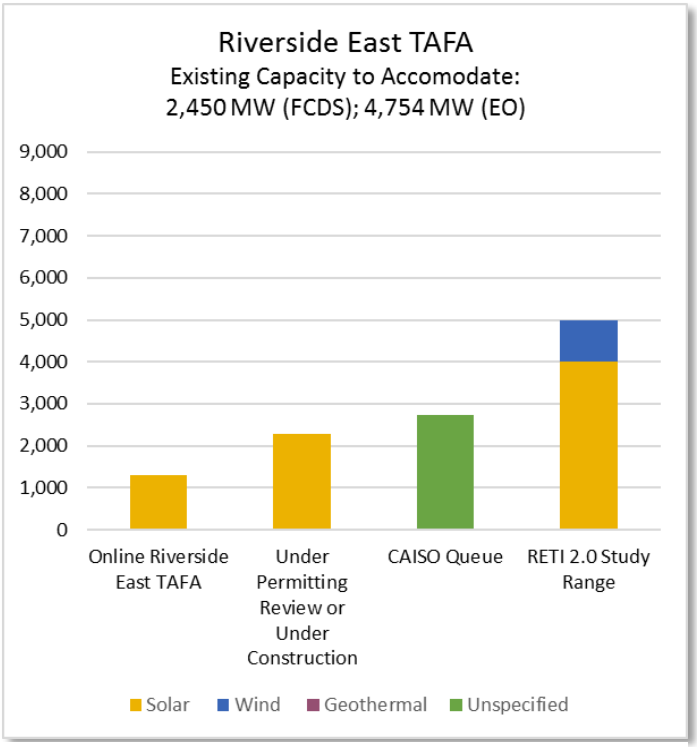


*Figure A-8: Riverside East TAFA Existing and Proposed Renewable Energy and Available Transmission Capacity*

As part of the DRECP, the BLM identified 148,000 acres of DFAs in the Riverside East TAFA, shown in Figure A-1 above. Prior to completing the DRECP, the BLM prepared the Solar Programmatic EIS. This document identified the Riverside Solar Energy Zone, most of which overlaps with the DFA.

The Riverside East TAFA has extremely high solar resources and several solar projects in the development pipeline. Developing between 2,000 and 4,000 MW of solar in this region is feasible. While the RPS calculator shows over 500 MW of wind in the Riverside East TAFA, the resource is identified in areas where renewable energy development is not allowed. Siting 500 to 1,000 MW of wind in this TAFA would be very challenging.

Reaching the full hypothetical study range of solar development would be feasible by avoiding the sensitive resources and developing primarily within the areas designated for development. Reaching the full hypothetical study range for wind would be very challenging because the majority of the wind resource overlaps with sensitive biological and other resources.

***Biological Considerations***

The DRECP and previous renewable energy project environmental reviews identified biological resources that may be environmental constraints in the Riverside East TAFA. Primary biological concerns are the federally listed desert tortoise, Mojave fringe-toed lizard habitat, the sand transport corridor, foraging habitat for golden eagles, and important habitat for special-status plants.

As a means of addressing these concerns, the DRECP LUPA or other BLM land-use plans designated National Conservation Lands and Areas of Critical Environmental Concern within the TAFA. Examples include the following:

- The Chuckwalla ACEC located south of the Desert Center region encompasses the Orocopia, Chuckwalla, Little Chuckwalla, and Palo Verde mountains and the intervening alluvial fans, washes, and valleys. This area is designated critical habitat for desert tortoise and is home to a large number of BLM-sensitive animals. The flora is one of the most botanically diverse in the California desert with 158 plant species including several species found nowhere else.
- The Palen-Ford Playa Dunes ACEC would protect one of the major playa/dune systems of the California desert and contains extensive and pristine habitat for Mojave fringe-toed lizard. The unit would protect an entire dune ecosystem for this and other dune-dwelling species, including essential habitat and ecological processes (that is, sand source and sand transport systems). The unit would also contribute to the overall linking of five currently isolated wilderness areas of northeastern Riverside County.

- The McCoy Wash ACEC, north of Blythe, would protect critical desert dry wash woodland habitat in the McCoy Valley. The ACEC forms corridor of habitat within the Riverside East Solar Energy Zone of the Western Solar PEIS.

***County Land-Use Considerations***

Riverside County received a planning grant from the Energy Commission in April 2014 to support the county in developing a general plan amendment to provide a framework of policies and data addressing renewable energy resources throughout the county, including defining an (eligible) renewable energy development (eRED) program. Mapping efforts were the major focus in 2014-2015 with a goal of identifying areas suitable for additional eRED study. Data have been developed for analysis of land-use, renewable energy designations, and conservation plans. The draft general plan amendment is expected to propose renewable energy policies, discussion, data, and maps. The data and draft general plan amendment are still under development and the county has not initiated public review of the draft amendment. In general, the development of renewable energy in the Riverside East TAFA has had few land-use constraints.

***Cultural Resources Considerations***

There are abundant prehistoric and tribal cultural resources in this region. Well-known sites include Alligator Rock, Corn Springs, and the Bradshaw Trail. Alligator Rock is a microcosm of the native societies and archaeology of the Colorado Desert. It contains examples of most of the site types that are common to the Colorado Desert, as well as some site types that are uncommon. It tells a story of resource procurement, trade, and travel carried out by resourceful, mobile populations.

Furthermore, the Mule-McCoy ACEC has been shown to be rich in cultural resources. Transportation and trade trails follow the bases of the mountains and branch out across the valley floors, interconnecting the mountain range routes. Out in the valley center where wind-blown sand moves across the flats, these trails lose the physical visage but remain marked by the attendant artifact scatters, such as pot drops (ceramic sherd scatters), lithic scatters, rock features, and isolated groundstone artifacts. Cremation sites are often revealed as dune sands move about.

The DRECP FEIS identified three examples of tribal cultural landscapes that exist in areas previously considered to be nonsensitive: the Salt Song Trail, Keruk Xam Kwatcan/Earth Figures Landscape, and Pacific to Rio Grande Trail Landscape. These cultural landscapes consist of physical marks on the land, both trail marks and natural land patterns; wayside locations where specific songs and other ceremonies are sung or conducted; springs, tanks, and wells; and culturally important plant and animal species.[17]

***Water Considerations***

Groundwater basins within the Riverside East TAFA are or may be hydrologically connected to the Colorado River. There are concerns that pumping for new development, including renewable energy, could induce flows from the Colorado River into the basins. There are legal restrictions too any use of lower Colorado water without allocation.

[17] BLM 2015—U.S. Bureau of Land Management. *Desert Renewable Energy Conservation Plan Proposed Land Use Plan Amendment and Final Environmental Impact Statement*. October. BLM/CA/PL-2016/03+1793+8321. Available at: http://drecp.org/finaldrecp/.

## Transmission Implications

The California ISO is the transmission system operator for the Riverside East TAFA. Transmission service is provided by SCE, although some facilities are owned by WAPA, IID, and the Metropolitan Water District of Southern California. SCE provides local service and export of renewable energy generation to the Los Angeles basin via the Colorado River and Red Bluff substations. From the Riverside East TAFA, SCE lines interconnect through the Devers substation before continuing to the Los Angeles basin.

The TTIG expects areawide and local constraints to trigger major transmission upgrades in the Riverside East TAFA if the hypothetical study range of 2,000-4,000MW of new generation is interconnected to the existing planned system. This level of additional generation may also result in increased renewable curtailment, especially during maintenance outage conditions.

Further, the TTIG report noted two constraints and provided the following conceptual mitigation examples. See write up for this mitigation option under the Imperial Valley TAFA.

**Lugo-Victorville 500 kV line Upgrade (Desert Area Constraint).** See write up for this mitigation option under the Imperial Valley TAFA.

**Base Case Thermal Overloads on 500 kV lines between Valley, Aberhill, and Serrano Substation (Desert Area Constraint):** See write up for this mitigation option under the Imperial Valley TAFA.

## Victorville/Barstow TAFA

As part of the RETI 2.0 process, the Plenary Group proposed a hypothetical study range of up to 4,500 MW of new solar potential and up to 500 MW of wind potential from the Victorville/Barstow TAFA that includes the Barstow, Victorville, San Bernardino–Lucerne, Kramer, and Inyokern Super CREZs, shown on Figure A-2, above.

*Figure A-9: Victorville/Barstow TAFA*


### Renewable Resource Potential Overview

While the Victorville/Barstow TAFA (Figure A-9) has extremely high solar resources and some wind energy potential, he RETI 2.0 review suggests that reaching the hypothetical study range of 4,500 MW of solar energy and 500 MW of wind energy in this TAFA would be challenging due to the sensitive resources throughout the TAFA and extensive community preference for community-scale renewable energy in San Bernardino County.

The Victorville/Barstow TAFA covers the western half of San Bernardino County, including Barstow and the Victor and Lucerne Valleys, a portion of northern Kern County near Indian Wells, and the southwestern portion of Inyo County. This area includes the existing LUZ Solar Energy Generating Systems solar trough projects built in the 1980s and the Abengoa Mojave solar trough project built in 2014. This region has several existing and proposed solar PV projects, most of which are 20 MW or smaller. The most recently approved projects include a 44 MW solar PV project near Daggett, a 20 MW solar PV project near Joshua Tree, and a 20- MW solar PV project near Barstow.

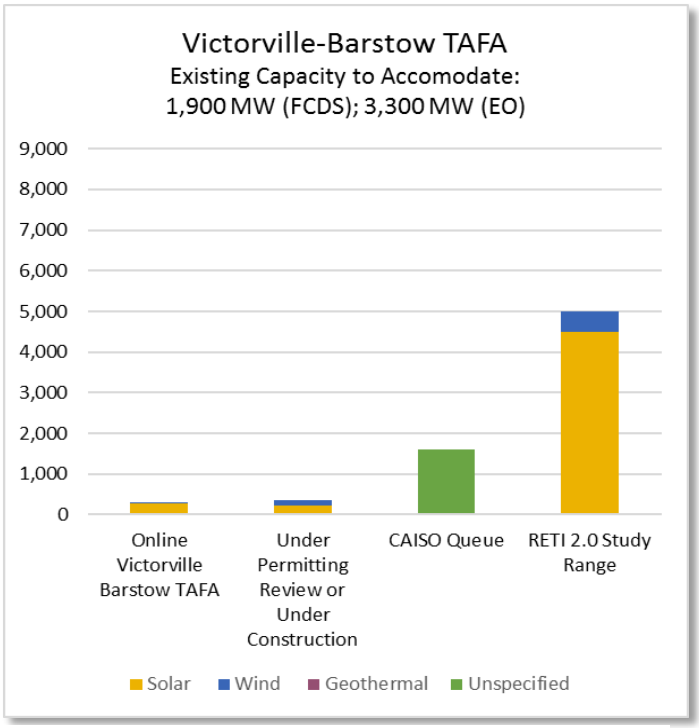


*Figure A-10: Victorville-Barstow TAFA Existing and Proposed Renewable Energy and Available Transmission Capacity*

As part of the *DRECP*, the BLM identified some DFAs in the Victorville/Barstow TAFA, shown in Figure A-2 above. Specifically, the DRECP LUPA identified almost 90,000 acres of DFAs on BLM land in the Victorville/Barstow TAFA in a number of relatively small patches along State Route 395, near Searles Valley, near the greater Barstow area, on the outskirts of Victorville and in Lucerne Valley.

There is little overlap between BL M-designated DFAs and the remaining high-quality wind areas in the TAFA, suggesting

limited potential for utility-scale wind energy.

Inyo County designated solar energy development areas near Pearsonville and Trona as Solar Energy Development Areas. San Bernardino County's draft renewable energy and conservation element includes a guiding principle to focus on smaller "community-oriented renewable energy" development on private lands within the county.[18] In Kern County, solar energy development was identified as a land use in the Indian Wells region that could result in fewer environmental effects.

Indian Wells and southern Inyo County could support additional renewable energy projects but would still likely fall short of the hypothetical study range.

## Environmental and Land-Use Implications

With the DRECP and county planning activity in the Victorville/Barstow TAFA area, the environmental, land-use, and cultural resource implications of development are relatively well-understood at the landscape scale, and frameworks either exist or are being developed to direct development to the least impactful areas, where recent data and tools may facilitate permitting.

### *Biological Considerations*

The DRECP and county planning processes identified a series of environmental constraints in the Victorville/Barstow TAFA. Primary biological concerns are critical habitat for the federally listed desert tortoise, known habitat for Mohave ground squirrel, foraging habitat for golden eagles, and important habitat for special-status plants, such as Parish's phacelia and Mojave monkeyflower. The region also has Mojave fringe-toed lizard habitat at the delta of the Mojave River.

To address these concerns, the DRECP LUPA or other BLM land-use plans designated National Conservation Lands and Areas of Critical Environmental Concern within the TAFA. Examples include the following:

- The Superior-Cronese ACEC, which covers most of the region north of Barstow and south of the China Lake Naval Weapons Center, provides high-density desert tortoise habitat, encompasses designated desert tortoise critical habitat, and provides critical tortoise habitat linkage.
- The Granite Mountain Wildlife Linkage ACEC, located between Lucerne Valley and Apple Valley and includes Granite Mountain, provides critical links for wildlife populations to the north and south of this linkage area. It is critical for bighorn sheep, golden eagles, desert tortoise, and several other species.
- The Ord-Rodman ACEC is located northwest of Twentynine Palms Marine Corps Base and provides high-density desert tortoise habitat and habitat linkages.
- The Fremont-Kramer ACEC was designated east of the Edwards Air Force Base in the Fremont Valley, Rand Mountains, Red Mountain, and elsewhere because it contains desert tortoise critical habitat and essential movement corridors that link wildlife habitats.
- The Mohave Ground Squirrel ACEC contains habitat for the Mohave ground squirrel and provides connectivity between the three military bases to the north, east, and south.

### *County Land-Use Considerations*

Current and planned development within the Victorville/Barstow TAFA has been limited to projects primarily 20 MW and smaller and primarily near the Barstow region Larger projects may be developed in

[18] *County of San Bernardino, Draft General Plan Renewable Energy and Conservation Element,* November 3, 2016.

the future in the Indian Wells region and or in the SEDAs within Inyo County. San Bernardino County planning has focused on smaller, community-oriented projects. There is extensive and known community opposition to utility-scale renewable energy and transmission development in the Victorville, Apple Valley, and Lucerne Valley regions.

**San Bernardino County.** San Bernardino County is completing a renewable energy and conservation element (RECE) for its county general plan, a process begun with funding from the Energy Commission and AB X1 13. This proposed element presents renewable energy facility standards that promote smaller sized community-oriented renewable energy projects as well as development standards for utility-scale renewable energy. [19]

The San Bernardino County Board of Supervisors established five fundamental positions regarding the DRECP, including the following actions to "protect desert community values and economic development opportunities by:"[20]

- Focusing renewable energy development on private lands that have marginal economic development potential, have been previously disturbed, or have been contaminated, in addition to federal land in the County
- Focusing mitigation and conservation on federal land in the County
- Minimizing mitigation and conservation on private land in the County

In a February 17, 2016 Resolution, the San Bernardino Board of Supervisors expressed "general and tentative" support for four DFAs on BLM land within this TAFA: North of Kramer Junction, Trona (in the Searles Valley), Hinkley, and El Mirage, as well as for the Variance Process Lands[21] near Amboy. These limited sites preference is also supported in the county's draft RECE element.

Community members During the DRECP and general plan element processes, many community members from the Victorville and Lucerne areas opposed utility-scale renewable development near these communities.

**Kern County.** Kern County planning is discussed in the Tehachapi TAFA summary section. However, in the RETI 2.0 stakeholder process, Kern County made a specific request that the Indian Wells Valley (located west of the town of Ridgecrest) should be considered as a special study area for transmission to serve solar development in the valley. The county sees the Indian Wells Valley as a valuable area of future solar energy development and renewable energy was considered in the Indian Wells Valley Land Use Management Plan.[22]

**Inyo County.** The Inyokern CREZ includes the southwestern corner of Inyo County. In addition to Indian Wells Valley (see Kern County discussion above), the Inyokern CREZ includes some potential development areas in Inyo County, including the Pearsonville Solar Energy Development Area (about 600 acres).

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[19] *County of San Bernardino, Draft General Plan Renewable Energy and Conservation Element,* November 3, 2016.

[20] County of San Bernardino Comments Re: RETI 2.0, July 29, 2016, 15-RETI-02

[21] *Variance Process Lands* are lands that are potentially available for renewable energy development but would have minimal streamlining and are not incentivized. Variance Process Lands have a specific set of conservation and management actions in the *DRECP Land Use Plan Amendment*. Applicants must demonstrate that a proposed activity on Variance Process Lands will avoid, minimize, and/or mitigate sensitive resources.

[22] *Indian Wells Valley Land Use Management Plan,* Kern County Planning and Community Development Department, http://pcd.kerndsa.com/planning/environmental-documents/390-indian-wells-valley-land-use-management-plan.

Using funds from an Energy Commission planning grant Inyo County developed a renewable energy general plan amendment that was approved in March 2015. In the general plan amendment, the county identified three solar energy development area (SEDA) groups and one study area that total up to 850 MW:

- The study area is in the western part of the county (along the Highway 395 corridor).
- The Southern SEDA group (with the Trona SEDA) is in the southern area with a 100 MW cap.
- The Eastern SEDA group (with the Charleston View and Sandy Valley SEDAs) is in the eastern part of the county (near the border with Nevada and San Bernardino County) with a 500 MW cap.
- The Western SEDA group (with the Laws, Owens Lake, Rose Valley, and Pearsonville SEDAs) is in the western part of the county with a 250 MW cap

Pearsonville was identified by the Inyo County Renewable Energy General Plan Amendment as an area suitable for solar development. The Inyo County Trona Solar Energy Development Area is 600 acres and located immediately north of the Inyokern CREZ.

***Water Considerations***

The California Department of Water Resources has identified the water basin serving the Indian Wells Valley as a critically over drafted and Kern County has identified utility-scale solar energy as a possible solution to rebalance land uses to realize groundwater sustainability in this area.

***Cultural Resources Considerations***

There are abundant prehistoric and tribal cultural resources in this region. Well-known resource localities include Afton Canyon and the Calico Early Man site. Humans in the Afton Canyon area left a record in the form of stone tools and pottery, some estimated to be more than 8,000 years old. The importance of the cultural and prehistoric values in the region is documented in the DRECP California Desert National Conservation Lands designations.

## Transmission implications

The California ISO and the Los Angeles Department of Water and Power (LADWP) are the primary transmission system operators in the Victorville/Barstow TAFA. Transmission service is provided by SCE and LADWP, which are interconnected through the jointly owned Lugo-Victorville 500 kV lines. SCE provides local service and export of renewable energy generation to the Los Angeles basin via the Lugo Substation. From the Victorville regions (Lugo substations), the SCE lines interconnect with the SCE and LADWP system in the Inland Empire, south of the Cajon Pass. SCE also operates a 115 kV line from Inyo County to SCE's Inyokern Substation.

The TTIG estimates that adding a hypothetical 5,000 MW of renewable energy to the existing planned system in the Victorville/Barstow region would trigger areawide and local constraints and require major transmission upgrades to enable FCDS. The California ISO 2015-2016 transmission plan 50 percent RPS special study did not identify any areawide constraint that would prohibit a large amount of generation (5,000) MW from being interconnected in the Victorville/Barstow area from an energy-only perspective. The study highlighted the possibility of more than 1,000 MW of renewable curtailment under maintenance outage condition.

Further, the TTIG report noted that if 1,500 MW of the hypothetical study range were developed in the SCE service territory, three constraints would occur in SCE's North of Lugo transmission area. Conceptual mitigation examples include but are not limited to:

**Base case overloads on Kramer-Victor No. 1 and No. 2 220 kV lines.** Previous studies addressed this constraint with a new transmission line, either between Coolwater and Lugo (220 kV) or Kramer and the community of Llano (500 kV). A Coolwater-Lugo 220 kV line would consist of a new 34-mile 220 kV line from the existing Coolwater 220 kV Substation, south to the Lugo-Pisgah corridor, and 28 miles of tear down and rebuild from Calcite Substation west to Lugo Substation. Alternatively, a Kramer-Llano 500 kV line would require new 500 kV facilities at Kramer Substation, a new 40-mile 500 kV line heading south from Kramer Substation, which would loop into the existing Lugo-Vincent No. 2 500 kV line near the community of Llano. The TTIG estimated the cost at $480 million.

**Base case overloads on Calcite-Lugo 220 kV line.** Generation development north of Lucerne Valley at the conceptual Calcite Substation[23] could create base case overloads on the Calcite-Lugo 220 kV line. Previous studies have indicated the required mitigation is a tear down and rebuild of the Calcite-Lugo 220 kV line. The TTIG estimated the cost at $260 million.

**Lugo-Victorville 500 kV line Upgrade (Desert Area Constraint).** See write up for this mitigation option under the Imperial Valley TAFA.

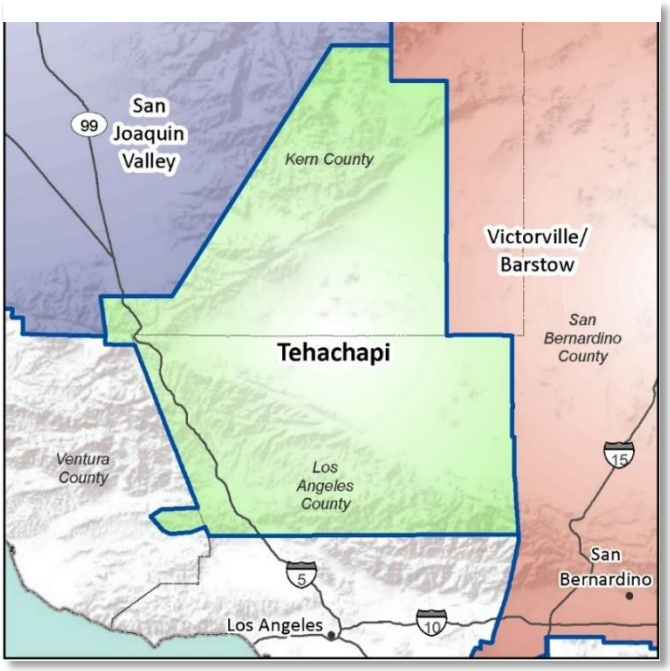
**Base case overloads on Lugo No. 1AA and No. 2AA 500/220 kV Transformers.** Generation development north of Kramer, north of Lucerne Valley at the Calcite Substation, or east of Lugo could create base case overloads on the existing Lugo No. 1AA and No. 2AA 500/220 kV transformer banks. Previous studies have indicated the required mitigation is a new Lugo No. 3AA 500/220 kV transformer bank. The TTIG estimated the cost at $150 million.

[23] The Calcite Substation would be a new 220 kV Substation that would be required to interconnect generation near the Lucerne Valley. This substation was assumed to be in place for the TAFA evaluation.

## Tehachapi TAFA

The Plenary Group proposed a hypothetical study range of up to 4,500 MW of new solar energy potential and up to 500 MW of wind energy potential. This renewable energy is assumed to be located in the vicinity of the Tehachapi TAFA, which includes the Tehachapi Super CREZ, shown on Figure A-2 above.

*Figure A-11: Tehachapi TAFA*




### Renewable Resource Potential Overview

The Tehachapi TAFA region (Figure A-7) is famous for its wind energy generation; the Tehachapi Wind Resource Area (TWRA) is the largest wind zone in California and generates almost 3,300 MW in three zones, the largest of which is just west of the town of Mojave.

Because this region is the westernmost part of the Mojave Desert, it also has excellent solar resources and supports almost 1,300 MW of existing solar projects in Kern County and almost 500 MW in Los Angeles County, with additional commercial projects not yet on-line but in development in both southern Kern County and northern Los Angeles County (Antelope Valley).

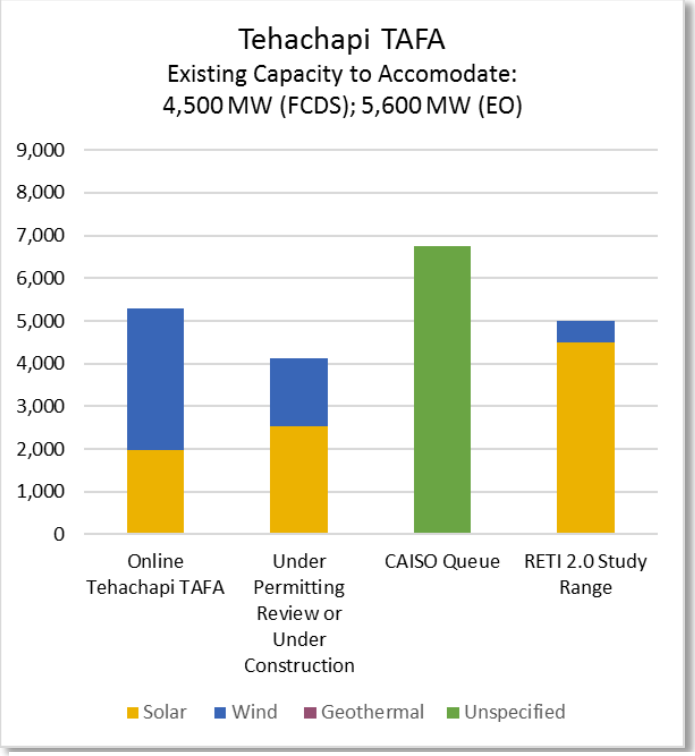



*Figure A-12: Tehachapi TAFA Existing and Proposed Renewable Energy and Available Transmission Capacity*

As part of the DRECP, the BLM identified Development Focus Areas (DFAs) in the Tehachapi TAFA, shown on Figure 2.2-2 (in Section 2.2 of the main report) and described below under each county.

While the Tehachapi TAFA already includes the largest concentration of renewable energy projects in California, many areas are still available for renewable energy development.

Reaching a full 4,500 MW of solar energy and 500 MW of wind energy in this region may be challenging because extensive existing development has occurred on some of the most accessible lands. But given the goals of the different counties and the areas identified as potentially suitable for renewable energy, developing this range is considered feasible.

## Environmental and Land-Use Implications

The DRECP and county planning documents identify a substantial part of the region within the Tehachapi TAFA as appropriate for additional renewable energy development. Specifically, the DRECP LUPA identified roughly 28,000 acres of DFAs on BLM land in the Tehachapi TAFA (within the TWRA).

### *Biological Considerations*

The DRECP and county planning processes also identified a series of environmental constraints in the Tehachapi TAFA. Primary biological concerns are potential impacts to Mohave ground squirrel habitat and connectivity, desert tortoise habitat and connectivity, and California condor habitat. As a means of addressing these concerns, the DRECP LUPA or other BLM land-use plans designated National Conservation Lands, Areas of Critical Environmental Concern, and Wildlife Allocation areas within the TAFA, particularly in the areas outside the desert floor. Examples include the following:

- The Desert Tortoise Research Natural Area ACEC in the western Mojave Desert north of California City was designated on public lands supporting the highest known continuous densities of desert tortoises.
- The Tehachapi Linkage Wildlife Allocation is a BLM conservation designation where management emphasizes wildlife values, but the area does not contain the same sensitive values or management limitations as an ACEC. This area is the southern limit of the range for many Sierra Nevada plants and animals. It contains federally listed California condor, state-listed Tehachapi slender salamander, and BLM-sensitive yellow-blotched salamander and habitat that is essential to maintaining species diversity and genetic linkages.

### *County Land-Use Considerations*

Current and planned development within the Tehachapi TAFA has been concentrated in areas with fewer valuable ecological and cultural resources. Furthermore, Kern and Los Angeles Counties within the TAFA have incorporated renewable energy into their planning processes.

**Kern County.** The Tehachapi TAFA includes the eastern half of Kern County, within the Mojave Desert and Tehachapi Mountains. While much of the TWRA has been developed, there is continued interest from wind and solar developers, as well as ongoing development. Kern County has permitted more than 11,000 MW of renewable energy throughout the county and has a goal to permit another 5,000 MW in the future. Kern County regulates renewable energy development through conditional use permits; Kern County included renewable energy as part of its energy element in the county general plan, adopted in 2004.

As summarized in the ELUTG final report, during the RETI 2.0 stakeholder process, Kern County provided recommendations for how the state energy agencies could work more effectively with counties to improve planning for renewable energy.[24]

**Los Angeles County.** The portion of Los Angeles County located in the Tehachapi TAFA is the Antelope Valley, including the cities of Lancaster and Palmdale. The county has approved 12 solar PV projects on 5,300 acres, primarily surrounding Lancaster.

[24] See page 36 of the final ELUTG report, *Environmental and Land Use Information to Support the Renewable Energy Transmission Initiative (RETI) 2.0 Process* for a summary of recommendations made by Kern County during the RETI 2.0 process. http://docketpublic.energy.ca.gov/PublicDocuments/15-RETI-02/TN214445_20161109T100524_Environmental_and_Land_Use_Information_to_Support_the_Renewable.pdf

Los Angeles County is finalizing a renewable energy ordinance to be presented to the Los Angeles County Board of Supervisors. The proposed renewable energy ordinance would guide the development of renewable energy in unincorporated portions of the county. Specifically, it requires a conditional use permit for any ground-mounted utility-scale projects and permits such projects in certain zoning designations.[25] It also prohibits utility-scale wind projects within the unincorporated portions of the county. The board has indicated its intent to approve the ordinance.[26] Moreover, Los Angeles County's Antelope Valley Plan, adopted in 2015, which overlaps with almost the entire portion of the Tehachapi TAFA in Los Angeles County, would direct renewable energy development and would prohibit ground-mounted utility-scale renewable energy facilities within significant ecological areas and economic opportunities areas.

***Cultural Resources Considerations***

Cultural resources are abundant in the Tehachapi TAFA. They consist of Native American archaeological resources (including stone quarries and rock circles), traditional and contemporary tribal use areas, historic archaeological resources, and historic built environment resources (including historic military structures).

## Transmission Implications

The California ISO is the primary transmission system operator for the Tehachapi TAFA. The high-voltage system within the TAFA includes SCE and LADWP lines. SCE provides local service and export of most renewable energy generation to the Los Angeles basin via the Tehachapi Renewable Transmission Project (TRTP), for which construction is nearly complete. The LADWP system includes the Pacific DC Intertie carrying energy from the Pacific Northwest into the L.A. system and the Inyo-Rinaldi 230 kV line. LADWP's 230 kV Barren Ridge Renewable Transmission Project has just been completed, allowing import of solar, wind, and hydroelectric generation into the LADWP system.

The TTIG does not expect that adding an additional 5,000 MW of renewable energy in the greater Tehachapi region would trigger a major transmission upgrade. However, this level of additional generation may result in increased renewable curtailment especially during maintenance outage conditions. A significant increase in generation beyond the HSR could cause system stability issues and trigger expensive 500 kV upgrades within SCE's territory south of Vincent.

[25] Utility-scale ground-mounted solar projects would be permitted with a conditional use permit from regional planning in all zoning designations except light agricultural (A-1), open space (O-S), watershed (W), and any residential zones (residential agricultural [R-A], single-family residence [R-1], two-family residence [R-2], limited multiple residence [R-3], unlimited residence [R-4], and residential planned development [RPD]). (See Table 3-3 in Chapter 3, Project Description of the Final Environmental Impact Report: Los Angeles County Renewable Energy Ordinance).

[26] Los Angeles County Department of Regional Planning: Renewable Energy Latest News. http://planning.lacounty.gov/energy.

## San Joaquin Valley TAFA

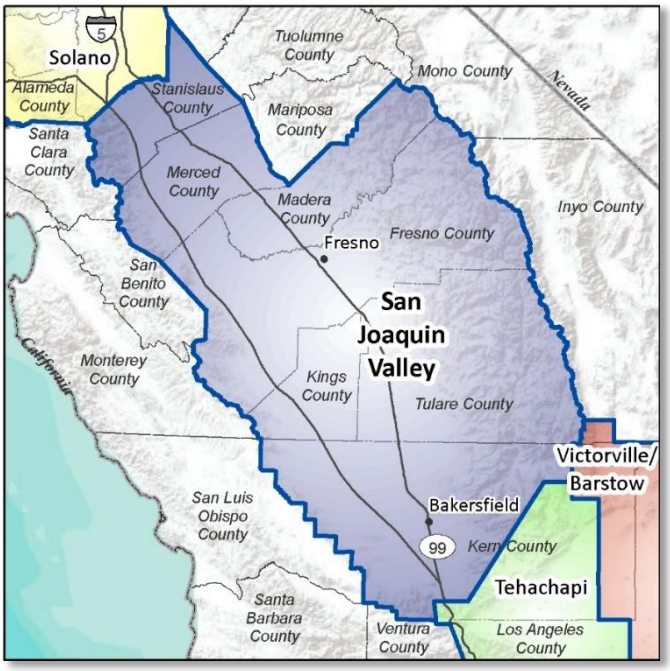
The hypothetical study range for the San Joaquin Valley is up to 5,000 MW of new solar energy potential. This renewable energy resource is assumed to be in the San Joaquin Valley TAFA, which includes the Westlands, Los Banos, and Central Valley North Super CREZs, shown on Figure A-3 above.

### Renewable Resource Potential Overview

The San Joaquin Valley TAFA (Figure A-13) is a region dominated by agriculture. More recently, it has seen a large amount of solar PV development due to the excellent solar resource. The San Joaquin Valley TAFA covers a vast region and includes the counties of Kern, Tulare, Kings, Fresno, Madera, Merced, and Stanislaus.

The San Joaquin Valley TAFA has high solar resources and many solar projects in the development pipeline. Developing up to 5,000 MW of solar in this region is feasible.

*Figure A-13: San Joaquin Valley TAFA*



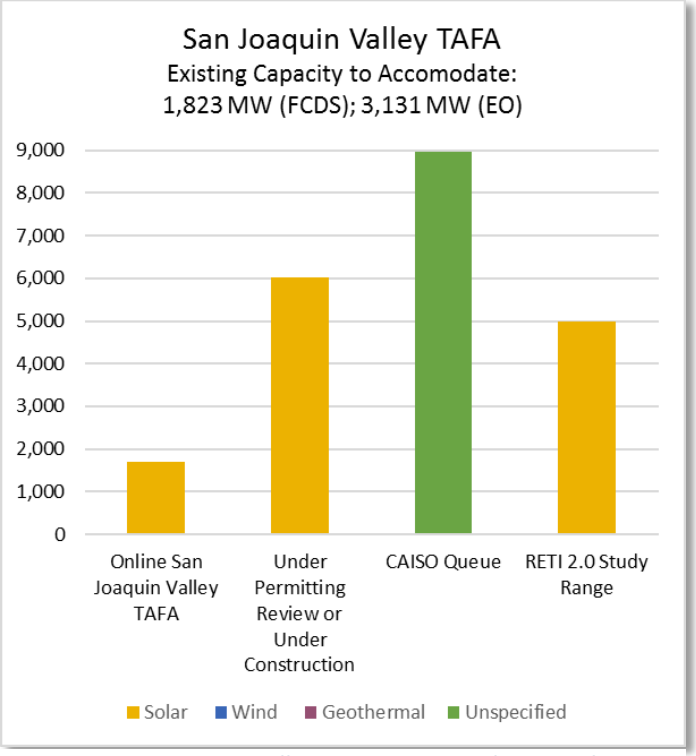




*Figure A-14: San Joaquin Valley TAFA Existing and Proposed Renewable Energy and Available Transmission Capacity*

While the San Joaquin TAFA has numerous sensitive resources and habitat, reaching a full 5,000 MW of solar energy would be highly feasible within the "least conflict" and other areas with minimal environmental, agricultural, cultural, military, and other conflicts.

#### *Stakeholder Planning: San Joaquin Valley Solar Report*

Given the interest in developing solar energy in the San Joaquin Valley, the Governor's Office of Planning and Research in 2015 urged the completion of a stakeholder-led, landscape-scale planning process to identify "least-conflict" lands for solar PV development in the valley from the perspective of multiple stakeholder groups. The stakeholder groups included environmental conservation, agriculture farmland conservation, solar industry, and transmission groups. The project team made the final outputs from each stakeholder working group available

publicly, with the goal of identifying potential areas for solar PV development in the valley that each stakeholder group viewed as "least conflict." The project team then generated composite least-conflict areas. This exercise was written up in the report *A Path Forward: Identifying Least-Conflict Solar PV Development in California's San Joaquin Valley*. This exercise was informational; it was a non-regulatory land-use planning effort.[27]

An overview of each county's renewable energy policies is provided below. Unlike in the California desert, the San Joaquin Valley TAFA counties have not completed specific renewable energy planning processes. Notwithstanding, most counties have specific permitting processes for solar PV facilities and are integrating renewable energy into their general plan updates; all have had some experience permitting such projects.

## Environmental and Land-Use Implications

The San Joaquin Valley Solar Report identified composite least-conflict areas totaling more than 470,000 acres (5 percent) of the 9.5 million acres within the project boundary. After adjusting for tribal areas of concern, 213,000 acres of least-conflict lands were identified.

Least-conflict areas ranged from priority least-conflict areas to potential least-conflict areas. The priority least-conflict areas concentrated in the central portion of the valley, found mostly within Fresno County and the Westlands Water District. Least-conflict areas were scattered throughout the other valley counties. The potential least-conflict areas were concentrated in Fresno, Kings, and Madera Counties.

### *Biological Considerations*

The San Joaquin Valley is an area that has seen vast landscape-scale change since the early twentieth century. Most of its natural communities on the valley floor have been reduced to less than 5 percent of their original extent. Primary biological concerns are: potential impacts to San Joaquin kit fox, Swainson's hawk, tricolored blackbird, wildlife movement corridors, and vernal pool and other wetland/riparian habitat.

The San Joaquin Valley Solar Report identifies areas within a connected landscape that allow movement of plants and animals and that has embedded rarity and a certain level of intactness and unique species. It also aimed to cover migratory bird habitat and existing conservation lands, as well as allow for some flexibility. The model inputs used to identify the least conflict areas included conservation elements, wetland density, vernal pool density, species distribution, landscape permeability, and selected habitat corridors.

### *County Land Use Considerations*

**Kern County.** The San Joaquin Valley TAFA includes the western half of Kern County, within the Central Valley. See the Tehachapi TAFA discussion for Kern County's renewable energy status.

**Tulare County**. Tulare County has a "solar development" permit process designed to accommodate and promote solar projects. Tulare permits solar development through special use permits. The Tulare General Plan has a goal to support efforts, when appropriately sited, for the development and use of alternative energy resources, including solar.

**Kings County.** The Kings County General Plan states that the construction of commercial solar farms in agriculturally zoned land is a conditional use in Kings County and should be directed to lower priority farmland. The general plan includes an objective to encourage and support efforts to develop

[27] Available at https://db-static-content.s3.amazonaws.com/versions/439/img/gateways/sjvp/report.pdf.

commercial renewable energy in lower priority agriculture lands when appropriately sited (RC Policy G1.2.2) and an objective to site new large-scale renewable facilities where they can be served by existing electrical transmission line or where the lines can be located to minimize impacts (RC Policy G1.2.5).

**Fresno County**. Fresno County processes solar PV facilities through the unclassified conditional use permit process based on Section 853.B.14 of the Fresno County zoning ordinance. During the permit process, information considering the agricultural operational/usage of the parcel, including specific crop type and crop yield for at least 10 years, is considered. The process also considers the source of water for the parcel(s), the current land status (Williamson Act Contract, Conservation Easement, and so forth), and soil types.

**Madera County.** The Madera County zoning ordinance allows for solar development in certain agriculture zoning with a conditional use permit.

**Merced County.** Merced County's general plan includes a policy to encourage the installation of solar production facilities in agricultural areas as long as they do not result in a tax burden to the county, do not result in permanent water transfers off of productive agriculture land, do not require cancellation of Williamson Act contracts, and do not conflict with sensitive habitats or other biological resources. The county requires dedications of agricultural land and habitat mitigation when impacts to such resources are significant under the California Environmental Quality Act (CEQA).

***Land-Use and Agriculture Considerations***

As noted in the discussion of the renewable resource potential, land-use concerns in the San Joaquin Valley are dominated by agriculture. The San Joaquin Valley is one of California's largest and most important agricultural regions. All 8 counties of the Valley rank within the top 10 list for agricultural market value within California, with 7 of the 8 counties on the top 10 list nationally. Federal and state water projects allow irrigated crop production year round in this region of California. Tax incentives such as the Williamson Act support the protection of farmland and conservation of rangeland at the county level.

The highest priority agriculture land in the San Joaquin Valley Solar Report was identified as prime farmland, farmland of statewide importance, or unique farmland per the Farmland Mapping and Monitoring Program (FMMP) that coincided with excellent or good groundwater recharge areas. Important and potentially important agriculture areas were identified as lands classified by the FMMP as Prime farmland, farmland of statewide importance, or unique farmland but were not also coincident with excellent or good groundwater recharge areas or citrus cropland or that were also known to have impaired soils (moderately or strongly saline areas). Least-conflict areas and priority least-conflict areas were areas not identified as prime farmland, farmland of statewide importance, or unique farmland and poor, very poor, non-agricultural, Storie Index classes, or areas that were within Westlands Water District drainage impaired lands that overlaid impaired soil areas (slightly, moderately, or strongly saline areas).

***Water Considerations***

More than 500,000 acres of farmland were fallowed last year because of water shortages, particularly south of the Delta.[28] In addition, insufficient drainage has been a significant issue on some lands within the valley, leading to the buildup of salts and heavy metals and the potential need for permanent fallowing of agriculture, especially within the Westlands Water District.

***Tribal Considerations***

[28] http://www.sacbee.com/news/state/california/water-and-drought/article69451732.html.

The San Joaquin Valley Solar Report process also included consultation with Native American tribes, which resulted in tribal groups reviewing the composite least-conflict conflict map, and identifying tribal areas of concern. Tribal areas of concern are those areas within the composite least-conflict lands that have greater potential than the other composite least-conflict areas to affect tribal resources and interests. As the San Joaquin Valley Solar report notes, tribal areas of concern are not shown to protect the confidentiality of the tribal data, though a map of the composite least-conflict lands, totaling 213,000 acres, not identified as tribal areas of concern is available in the report. Future users of this information should review *A Path Forward: Identifying Least-Conflict Solar PV Development in California's San Joaquin Valley* to become more aware of potential conflict with tribal resources and interests in the San Joaquin Valley TAFA.

## Transmission Implications

The California ISO is the primary transmission system operator for the San Joaquin Valley TAFA. Transmission service is provided primarily by PG&E and SCE systems that are connected at the 500 kV level, with some facilities owned by WAPA. Northern portions of this area are within the Balancing Authority of Northern California and the Turlock Irrigation District system. The San Joaquin Valley area is interconnected to the bulk system through the PG&E 500 kV substations primarily at Midway, Gates, and Los Banos, with underlying 230 kV transmission system interconnecting the local areas. The southeastern portion of the SCE 220 kV system in the Big Creek area connects to the southern 500 kV system. The PG&E and SCE 220 kV transmission systems are not interconnected. The northern and southern 500 kV systems are interconnected between the Midway and Vincent 500 kV substations.

Generally, adding 5,000 MW into the San Joaquin Valley could create issues on the existing subtransmission system (70 and 115 kV), which has limited capacity and may require extensive upgrades to accommodate generation at those voltage levels. As generation flows from the sub transmission system onto the bulk electric system (230 and 500 kV), this amount of generation could also result in capacity constraints on the transmission path from Los Banos–Panoche-Gates-Arco-Midway. Conceptual mitigation examples include the following.

**Fresno area constraints.** Several upgrades between Gates and Los Banos and Gates and Midway will be required to mitigate 230 kV, 115 kV and 70 kV constraints. Major upgrades could potentially include a third 500/230 kV transformer at Gates along with multiple 230 kV transmission line section reconductorings between Los Banos and Panoche, Borden and Gregg, Gates and Arco, and Gates and Midway. In addition, depending on concentration and location, reconductoring local 70 and 115 kV lines and various substation upgrades will be required. The estimated cost for this is $400 million to $500 million. Alternatively, a new 500 kV transmission substation can be considered to transfer the generation on to the 500 kV system. The estimated cost of this mitigation is unknown.

## Solano TAFA

The hypothetical study range for the Solano TAFA is 1,000–2,000 MW of new solar energy potential and 500–1,000 MW of wind energy potential. This renewable energy resource is assumed to be in the Solano TAFA, whose boundaries coincide with the Solano Super CREZ, shown on Figure A-4 above.

*Figure A-15: Solano TAFA*


### Renewable Resource Potential Overview

The Solano TAFA (Figure A-15) is a region dominated by agriculture and urban and suburban development. The Solano TAFA includes San Joaquin County, Alameda County, Contra Costa County, Solano County, Sacramento County, and the southern half of Yolo County. It includes the cities of Sacramento, Davis, Stockton, as well as all of the San Francisco East Bay communities and urban areas.

According to the CPUC's RPS calculator, the technical potential for solar PV energy in the Solano TAFA is more than 120,000 MW, and the technical potential for wind energy is more than 1,100 MW.

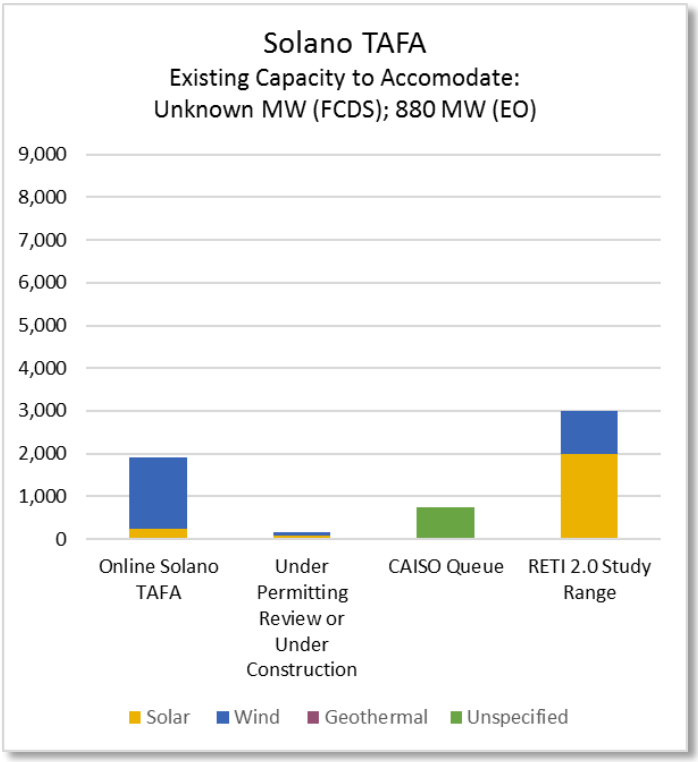



*Figure A-16: Solano TAFA Existing and Proposed Renewable Energy and Available Transmission Capacity*

There are several factors that would make meeting the hypothetical study range challenging, in particular for wind energy. Areas of developable wind and solar potential are primarily on the valley floor, which could result in conversion of farmland and impacts to birds. Many counties have restricted the areas where solar and wind can be developed, and many regions of the Solano TAFA are already developed, such as the Altamont Pass and Montezuma Hills Wind Resource Areas.

### Environmental and Land-Use Implications

Unlike the desert TAFAs and the San Joaquin Valley, the Solano TAFA and other Northern California TAFAs have not been subject to recent formal or informal renewable energy planning processes. While solar energy potential is more or less ubiquitous across the region, most wind

energy development potential is on the valley floor and the western side of the Solano TAFA. Few RETI Category 1 development constraints exist in the Solano TAFA, and the land is mostly private.

***County Land-Use Considerations***

An overview of each county's renewable energy policies is provided below. Unlike in the California desert, some of the counties in the Solano TAFA have no specific renewable energy planning processes. Notwithstanding, most counties have specific permitting processes for solar PV facilities, are integrating renewable energy into their general plan updates, and may have had some experience permitting such projects.

**San Joaquin County.** San Joaquin County is updating its general plan. A draft update was published in September 2016 and approved by the San Joaquin County Planning Commission in September 2016. In order to take effect, the San Joaquin Board of Supervisors still needs to review and approve the update. The draft general plan update included goals pertaining to renewable energy including encouraging residents, businesses, and energy providers to develop and use alternative, renewable energy sources such as solar and wind (NCR-5.2). Furthermore, the draft update establishes a requirement that the county, prepare and maintain an ordinance that guides the permitting, construction, operation, and decommissioning of large-scale solar energy facilities (NCR-5.3). The county's draft update also has a goal to discourage placing energy facilities on prime farmland (NCR-5.6) and to balance the development of new energy facilities with environmental protection and preservation (NCR-5.5).

**Alameda County.** Alameda County will not allow solar energy facilities on important farmlands unless they are within one-half mile of a substation that existed as of the date of policy adoption (2012). Solar energy facilities are prohibited south of the Livermore Planning Area and in the Altamont Pass Wind Resource Area. See inset regarding wind energy development in the Altamont Pass Wind Resource Area.

**Contra Costa County.** The Contra Costa County General Plan (2005) Conservation Element includes a discussion regarding renewable energy resources, including wind energy and solar power. As with Alameda County, Contra Costa County includes a portion of the Altamont Pass Wind Resource Area, and the county has approved a substantial amount of wind projects. Its goal is to balance the potential wind projects with protection of the environmental resources in the southeast county.

**Solano County.** A Solano County passed an ordinance in October 2015 that prohibits commercial solar energy on all agricultural districts, rural residential districts, residential traditional communities, watershed and conservation, marsh, park, commercial recreation, and industrial water dependent districts. The ordinance allows

### The Altamont Pass Wind Resource Area

The Altamont Pass Wind Resource Area was established in 1980 by the California Energy Commission. By the mid-1990s, more than 50 permits had been issued by Alameda County for wind farms on hundreds of acres within the resource area. Permits for the continued operation of the old generation of wind farms were approved by the Alameda County Board of Supervisors in 2005. The permits approved in 2005 were set to expire in 2018 and required the operators to repower their wind farms by that time. However, a settlement agreement among the County, the windfarm operators and a coalition of environmental advocacy groups in 2007 led to agreements by most of the operators to repower by 2015 to reduce the problem of avian mortality. All the operators contributed to the preparation of a program environmental impact report (PEIR) to enable repowering and compliance with CEQA.

As of November 1, 2015, all old generation turbines permitted by Alameda County were shut down, and by May 2016, repowering of most of the operating companies' assets has been approved. One other pre-existing wind farm is expected to be the subject of a permit for repowering in 2017 or 2018. The PEIR also anticipates the development of some additional wind farm projects.

solar on highway commercial districts, neighborhood commercial districts, commercial service districts, and manufacturing districts. These areas are limited in supply and primarily developed. Solano County is essentially limiting renewable energy to small or parking lot structures. Solano County also has a wind energy development moratorium north of Highway 12 due to potential conflicts with the Travis Air Force Base.

**Sacramento County.** Sacramento County allows solar energy systems that are freestanding as the primary use of a site in select zones with approval from the county zoning administrator. "Commercial II" solar facilities greater than 10 acres are allowed in agricultural zoning districts with conditional use permits if approved by the Sacramento County Board of Supervisors and if the agricultural lands are not under Williamson Act contracts. "Commercial II" solar facilities are also allowed in industrial zoning districts with either a Conditional Use Permit (Industrial MP) or with a Minor Use Permit (Industrial M-1 and M-2). Large wind turbines are allowed in agricultural, mixed use, commercial, and industrial zoning districts with a conditional use permit. (Sacramento County Zoning Code, Effective September 2015).

**Yolo County.** The Yolo County Zoning Code Sec. 8-2.1105 includes provisions for permitting large solar projects (up to 120 acres) and very large solar projects (greater than 120 acres). Large solar systems may be installed on agricultural districts, public and open space districts, and industrial districts. Both very large utility-scale solar energy systems and utility-scale wind energy systems can be installed and operated in agricultural districts (the agricultural intensive [A-N] zone, the agricultural extensive [A-X] zone, and the agricultural industrial [A-I] zone). Both large and very large solar energy systems and wind energy systems may be approved with a major use permit. All large and very large solar facilities must mitigate for the permanent loss of agricultural land.

As described in the ELUTG report, Yolo County staff participated in the July 2016 ELUTG public meeting. The county described potential conflicts between renewable energy, such as solar PV, and agricultural resources, especially for those lands under Williamson Act contracts. According to the county, nearly two-thirds of land in the county is under Williamson Act contract, and, as described by county staff, the county takes "ag land preservation very seriously" and does "not cancel Williamson Act contracts." Developing solar on lands with Williamson Act contracts would require developers to mitigate any loss of Williamson Act land. Yolo County staff also relayed recent experiences in developing of wind resources, including concerns over compatibility with agriculture, impacts on biological resources (especially avian/raptor impacts), and visual/recreation values.[29]

***Biological Resource Considerations***

Primary concerns pertaining to biological resources include potential impacts to migratory birds and raptors, including golden eagles, in the Sacramento-San Joaquin Delta and Altamont Pass. The agricultural and riparian areas of the Central Valley provide habitat for a wide variety of birds and portions are designated as Important Bird Areas (for example, the Yolo Bypass Area, Sacramento–San Joaquin Delta, Cosumnes River Watershed–Lower, Mount Hamilton Range, San Joaquin River–Lower, and Byron Area) and national wildlife refuges (e.g., Stone Lakes, San Joaquin River). Critical Habitat exists for Alameda whipsnake, California tiger salamander, California red-legged frog, vernal pool plants and animals, anadromous fish and Delta smelt. Other special-status species potentially impacted by development include, but are not limited to giant garter snake, San Joaquin kit fox, and several listed plants.

[29] Eric Parfrey, Yolo County. Environmental and Land Use Technical Group Meeting: County Workshop. July 21, 2016. http://www.energy.ca.gov/reti/reti2/documents/index.html

### *Land-Use Considerations*

Near the San Francisco Bay, land-use constraints include public parkland and protected water supply reservoir watersheds. Population density is relatively high and concentrated near Martinez, Concord, Antioch, Livermore, and Tracy. The Delta and Central Valley areas encompass flat farmland and rolling foothill grasslands with lower population density. A primary land-use consideration within the TAFA is potential conversion of prime farmland to renewable energy development. Solano County prohibits commercial-scale solar projects in all agricultural districts in unincorporated areas. Interference with operations at Travis Air Force Base is a key land-use consideration for wind energy development in Solano County and wind energy projects are prohibited by Solano County north of Highway 12.

### *Cultural Resources Considerations*

A variety of cultural resources are documented in the Solano TAFA. The Montezuma Hills and Suisun Marsh both contain cultural landscapes. Deeply buried Native American habitations and burial sites have been found in several valleys within the TAFA, beneath developed surfaces (City of Sacramento, town of Locke), as well as in the marshy lowlands of the East Bay. Historic transportation infrastructure and other historic built environment resources are common also.

## Transmission Implications

The California ISO is the primary transmission system operator for the Solano TAFA. The electric transmission infrastructure in this area is composed of interconnected 500 kV, 230 kV, 115 kV, and 60 kV facilities and is an integral part of the bulk electric system that facilitates power transfers throughout the ISO-controlled grid. The high voltage system within the TAFA includes PG&E lines although many publicly owned utilities provide service within the region. The transmission infrastructure also helps meet electric demand in major load centers in Northern California including the Greater Bay Area and Sacramento.

In general, the TTIG report found that while smaller facilities may be able to interconnect to existing transmission network with minor upgrades, there was an inability for larger new facilities to interconnect to the existing grid. Additionally, it found that the hypothetical study range of generation could create challenges on the existing sub-transmission system (60 and 115 kV) in some locations that have limited capacity.

**500 kV bulk power substation.** Conceptual mitigation examples included a new 500 kV bulk power substation in southern Solano County that would be connected to the 500 kV bulk system as well as the 230 kV Greater Bay Area transmission system. The proposed substation would be looped off the existing VacaDixon-Tesla 500 kV line via a 500 kV double circuit tower line. The substation would have 500 kV and 230 kV line terminations and one 500/230 kV transformer bank. This concept includes two new 230 KV transmission line connections between the substation and the existing Pittsburg Substation, likely to be submarine cables. The TTIG Report did not estimate a cost for this conceptual mitigation.

## Sacramento River Valley TAFA

The hypothetical study range for the Sacramento River Valley TAFA is 1,000–2,000 MW of new solar energy potential and 500–1,000 MW of wind energy potential. This renewable energy is assumed in the general boundaries of the Sacramento River Valley TAFA which shares the same boundaries as the Sacramento River Valley Super CREZ, shown on Figure A-4 above.

*Figure A-17: Sacramento River Valley TAFA*


### Renewable Resource Potential Overview

The Sacramento River Valley TAFA (Figure A-17) is dominated by agriculture. It includes Napa County, the northern half of Yolo County, Sutter County, Colusa County, Lake County, Butte County, Glenn County, and Tehama County.

According to the RPS calculator the technical potential for solar PV energy in the Sacramento River Valley TAFA is more than 225,000 MW and the technical potential for wind energy is almost 2,700 MW.

Although the technical potential identified by the CPUC's RPS Calculator is above the hypothetical study range, several factors would make meeting the hypothetical range challenging. Many counties have minimal experience developing renewable energy and that experience is primarily at the distributed-scale. Commercial interest in developing utility-scale has been minimal.

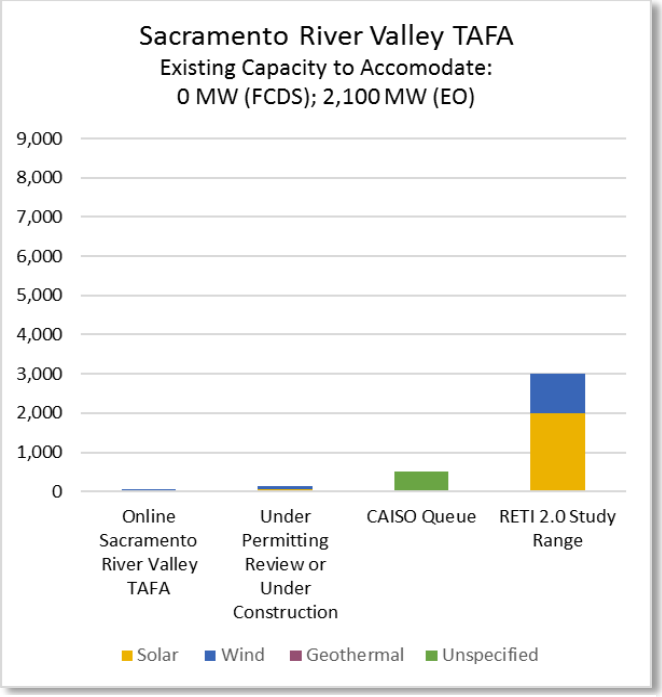



*Figure A-18: Sacramento River Valley TAFA Existing and Proposed Renewable Energy and Available Transmission Capacity*

Development on the Sacramento Valley floor may face opposition from agricultural operations and private land owners. Portions of the foothills are protected by federal and state designations. While some level of development in the Sacramento River Valley TAFA is likely, the hypothetical study range would likely pose environmental challenges.

### Environmental and Land-Use Implications

While no comprehensive land-use planning study has been conducted for renewable energy in the Sacramento River Valley TAFA, the following section describes the types of environmental concerns that would be likely be present when developing renewable energy in this region.

***Biological Resource Considerations***

This TAFA encompasses the northern portion of the Central Valley, which provides high quality agricultural and riparian habitat as well as extensive wetlands used by migratory and water birds. Portions are protected by more than 10 National Wildlife Refuges (e.g., Sutter National Wildlife Refuge and Sacramento River National Wildlife Refuge) and designated as BLM Areas of Critical Environmental Concern (e.g., Sacramento River/Bend Area). The foothill areas along the southwestern portion of this TAFA include the recently-designated Berryessa Snow Mountain National Monument, which includes populations of Tule elk and California's second-largest population of wintering bald eagles. Critical habitat for the yellow-billed cuckoo, California tiger salamander, California red-legged frog, vernal pool plants and animals, anadromous fish and Delta smelt is found mostly within the Central Valley portion of this TAFA. Primary biological resources implications of renewable energy development in the Sacramento River Valley TAFA would be avian mortality from collisions with wind turbines as well as wetland habitat loss if solar PV projects were located on the Central Valley floor.

***County Land-Use Considerations***

An overview of each county's renewable energy policies is provided below. Unlike in the California desert, some of the Sacramento River Valley TAFA counties have no specific renewable energy planning processes. Additionally, very limited development has occurred in this region so there are few permitting examples.

**Napa County.** The most recent Napa County General Plan is from 2009. Renewable energy is discussed in the Conservation Element which promotes local renewable energy (Goal CON-16) and research and development and use of advanced and renewable energy technology (Policy CON-68). This element does not address siting concerns of utility-scale renewable energy.

**Yolo County.** Yolo County permitting is addressed in the Solano TAFA section. As part of the ELUTG report, Yolo County staff indicated that Yolo had much less wind energy development than what it had anticipated, and most wind energy development is distributed scale (1 to 2 MW). The county described its experience working with a developer and the California Department of Fish and Wildlife (CDFW) to begin scoping the permit and environmental review process for a potential utility-scale wind energy project with 200 turbines on 40,000-50,000 acres in the northern portion of the county near Colusa County. According to Yolo County staff, the developer did not move ahead with the project prior to the permitting process.[30]

**Sutter County.** The Sutter County General Plan includes a brief discussion of renewable energy, including supporting the development and use of new technologies that promote resource efficient operation of agriculturally related industries including energy development technologies such as wind and solar (Policy AG 4.3). This element does not address siting concerns with utility-scale renewable energy or compatibility with agriculture. While renewable energy is addressed in the Sutter County Climate Action Plan, the focus is on small-scale distributed projects.

**Colusa County.** The Colusa County Zoning Code (adopted August 2014), includes an Energy Production (EP) Overlay Zone that is intended to identify and designate areas suitable for the development of large-scale commercial energy facilities,[31] including but not limited to solar energy, wind energy, and geothermal energy, and to streamline the approval of such facilities. The application of the EP overlay

[30] Eric Parfrey, Yolo County. Environmental and Land Use Technical Group Meeting: County Workshop. July 21, 2016. http://www.energy.ca.gov/reti/reti2/documents/index.html.

[31] http://www.countyofcolusa.com/DocumentCenter/View/5218

zone would be based on the availability of resources, the location of existing or proposed infrastructure, and the potential for commercial energy facilities to be appropriately sited. The EP overlay may be applied within the following zones: Foothill Agriculture, Exclusive Agriculture, Upland Conservation, Light and Heavy Industrial, Forest Management and Recreation, and Public Facilities. The Zoning Code includes performance standards for the EP zone including farmland protection.

**Butte County**. The Butte County Department of Development Services is undertaking a grant-funded project pertaining to the future of utility-scale solar energy facilities in unincorporated Butte County.[32] This project would establish a community-based vision for solar energy generation in Butte County, identify appropriate and inappropriate locations for utility-scale solar energy facilities, and amend the County's regulations to streamline the permitting process for solar facilities in suitable locations. This project is referred to as the PowerButte: Solar Overlay Zone project. The Recommended Approach describes areas that are "suitable" and "most suitable" for utility-scale solar energy development; areas that are "prohibited" from development, and areas that are constrained by a variety of factors. The Recommended Approach also discusses standards for utility-scale solar facilities and the recommended permit process for areas within the overlay zone and areas located outside the overlay zone. One primary concern raised is whether the Overlay Zone should allow solar development in grazing areas. The Butte County Planning Commission has not yet voted on the Overlay Project.

**Glenn County.** In 2015 and early 2016, the Glenn County Board of Supervisors imposed a moratorium on any development in exclusive agriculture (AE) zones while changes to the Glenn County Code Chapter 15.330 were being developed. While the moratorium was for any development that required a Conditional Use Permit, it was designed to address solar development. Since then, Glenn County established County Code Chapter 15.860 to facilitate the location of power generation facilities. This code allows for power generation as a primary use (occupies more than 50 percent of the lot and the generated power is used offsite) in exclusive agriculture and foothill agriculture (FA), Williamson Act Lands, and Industrial lands with a Conditional Use Permit. Power generation facilities may be subject to requirements to mitigate for certain types of agriculture at a 1:1 ratio including lands under the Farming Mapping and Monitoring Program and Williamson Lands Act.

**Tehama County.** In September 2015, the Tehama County Board of Supervisors adopted Rezone #15-03, which are ordinances regulating wind and solar facilities. The new ordinances (one for wind and one for solar) would allow for development of wind and solar facilities in certain zoning districts, including agricultural districts with approval of a use permit. The ordinances also include standards for the projects including setbacks. Wind facilities are prohibited on Williamson Act Lands. Solar facilities are prohibited on Williamson Act Lands except under certain conditions.

As part of the RETI ELUTG report, the Tehama county planning staff provided an email to share its experiences with renewable energy development. Most of the county's experience is with distributed-scale renewable energy, mostly solar PV. According to the county, RETI 2.0 should revise renewable energy capacity estimates for Northern California down by one-third because there is not enough electric load in the county to consume the capacity from the RETI 2.0 estimates for the Northern TAFA. The county also indicated that 80 percent of the land assumed by RETI 2.0 as potential solar and wind energy development in Tehama County is under Williamson Act contract.

[32] This project was funded with a 2014 Grant from the California Strategic Growth Council.

### *Land-Use Considerations*

The Sacramento River Valley TAFA has extensive private land that is used for multiple activities including many types of recreation. This region is dominated by agriculture, and agriculture conversion has been a traditional concern with the development of renewable energy.

The recently designated Berryessa Snow Mountain National Monument includes some of the most scenic and biologically diverse landscapes in northern California. The area supplies water for millions of people and supports a wide range of outdoor activities, including hiking, hunting, fishing, camping, off-highway vehicle use, horseback riding, mountain biking and rafting.

### *Cultural Resource Considerations*

The BLM Sacramento River Bend ACEC was established to protect cultural resources. The Sacramento River Bend area is at the historic territorial intersection of two Native American tribes: the Yana to the east, and the Nomlaki to the west. Ancestors of these hunter-gatherers have left evidence indicating 6,000 to possibly 10,000 years of prehistoric existence. Traces of Native uses across the landscape include villages, hunting and fishing camps, stone tool workshops, occupation rock shelters, circular stone features and rock art. These uses focused on the river and major streams, and left a rich prehistoric legacy.

## Transmission Implications

The following discussion applies to both the Sacramento River Valley TAFA and the Lassen/Round Mountain TAFA. The high voltage transmission system in northern California includes three 500 kV lines (the California-Oregon Interties) which extend from the California-Oregon border to the Tesla and Tracy Substations south of Sacramento. These lines (which have a WECC approved path rating of 4,800 MW) are operated in parallel with several 230 kV lines with which a number of hydroelectric facilities (with an installed capacity of roughly 4,200 MW) are interconnected. Operating and planning studies have indicated that it is not possible to simultaneously deliver 4,800 MW over the California-Oregon Interties facilities and the 4,200 MW of hydroelectric capacity to load centers in northern California. For example, the 2016 summer operating studies indicate:

- If California-Oregon Interties imports are at 4,800 MW, the amounts of hydroelectric capacity that could be delivered would be limited to about 2,900 MW (70 percent of installed capacity).
- If the hydroelectric generation is above 3,800 MW (90 percent of installed capacity) the California-Oregon Interties imports would have to be limited to about 4,000 MW.

**California-Oregon Intertie.** The existing grid cannot deliver all the California-Oregon Interties import potential and the existing Northern California generation simultaneously at certain times. Additional capacity is required to transmit any incremental firm renewable capacity to avoid having to curtail hydroelectric resources in Northern California and/or renewable or hydroelectric resources in the Pacific Northwest. It is possible that energy only resources would likely have to be curtailed to mitigate post-contingency overloads and the combined capacity of such would have to be limited to be compatible with the California ISO's planning standards. Conceptual mitigation examples include a new 500 kV line between the California-Oregon border and the Tracy/Tesla area. It is not known whether the existing transmission corridors could be expanded to accommodate an additional 500 kV line, or what specific environmental and land use issues could be encountered. The estimated cost of this type of line would be between $2 billion and $4 billion.

## Lassen and Round Mountain TAFA

The hypothetical study range for the Lassen and Round Mountain TAFA is 500–1,000 MW of new solar energy potential, 500–1,000 MW of wind energy potential, and 450 MW of geothermal energy potential. This renewable energy is assumed to be located in the general boundaries of the TAFA, which includes the Round Mountain A, Round Mountain B, and Lassen North Super CREZs, shown on Figure A-4.

*Figure A-1: Lassen and Round Mountain TAFA*


### Renewable Resource Potential Overview

The Lassen and Round Mountain TAFA (Figure A-19) is a region dominated by forestry and federally managed land. The TAFA includes Shasta County, Lassen County, the southeastern portion of Siskiyou County, and Modoc County.

According to the CPUC's RPS calculator the technical potential for solar PV energy in the Lassen / Round Mountain TAFA is more than 350,000 MW, the technical potential for wind energy is 1,900 MW, and the technical potential for geothermal energy is 435 MW.

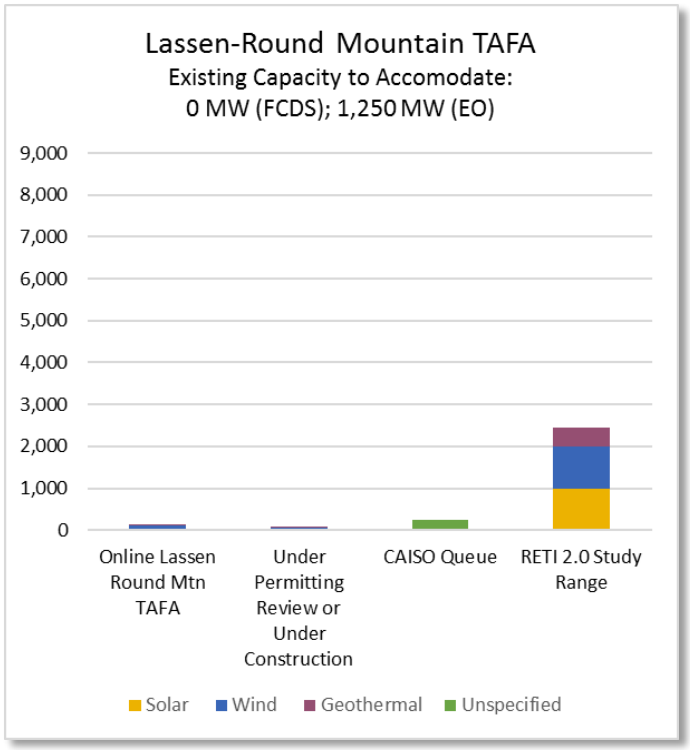



*Figure A-20: Lassen and Round Mountain TAFA Existing and Proposed Renewable Energy and Available Transmission Capacity*

An overview of each county's renewable energy policies is provided below. Unlike in the California desert, the counties in the Lassen and Round Mountain TAFA have completed no specific renewable energy planning processes. Moreover, very limited development has occurred in this region so there are few permitting examples.

### Environmental and Land-Use Implications

While no comprehensive land-use planning study has been conducted for renewable energy in the Lassen and Round Mountain TAFA, the following section describes the types of environmental concerns that would be likely be present when developing renewable energy in this region.

#### *Biological Resource Considerations*

Primary biological resources implications of renewable energy development in this

TAFA include impacts to greater sage grouse and other special-status species dependent on sage brush vegetation communities in northeastern California as well as to species dependent on forested areas throughout the remainder of the TAFA (such as the northern spotted owl). Several lakes (such as Lake Almanor, Honey Lake, and Eagle Lake) and associated Important Bird Areas occur in areas with potential wind and geothermal resources. Extensive federal (BLM, NPS, and USFS) landownership in this TAFA promotes habitat intactness; renewable energy development may result in fragmentation.

***Land-Use Considerations***

The Lassen and Round Mountain TAFA has extensive federal land ownership under BLM, USFS, and NPS management. Many areas within the TAFA are federally protected (i.e., Lassen Volcanic National Park, Lava Beds National Monument, and Whiskeytown-Shasta-Trinity National Recreation Area) and would not be compatible with renewable energy development.

One utility-scale renewable project was built within the TAFA (the Hatchet Ridge Wind Project) but no additional projects have been permitted.

The land-use concerns notwithstanding, some of the counties in this TAFA have expressed interest in further renewable development, notably geothermal energy.

***County Land-Use Considerations***

**Shasta County.** Shasta County does not have a specific renewable energy planning process. The 101-MW Hatchet Ridge Wind Farm was approved through a Use Permit in 2008.

**Lassen County.** Lassen County does not have a specific renewable energy planning process. The Honey Lake Power 5 MW solar PV project was approved through a Use Permit in 2014.

**Siskiyou County.** Siskiyou County does not have a specific renewable energy planning process. In 2009, the Siskiyou County Board of Supervisors adopted a resolution that actively supports and promotes the development of renewable energy industries within the county.

**Modoc County.** As part of the ELUTG report, Modoc County staff shared its recent experiences with renewable energy and transmission development and described the county's priorities. According to the county, due to a lack of available transmission capacity and long distances to electric load, Modoc County has experienced less utility-scale renewable energy development interest than other portions of the state. In Modoc County, renewable energy development and development interest has primarily been distributed-scale projects smaller than 20 MW, including geothermal and solar. Modoc County expressed interest in working closer with the state to plan for renewable energy and transmission development.

**Lassen and Round Mountain TAFA Resource Potential Overview.** Although the technical potential identified by the CPUC's RPS Calculator is above the hypothetical study range, several factors would make meeting the hypothetical range challenging. Many counties have minimal experience developing renewable energy and then primarily at the distributed-scale. Commercial interest in development at the utility-scale has also been minimal. Counties have expressed interest in furthering geothermal energy.

***Cultural Resource Considerations***

As noted in the ELUTG Report, previous wind energy and geothermal development in the Lassen and Round Mountain TAFA highlights issues related both to cultural resources and tribal concerns: impacts to biological resources, preservation of cultural landscapes and traditional lifeways, and protection of Native American archaeology and burials. For example, the Pit River Tribe has identified concerns about the environmental impacts of wind energy projects: bird mortality, particularly eagles, ospreys, ducks,

and geese; disruption of other animals' migration patterns; physical, visual, and auditory intrusions on a significant cultural landscape; damage of archaeological resources and human remains; and compromised access to gathering areas for basketry materials. In addition, the Achumawi and Atsugewi (now represented primarily by the Pit River Tribe) have numerous power places in the vicinity of Lassen County wind project areas.

Geothermal development at Medicine Lake Highlands, Siskiyou County, is a second example of conflict with the values of Pit River, Wintu, Yana Indians, and others. California and Oregon tribes have long used Medicine Lake Highlands as a place for healing, renewal, and prayer. The federal government designated Medicine Lake Highlands as a Native American Cultural Landscape and the Medicine Lake Caldera as a Traditional Cultural District. The extension of geothermal leases within the highlands was challenged in federal court and subsequently undone in recognition of Medicine Lake Highland's spiritual significance to tribes.

### Transmission Implications

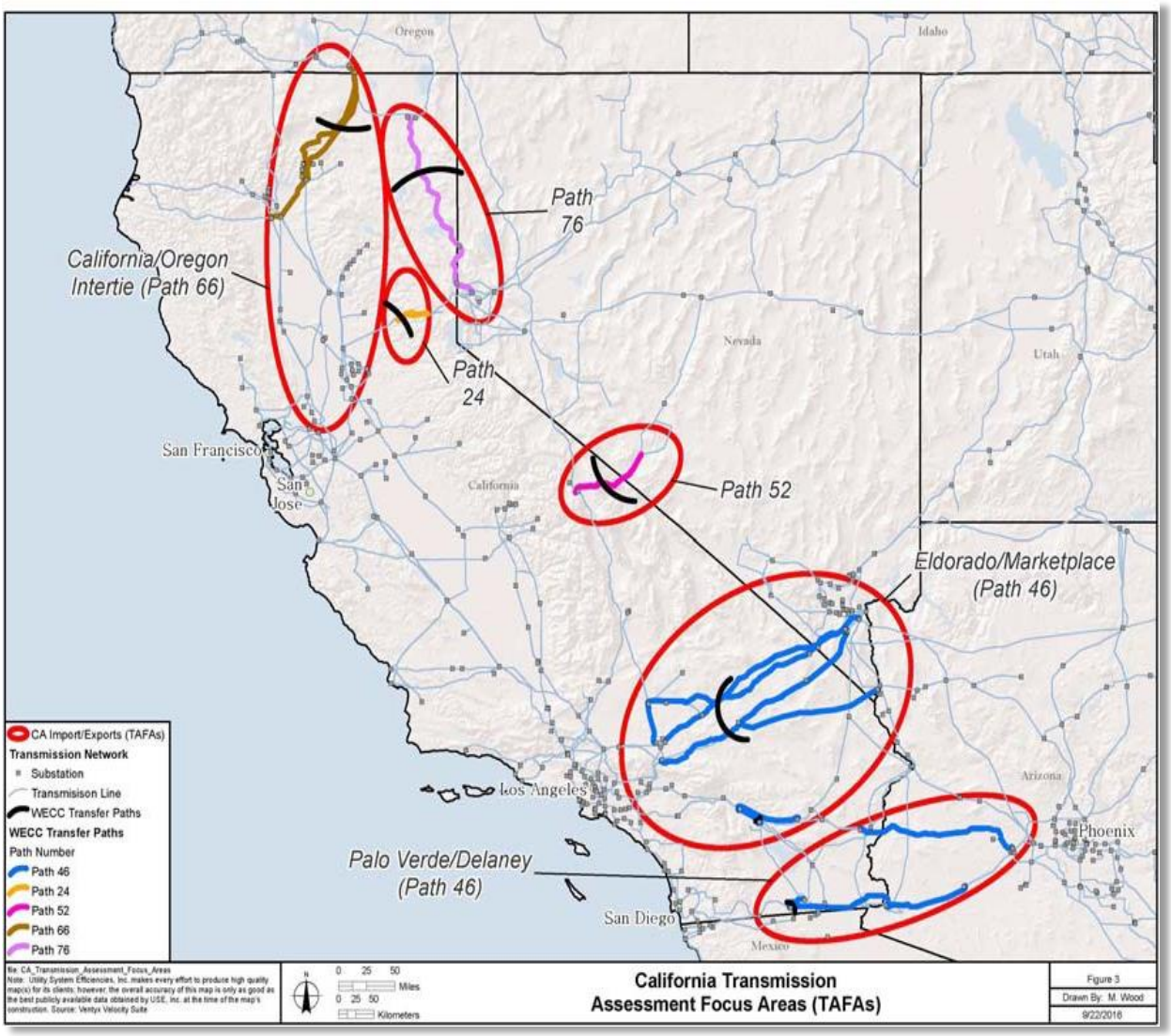
The transmission implications and feasible of developing the hypothetical study range are discussed under the Sacramento River Valley TAFA.

# Import/Export Paths: Summary of Transmission Issues and Implications

The TTIG evaluated transmission availability and requirements to import generation from outside of California over existing interties. This assessment focused on the transmission capacity for delivery of renewable energy imports from the point of interconnection to a California utility (generally near the Caslifornia border) to load centers within the state.

Figure A-21 shows the locations of these import-export paths, including the major high-voltage transmission lines that compose the path as well as the WECC path number.

**Figure A-21: California Import/Export Paths**




Source: Western Outreach Project Final Report: RETI 2.0, Figure 86.

## Southern California Intertie (Path 46)

Southern California is served by many interrelated transmission lines within the West of Colorado River path identified as Path 46 by WECC. The TTIG considered a subset of these lines to find that renewable energy imports could be delivered to southern California at two existing intertie points:

- From Nevada: the Eldorado, Mead, or Marketplace Substations (located between 4 and 20 miles south of Boulder City, Nevada and about 25 miles from the California state line).
- From Arizona: West from Palo Verde along Interstate 10, from the Palo Verde and Delaney Substations, about 50 miles west of Phoenix and about 90 miles east of California). Southwest from Palo Verde to the North Gila Substation in Arizona, then parallel to the Mexican border to Imperial Substation, and into San Diego to the Miguel and Suncrest Substations.

### *Eldorado, Marketplace, and Mead Substation (Nevada)*

The TTIG studied a potential ability to import about 3,000 MW from Nevada. This path could provide access to imported wind generation from Wyoming and Montana. For example, the TransWest Express Transmission Line proposes to import 3,000 MW of wind generation from Wyoming, terminating at the Eldorado transmission hub. The affected transmission lines connect the Marketplace/ Eldorado Substations with the Adelanto/ Victorville and Lugo Substations in western San Bernardino County.

The capacity to import renewable generation from the east through Nevada is affected by the Desert Area Constraint (see inset box). In addition, transmission constraints exist east of the Pisgah Substation (located about 35 miles east of Barstow and 100 miles west of the Arizona border). The constraints on this path would not only reduce import capacity, but they would also affect the ability of the transmission system to handle additional generation in the Victorville/Barstow TAFA, the Riverside East TAFA, and the Imperial TAFA.

### *Palo Verde and Delaney Substations (Arizona)*

The TTIG studied a potential ability to import from Arizona about 3,000 MW. This path could also provide access to imported wind generation from New Mexico, via proposed transmission projects like the Centennial West Cleanline (interconnecting 3,500 MW of wind from northeastern New Mexico to southern

**The Desert Area Constraint**

The TTIG concluded that there is an overarching transmission constraint in Southern California that limits the delivery of energy from multiple TAFAs in southeast California, as well as energy imports from out of state. This **Desert Area Constraint** affects the transmission capacity in three important TAFAs: Victorville, Riverside East, and Imperial TAFAs, as well as imports via Path 46 from Nevada and Arizona.

Previous transmission studies have indicated that additional resource development or imports could result in an overload on Lugo- Victorville 500 kV line. These studies have indicated that a $34 million upgrade of the Lugo-Victorville 500 kV line would mitigate this constraint and provide approximately 2,000 MW of additional capacity. LADWP, SCE, and California ISO are currently coordinating on this upgrade.

Beyond the Lugo-Victorville limitation, the next limiting element is a potential overload of the 500 kV lines between the Valley, Alberhill, and Serrano substations. Cluster studies have determined that the likely mitigation is either: (i) a new series compensated 500 kV line between Mira Loma and Red Bluff or (ii) a new Eldorado-Lugo 500 kV line. The TTIG estimates the order-of-magnitude cost of either one of these new lines at roughly $1 billion.

California[33]) or the SunZia Transmission Project[34] (importing wind or solar generation from New Mexico to south-central Arizona).

This path is also limited because of the Desert Area Constraint (which also affects capacity of lines between the California desert and Nevada, and the potential solutions are similar to those defined for the Eldorado hub, above.

## California-Oregon Intertie

The California-Oregon Intertie (COI), identified as Path 66 by WECC, is a corridor of three roughly parallel 500 kV AC power lines connecting the electric grids of Oregon and California. These lines, with a combined import path rating of 4,800 MW, are operated in parallel with a number of 230 kV lines with which a number of hydroelectric facilities are interconnected.

The original business case of these lines was to enable lower-cost Northwest hydropower to flow to California to meet its summer peak, and to export California fossil resources to help meet the Northwest's winter peak. About 10 years ago, California utilities started to procure wind generation from the Pacific Northwest, using the COI. Increasingly, path utilization is driven by seasonal and intra-day resource availability and divergence in locational prices. In 2014, PacifiCorp joined the California ISO energy-imbalance market (EIM), so the historic use of the COI for one-way seasonal power exchange is shifting to an increasingly bi-directional system, providing ramping and flexibility products in addition to its traditional energy products.[35]

The Plenary Group proposed a hypothetical study range of 2,000 MW of additional generation to be delivered from Oregon and the Northwest through the COI, with the energy received into California in the Round Mountain/Lassen and Sacramento River TAFAs. The TTIG determined that the transmission implications of these imports are determined by the capacity of the receiving TAFAs.

These TAFAs may have up to 3,350 MW of transmission capacity for energy only resource interconnections, but there is effectively no firm transmission available to delivery energy from this area. The TTIG found that it is not possible to simultaneously deliver 4,800 MW over the COI facilities as well as the 4,200 MW of hydroelectric capacity to load centers in Northern California. [36]

The TTIG states that it would be possible to interconnect energy only resources, but these new resources would likely have to be curtailed to mitigate post-contingency overloads. For full deliverability of new renewable energy resources, the TTIG responded that making substantial new imports deliverable would essentially require a new 500 kV line from the Oregon border to the Tracy area. Such an upgrade could cost as much as $4 billion.

## Central and Northern Sierra

The Plenary Group identified that a total of 500 MW of potential imports into California could originate from resources in the Central Sierra and Northern Sierra regions. Three transmission paths connect northern California with Nevada:

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[33] http://www.centennialwestcleanline.com/site/page/location

[34] http://www.sunzia.net/project_information.php?show_tab=description

[35] https://www.energygps.com/Newsletter/DisplayNewsletter?mtc=c3wwBhC6k0zA1Xpu1IsYyg%3D%3D&ctested=1

[36] TTIG. Transmission Capability and Requirements Report, Section 1.3, p.4 (10/24/2016).

- **Path 24, Tahoe (PG&E-Sierra):** a 60 kV and 115 kV system that connects the NV Energy system in Reno with the PG&E system in Truckee, generally following Interstate 80. Lines continuing across the Sierra Nevada and west into the PG&E territory north of Sacramento.
- **Path 76, Alturas:** a 345 kV line that connects the NV Energy system in Reno with the BPA system in southern Oregon.
- **Path 52, Owens Valley:** a 55 kV interconnection between the SCE system north of Inyokern with the Valley Electric Association, located along the eastern boundary of Nevada.

***Path 24, Tahoe (PG&E-Sierra)***

Path 24 is the transmission system that serves the I-80 corridor between Sacramento and Reno, Nevada. It includes 115 kV and 60 kV systems:

- Drum-Summit Intertie: Two 115 kV lines and one 60 kV lines connecting PG&E's Drum Substation in Placer County and NVEnergy's Summit Substation.
- Plumas–Sierra 60 kV Intertie: connecting PG&E's 60 kV system with NVEnergy through the Plumas Sierra's Marble substation.[37]

The Drum Substation exports hydroelectric generation from PG&E's Drum-Spaulding facility and serves the city of Colfax (Sierra County), which is about 50 miles north of Sacramento on I-80, and about 50 miles southwest of Truckee. To the west, in the Sacramento Valley, this substation connects with PG&E's Rio Oso 115 kV substation.

The TTIG states that the energy transfer capability of Path 24 is limited due to transmission constraints in the Reno area. The transfer capability of the line changes based on the load in the Reno area. In the 1980's, the "TransSierra Transmission Project" was considered, but it was not actively pursued. It has been studied in the past due its potential to import Nevada's geothermal power into California. Challenges to upgrading the existing 60 kV and 115 kV lines in this corridor include residential properties near the corridors and high scenic and recreational values. These smaller lines often have narrow rights-of-way, so upgrading to higher voltage lines that require wider corridors could be challenging.

***Path 76, Alturas***

Path 76 could allow for power generated in Nevada or northeastern California to flow north from Reno, through Lassen County to the Hilltop Substation near Alturas in Modoc County. Of the 164-mile long line between Reno and Hilltop, 140 miles are in California.[38] From Hilltop, the power would transfer to the BPA system, where it would flow to the Malin substation, where it could be imported into California via the COI. However, this energy would then be subject to the same constraints as other energy imports from the northwest that would use the COI (see Section A.2.2).

A new trans-Sierra line could potentially deliver energy to California. Lassen MUD submitted comments to RETI 2.0 in May, 2016 indicating interest in developing a double-circuit 230 kV line to interconnect the Alturas line to the California ISO grid at Cottonwood. A line of this size would likely allow the delivery of 500 MW to the California grid. However, if the new line connected at Cottonwood it would likely still face the same constraints to the COI transfer capability.

[37] https://www.caiso.com/Documents/7240A.pdf

[38] http://www.cpuc.ca.gov/Environment/info/alturas.htm

### *Path 52, Owens Valley*

Path 52 includes a 55 kV line (Silver Peak-Control), along the border of southwestern Nevada and Inyo County (in central eastern California).[39] Historically, during peak loading conditions, flows on the intertie have been limited to 14 MW.[40] NV Energy states that the line is bidirectional.

This path is operated by the Valley Electric Association (VEA), which provides service to more than 45,000 people within a 6,800-square-mile service area located along the California-Nevada border, with the majority in Nevada. In 2013, VEA became the first out-of-state utility to join the California ISO balancing authority, with the goal of opening the door to a wide range of renewable energy projects in Nevada by providing energy producers with a more cost-effective solution for delivering power to customers in California. This involvement also allows VEA to provide excess transmission capacity on its system to the California ISO, maximizing the utilization of the cooperative's assets.[41] VEA has upgraded its system and is increasing the transfer capability to the NV Energy and California ISO grid at Eldorado.

[39] http://energy.nv.gov/uploadedFiles/energynvgov/content/NEAC_FinalRpt-Section4-StrategicTransmissionDiscussion.pdf

[40] https://www.wecc.biz/Reliability/TAS_PathReports_Combined_FINAL.pdf (2013 Path Reports)

[41] http://www.vea.coop/content/about-valley-electric-association-inc

# Rest of the West: Renewable Demand, Supply, and Transmission Opportunities

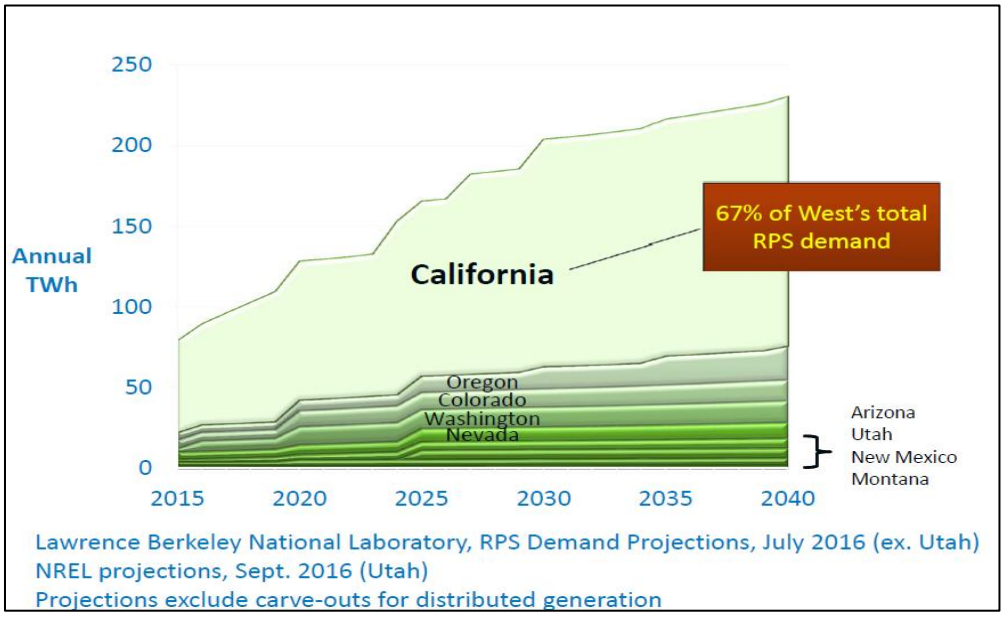
This section summarizes information regarding renewable energy supply, demand, and transmission in the western United States outside California. It also summarizes information regarding renewable supply and transmission in Baja California Norte, Mexico.

The *Western Outreach Project Report* (WOPR),[42] prepared for the Western Interstate Energy Board (WIEB), communicated the input and insights from stakeholders in other Western states for use in the RETI 2.0 process. The report summarizes comments received from stakeholders, highlights common themes, and provides recommendations to help inform California transmission and resource planning. The report explores potential combinations of renewable resources that could help California attain its RPS goals, and provides information on transmission associated with the various renewable scenarios. The report also presents recommendations that based on stakeholders concerns; these are intended to provide options for California agencies to consider related to further assessment of out-of-state renewable transmission opportunities.

## Renewable Energy Demand and Development in Other Western States

**Renewable energy demand.** While RPS mandates across the West continue to grow, aggressive procurement in recent years has reduced or delayed incremental need for significant amounts of new resources. California utilities will require twice as much renewable energy by 2030 to meet RPS goals as the other Western states combined, and California utilities are seen as on track to meet their RPS targets through 2020 and beyond, dampening current development activity. Corporate buyers and community choice aggregators are growing sources of demand, but their market impacts are limited.

**Figure A-22: Western U.S. Demand for Renewables Under Existing State RPS Requirements[43]**



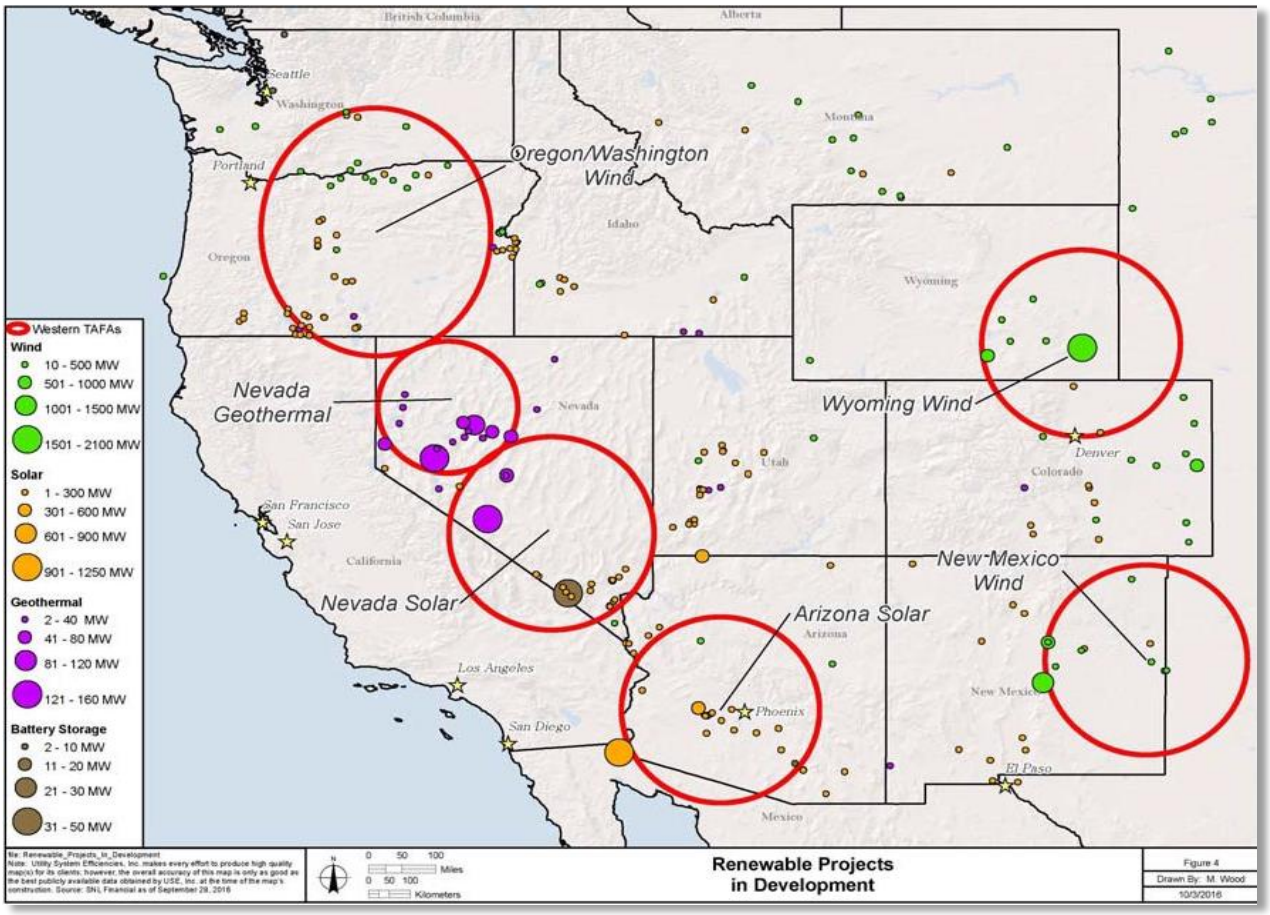

[42] https://efiling.energy.ca.gov/getdocument.aspx?tn=214121

[43] David Hurlbut, NREL. Slide 3: docketpublic.energy.ca.gov/PublicDocuments/15-RETI-02/TN213505_20160906T113114_Panel_1_Presentation__David_Hurlbut.pdf

**Renewable energy supply:** WOPR participants agreed that the supply of new renewable energy resources in the West is robust and increasingly cost-competitive with fossil energy resources, due to the combination of declines in material and development costs, improvements in renewable generation technology and capabilities, and federal tax incentives. Power Purchase Agreement (PPA) prices continue to fall and tens of thousands of megawatts are in development. The supply is both geographically and technologically diverse. In some cases, renewable energy potential and proposals align well with announced or potential coal plant retirements and potential latent transmission capacity.

The WOPR defined six out-of-state TAFAs with significant renewable generation potential. These TAFAs are illustrated by location and the magnitude of existing development proposals in Figure A-23. The map illustrates 1,200 MW of geothermal, 7,500 of solar, and 18,800 MW of wind projects in varying stages of development outside of California and across the West.

**Figure A-23: Western Wind, Solar, and Geothermal Projects under Development**




Source: WOPR Figure 4. Project data sourced from S&P Global Financial (SNL) on September 29, 2016.

## Patterns of Trade

**Oversupply conditions in California.** These conditions were acknowledged in workshops, and the proposed new transmission projects shown in Figure A-18 would help facilitate export of California oversupply. The stakeholders noted a concern, however, that physical infrastructure for export should not be a focal point until power-trading market products have been established to facilitate the trading and exchange of the oversupply. Participants also recognized that the EIM is active and already has resulted in California exports under such conditions.

**Concerns Related to Southwest Trade**. There are existing constraints in exporting power from California to Palo Verde and onward to southeast Arizona and moving power from Phoenix into the Tucson load pocket. If these constraints could be removed, there would be greater ability to both import power to California and send excess power from California to Arizona and other southern load areas.

Some critical paths in the West that might be used as export paths from California to the Southwest do not have WECC Path Ratings to flow in the west-to-east direction. The stakeholders recommended completion of a reliability study on flows in this direction. This same concern exists for the paths that might carry New Mexico wind into Arizona load centers and eventually into California on Path 49.

If the Southwest experiences substantial growth in solar resources, then during the times California is experiencing oversupply problems, the Southwest may also have oversupply and therefore little need for incremental generation, because solar resources in the Southwest would be producing at the same time. In such a case, the solar energy trade opportunities may be limited to the single-hour or two-hour time zone differences in the morning and evening.

**Concerns Related to Northwest Export**. In the Northwest, the transmission paths are optimized for flows north-to-south and east-to-west. There is currently 3,000 MW of *northbound* long-term firm Available Transfer Capability on the California-Oregon Intertie (COI). Recent Northwest Power and Conservation Council (NPCC) studies assume conservatively that California will supply about 3,000 MW of excess power to the Northwest. The NPCC expects that, in the winter months that were studied, California's export of excess generation is limited not by the availability of generation but by the capability of the transmission system.

**Diverted imports**. RETI 2.0 and WOPR participants also noted the importance of alternative markets for out-of-state power contracted to California during periods of oversupply. These so-called "diverted imports" are as economically attractive as export markets, but may have different transmission implications.

**Effects of coal retirement on transmission capacity.** One of the key discussion issues during WOPR workshops centered on how planned and potential coal plant closures could affect transmission capacity, and whether and how that capacity could be used to deliver renewable energy to or from California. It was noted that multiple utilities around the West may be interested in this transmission capacity or renewable procurement opportunities, and further study of planned and potential coal retirements and implications for transmission use would be valuable.

**Hydroelectric system changes.** With respect to the hydroelectric generating system, the WOPR notes the potential economic benefits of taking advantage of California's low-cost excess solar to ramp down hydro, only to sell energy back at a premium during California's morning and evening ramping periods. However, the WOPR also notes that the Northwest has its own challenges relating to the management of this system. The Northwest hydro system has a springtime oversupply situation from both hydro and wind generation. There are also complex limitations in hydro flexibility due to the physical layout of the dams and environmental constraints, which have already reduced hydro generation capacity by 1,200 MW, and the complex impacts of climate change on hydro availability.

## Transmission capacity, constraints, and proposals

**Existing Transmission.** WIEB workshop commenters noted that no significant firm capacity is available on the existing transmission system to allow delivery of many high-quality out-of-state renewable energy resources to California. The WOPR notes that the existing system has some capability to deliver some Nevada geothermal and some additional wind from Oregon and Washington to California; however, there is limited capability for delivering significant amounts of Wyoming and New Mexico wind to California. There are also several challenges related to exporting excess generation from California to other load areas. The WOPR illustrates existing transmission in Figure A-24, along with proposed transmission projects.

**Import Path Constraints.** Stakeholders noted that Paths 49 and 46 (the primary path between Arizona and California) have limited capability for further deliveries, primarily due to congestion on the California side of the path and lack of firm capacity to Palo Verde. The congestion and lack of firm capacity limits increased deliveries from Arizona into California.

Imports from Nevada into California will be aided by the future development of the Eldorado-Harry Allen line, but the ability to deliver energy resources from central or northern Nevada (or Utah, Idaho, or Wyoming) will be restricted by the limited available capacity on the One Nevada (ON) Line.

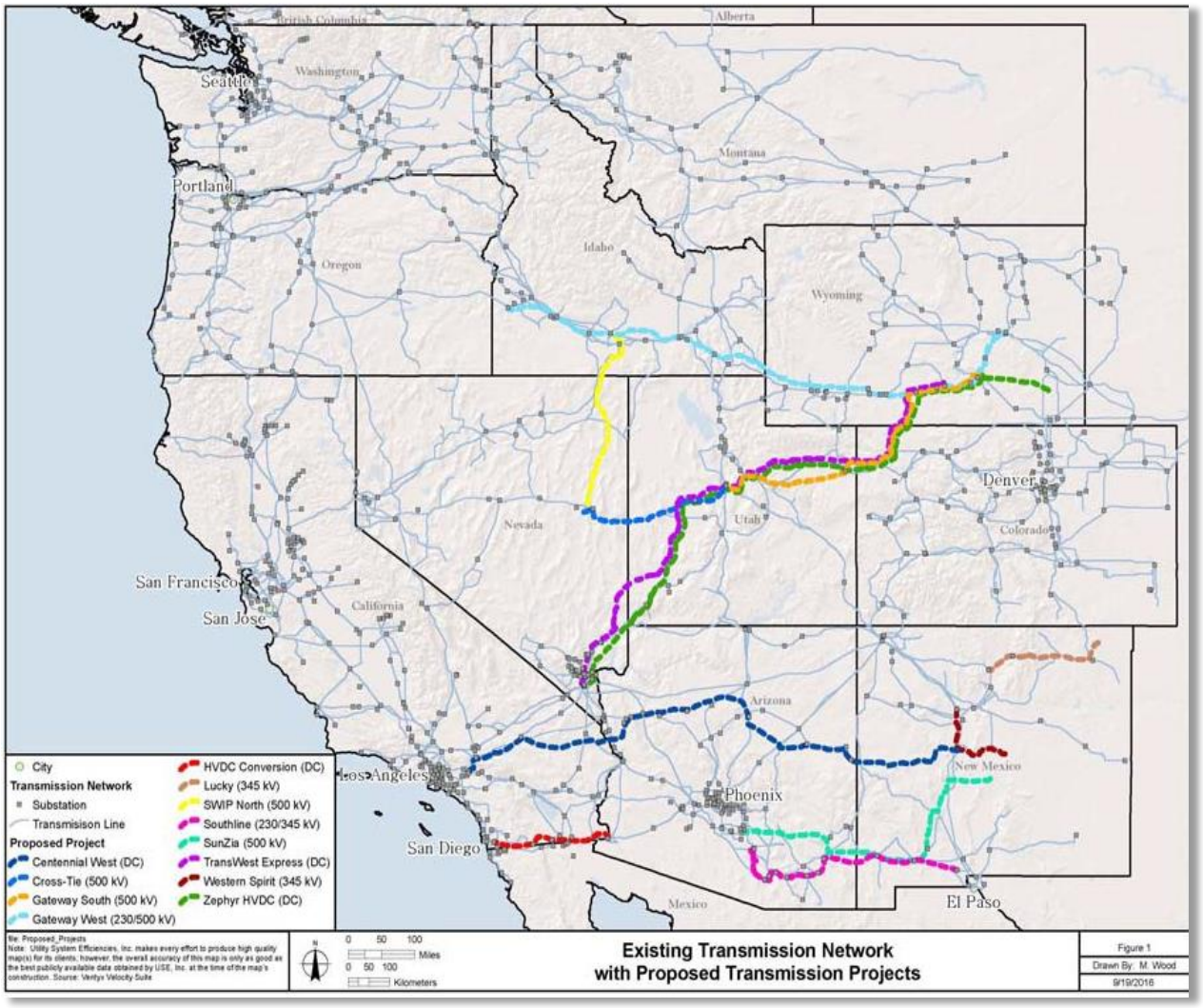
**Proposed Transmission.** The WOPR also described a set of twelve transmission projects now proposed across the West. These projects are summarized in Table A-2 and illustrated in Figure A-23. These twelve projects each propose to help overcome some of the transmission constraints associated with delivering high-quality renewable resources to California. Several of the projects are in advanced development. Combined, they have the potential to deliver up to 10,000 MW of renewable resources to California in increments ranging between about 500 to 3,000 MW.

**Table A-2. Proposed Western Transmission Projects**

| Developer / Project Name | Transfer Capacity (MW) | Origin | Termination |
|---|---|---|---|
| Cleanline Centennial West | 3,500 | Guadalupe, NM | Mira Loma, CA |
| TransCanyon Cross-Tie | 700–1600 | Mona, UT | Robinson Summit, NV |
| PacifiCorp Gateway South | 1,500 | Aeolus, WY | Clover, UT |
| PacifiCorp Gateway West | 1,500 | Windstar, WY | Hemingway, ID |
| Lucky Corridor LLC Lucky Corridor | 700 | Gladstone, NM | Ojo, NM |
| Hunt Power, Black Forest Partners Southline | 1,000 | Afton, NM | Saguaro / Tortolita, AZ |
| SDG&E Southwest Powerlink HVDC Conversion | 3,000 | North Gila, AZ | Miguel, CA |
| Southwest Power Group SunZia | 1,500–3,000 | Corona, NM | Pinal Central, AZ |
| LS Power SWIP North | 1,700 | Midpoint, ID | Robinson Summit, NV |
| TransWest Express | 1,500–3,000 | Platte, WY | Eldorado/Mead, NM |
| Cleanline Western Spirit | 1000 | Corona, NM | Rio Puerco, NM |
| DATC Zephyr | 2,100–3,000 | Chugwater, WY | Eldorado NV or Delta UT |

Source: Table 4, WOPR.

**Figure A-24: Western Transmission Projects Accessing Out-of-State Resources**




Source: WOPR.

Each of the proposed transmission projects would have significantly different effects regarding:

- California utilities' ability to procure renewable energy resources from elsewhere in the West
- California utilities' and marketers' ability to sell California oversupply to other western electricity markets, or to divert imports to other markets during oversupply conditions
- Available capacity for hour-ahead and real-time (e.g. Energy Imbalance Market) transactions
- Congestion, capacity, stability and reliability region-wide

## Summary of Western Outreach Report Recommendations

The WOPR presents recommendations in three major categories, each with several detailed points to elaborate. They are briefly summarized as follows:

**1. Convene further regional collaboration** between balancing authorities and transmission operators, load serving entities, transmission owners, power marketers, and project developers**.** State governments and regulators, or regional organizations like the Western Interstate Energy Board, could help provide a forum. The WOPR identified three topics for further collaboration:

a. **Facilitate western resource planning coordination** between utilities to identify opportunities for long-term intra-day energy exchange agreements or aligned or potentially joint procurement of renewable generation or transmission.

b. **Design, promote and review new market product(s),** such as a "duck-belly" (mid-day export from California) or "duck-neck" (evening import into California) power market product. Standardizing and promoting more flexible transmission service, including conditional firm service products and operational agreements including dynamic scheduling and intra-hour scheduling blocks.

c. **Assess coal retirement impacts on transmission capacity** and regional grid flows and stability.

**2. Update Resource and Transmission Data** used in California's planning and procurement processes. These recommendations include updating the out-of-state resource costs and transmission cost assumptions used in California planning tools including the RPS Calculator. The WOPR also proposed an innovative mechanism to gather data for this purpose – the WOPR recommended that California regulators and utilities issue a Request for Information for specific commercially viable out-of-state renewable energy resource and transmission service proposals for delivery to a California intertie. The RFI data could be used to both update regulators' and utilities' planning models and proceedings as well as informing utilities' current planning activities.

**3. Address barriers to entry for out-of-state resources** caused by potential market or regulatory failures. These potential barriers include the "right-sizing" dilemma, meaning the need for aggregating demand to support large-scale transmission, and the "chicken-and-egg" problem of transmission dependency on PPA-based financing and PPA dependency on transmission service. The WOPR also recommends that California regulators and utilities incorporate opportunity cost or scenario analysis of out-of-state options when evaluating procurement and transmission plans in order to capture the potential future conditions of the Western grid. Lastly, the WOPR recommended that addressing these considerations – including potential barriers to entry and opportunity costs – could lead California policymakers to consider RPS or IRP policy that allows action to be taken now on out-of-state resources.

## Mexico Renewable Energy Resources and Transmission

The opportunities to access renewable energy resources and markets for California renewable energy in Mexico were not initially identified as a focus during the RETI 2.0 process to identify TAFAs in May 2016. Therefore the renewable energy resource development and transmission issues in Baja California Norte (BCN), the Mexican state bordering California, were not assessed by the TTIG, ELUTG, or WOPR. Instead, this section includes a summary of issues and considerations based on a review of recent literature and news reports.

In June 2016, President Obama, Mexican President Peña Nieto and Canadian Prime Minister Trudeau, announced the North American Climate, Energy, and Environment Partnership. This Action Plan identified dozens of cooperative initiatives across energy, transportation, and natural resources, including several relevant to renewable energy development and transmission into California. These include:[44]

- Advance clean energy development and deployment
- Strive to achieve a goal for North America of 50 percent clean power generation by 2025
- Support the development of cross-border transmission projects, including for renewable electricity.
- Jointly study, identify, and implement options for broad energy system integration, including the North American Renewable Integration Study

Mexico is reforming its electric sector, including turning its electric grid over to an independent system operator, El Centro Nacional de Control de Energía (CENACE), privatization of load-serving utilities, and the creation of power and transmission markets. Third-party competitive generation and transmission projects are in development, including renewable energy projects to meet new renewable targets. Mexico's National Energy Strategy sets a goal to generate 35 percent of the nation's electricity from non-fossil sources by 2024. Non-fossil generation accounted for 22 percent of Mexico's electricity supply in 2014.[45]

Baja California Norte is home to substantial renewable energy resources including geothermal and high-quality wind. The 570-MW geothermal facility at Cerro Prieto, one of the world's largest, has historically exported to SDG&E, LADWP, and SCE. There has been significant interest in developing wind resources in BCN.[46] Mexico aims to increase its wind generation capacity from 2 GW to 12 GW by 2020, and several wind projects are being developed in Baja California. La Rumorosa wind resources west of Mexicali and south of Jacumba were identified in the original RETI project, report 2A,[47] as on par with the best in western U.S. Reports suggest that the generation profile, with high evening and morning winds but a pronounced midday trough, could be a good complement to California's anticipated duck curve.[48]

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[44] The White House Office of the Press Secretary June 29, 2016 "North American Climate, Clean Energy, and Environment Partnership Action Plan" https://www.whitehouse.gov/the-press-office/2016/06/29/north-american-climate-clean-energy-and-environment-partnership-action

[45] http://www.power-eng.com/articles/2015/09/mexico-had-more-than-54-gw-of-electric-generating-capacity-in-2014.html

[46] Renewable Energy in Mexico's Northern Border Region; Jonathan Pinzon, Lilia de Diego, Rafael Carmona, Luis Aguirre-Torres, April 2015 Mexico Institute Woodrow Wilson International Center for Scholars

[47] Renewable Energy Transmission Initiative, Phase 2A, September 2009, RETI-1000-2009-001-F-REV2

[48] Challenges and Opportunities to Deliver Renewable Energy from Baja California Norte to California, June 2008, CEC-600-2008-004

The electric grid in Baja California Norte (BCN) is operated as an independent system by CENACE. There are two primary interconnection points between the California ISO system and BCN: a connection with Tijuana south of Otay Mesa and another connection between Imperial Valley substation (southwest of El Centro) and La Rosita substation in BCN. These intertie points are then connected relatively weakly in the CENACE system, forming two generation/load pockets: the area around Tijuana in the west, and around Mexicali in the east. There are plans to connect these regions to the national grid by 2017 (Baja California Norte) and 2018 (Baja California Sur).[49]

The interconnection between the Baja California Norte grid and the California ISO transmission system to the north is collectively considered WECC Path 45. It has a WECC Path Rating of 408 MW from South to North and 800 MW from North to South, although the ratings are recognized as out-of-date. Several projects to bolster the capacity and strength the connection have been made in recent years,[50] partly in response to concerns over potential loop flows through the CENACE system in the event of a contingency on California lines.

On October 18, 2016 the California ISO announced that CENACE is exploring participation of the BCN grid in the California ISO Energy Imbalance Market. This development has potential to support more efficient real-time use of transmission and generation, and integration of renewables, on both sides of the border.

There are also several gen-tie lines connecting major power plants on the Mexican side of the border that serve the California market, including two natural gas plants and one new wind project in the La Rumorosa area.

The 155-megawatt Energia Sierra Juarez project came online in 2015. It is connected to the California grid through a dedicated, 7-kilometer, 230 kV generation-tie that connects to the SDG&E Sunrise Powerlink at the 500 kV ECO substation near Jacumba Hot Springs. Though not currently connected to the BCN grid, the project is also near the 230 kV connection between La Rosita and Tijuana and a potential loop-in to the BCN system is possible in the future.[51] Though "Phase 1" of the project is online with 155 MW of wind capacity, the gen-tie line is sized to a total capacity of 1250 MW to accommodate potential future phases.

According to SDG&E, while it is possible that additional renewable generation from Mexico could be imported into the United States on the gen-tie line for Sierra Juarez wind project, third party use of that line for additional import of renewable resources would be subject to an arrangement with the owner of the gen-tie and would require a Presidential Permit. Historically, SDG&E has not actively pursued interconnections with CENACE due to the complexity of getting a presidential permit, among other issues.[52]

More immediately, additional imports from Sierra Juarez into the ECO substation would be subject to the ECO-Miguel constraint (described in Section 2.2 and Appendix A). While there could be economic

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[49] IRENA (20175), Renewable Energy Prospects: Mexico, REmap 2030 analysis. IRENA, Abu Dhabi. www.irena.org/remap

[50] These include the Imperial Valley flow controller (phase-shifting transformer) and Suncrest dynamic reactive support, both expected to be in service by 2017.

[51] InterGen and IEnova Begin Commercial Operation of Energía Sierra Juárez Wind Project; Jun 09, 2015. http://www.intergen.com/news/intergen-and-ienova-begin-commercial-operation-of-energia-sierra-juarez-wind-project?/intergen-and-ienova-begin-commercial-operation-of-energia-sierra-juarez-wind-project/

[52] Email exchange with Jan Strack and Eusebio Arballo, September 22-29, 2016

opportunities for new Energy Only renewable projects located in Mexico, such imports would be subject to possible congestion-related costs.

IID is reportedly in discussion with Mexican utility Comisión Federal de Electricidad (CFE) to explore the potential for an interconnection between the Fern substation in the IID system and CFE.[53] The size of this connection could be 300 to 600 MW, and the parties are considering what transmission and economics could make the connection beneficial.

The transmission implications of additional imports from the BCN region were not assessed by the TTIG or Western Outreach project. However, imports from BCN can generally be analyzed similarly to the import/export path assessment performed by the TTIG — that is, subject to the constraints of the importing TAFA. In the case of the renewable-rich areas of La Rumorosa wind area and geothermal or solar resources from the La Rosita area, the constraints will be dictated by those in the Imperial TAFA — namely limited capacity on the ECO-Miguel line to the west and on Path 42 to the north. While energy only resources may be accommodated on these paths, full capacity deliverability may require upgrades such as those discussed for the Imperial Valley TAFA.

[53] TTIG final report, p.29, and IID presentation to Plenary Group (3/16/2016).