

DOCKETED

Docket Number:	15-RETI-02
Project Title:	Renewable Energy Transmission Initiative 2.0
TN #:	211080
Document Title:	04-18-16 Meeting Presentation by Erica Brand
Description:	N/A
Filer:	Misa Milliron
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	4/15/2016 8:56:07 AM
Docketed Date:	4/15/2016

Integrating Land Conservation and Renewable Energy Goals in California:

Energy Goals in California:

A Study of Costs and Impacts Using the Optimal Renewable Energy Build-Out (ORB) Model



Outline

- Study Description
- Methods
- Results and Findings
- Focal Geographies



DESCRIPTION AND METHODS

Study Questions

- Can a 50% Renewable Portfolio Standard be achieved and avoid impacts to important natural habitats?
- How do different levels of protection affect the environmental impacts, land and water use requirements, and incremental cost to electricity consumers of renewables development?
- How can models be used to achieve better environmental outcomes in high level energy and transmission planning?

Optimal Renewable Energy Build-out (ORB) Model

- ORB developed by Grace Wu, methodology vetted in peer-reviewed scientific journal*
- Four renewable technologies: solar PV, CSP, wind, geothermal
- Four categories of environmental restriction based on conservation value : Category 1-4
- Four 2030 RPS scenarios: 33% in-state, 40% in-state, 50% in-state, 50% WECC-wide

RPS Calculator Model

- Version 6.0. Existing model used by the California Public Utilities Commission
- Develops plausible renewable energy scenarios for the future, organized by “Super CREZ”



ORB-RPS Calculator

Analysis Steps

1. ORB site suitability model provides **technology-specific resource availability** (in MW) in each Super-CREZ for each category of environmental restriction
2. RPS Calculator uses these results to **calculate least-cost best-fit (LCBF) portfolio**
3. ORB optimal selection model takes LCBF portfolio from RPS Calculator and **selects best development sites** based on optimizing resource quality and minimizing proximity to transmission, substations, and roads

Environmental Protection Categories

Category 1

Category 2

Category 3

Category 4

Environmental Protection Category Definitions

- **Category 1:** Areas with **legal restrictions** against energy development
- Examples:
 - National Parks and National Monuments
 - Existing conservation and mitigation banks under conservation easements

Environmental Protection Category Definitions

- **Category 2:** Areas with **administrative and legal designations by public agencies** in order to protect ecological and social values
- Example:
 - Areas designated by the U.S. Fish and Wildlife Service as critical habitat for threatened and endangered species

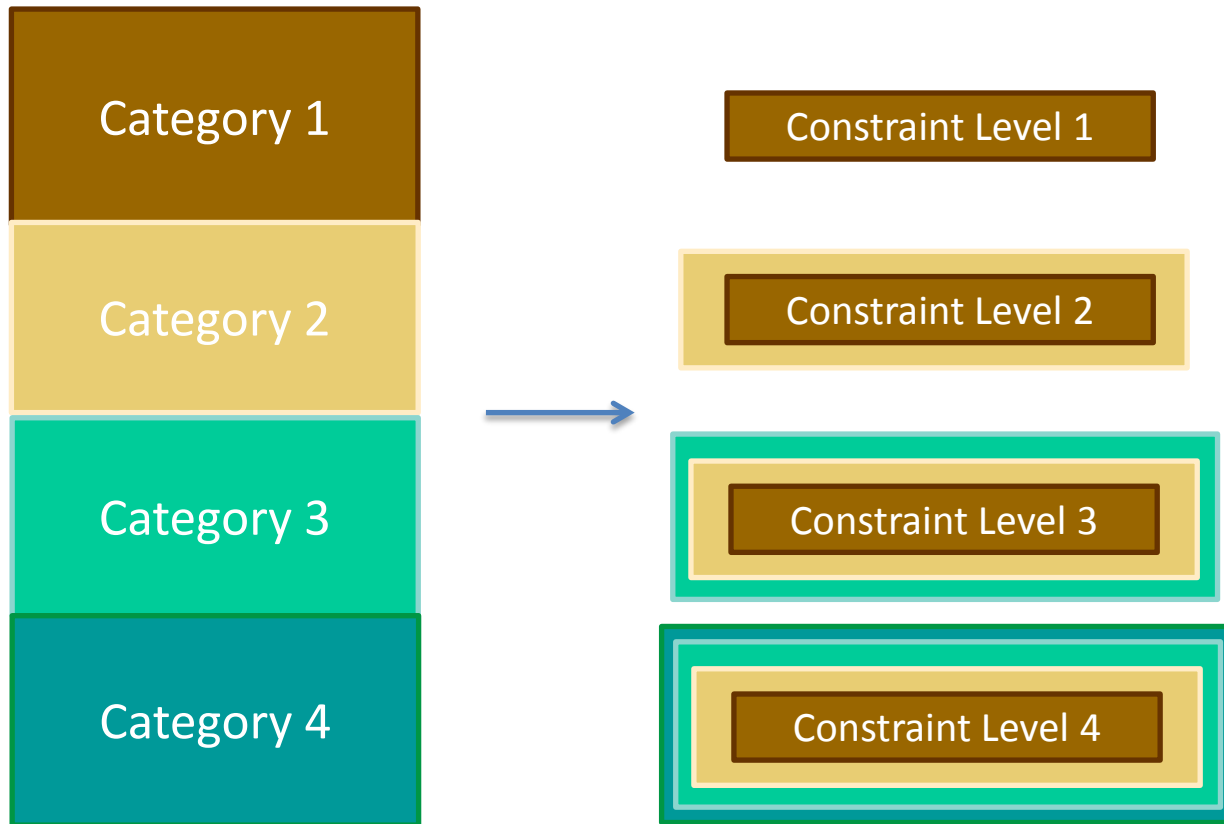
Environmental Protection Category Definitions

- **Category 3:** Areas with **ecological or social value**, including priority conservation areas
- Examples:
 - Prime Farmland
 - The Nature Conservancy portfolio areas and Ecologically Core desert lands

Environmental Protection Category Definitions

- **Category 4:** Lands with broad-scale **ecological value based on regional models and studies**
- **Examples:**
 - California Department of Fish and Wildlife's Essential Habitat Connectivity Areas
 - U.S. Fish and Wildlife Service Desert tortoise Priority 2 high quality contiguous habitat linkages

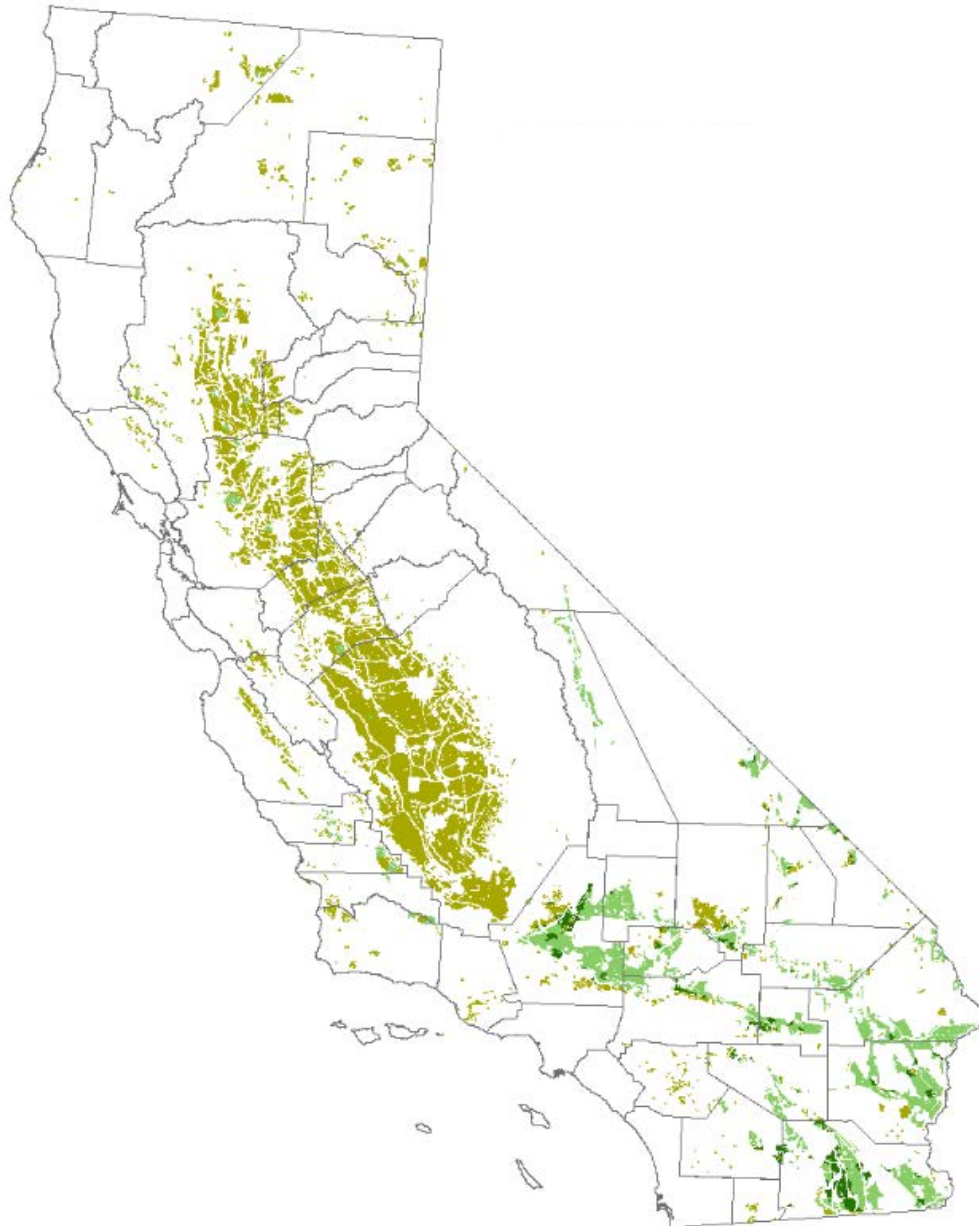
Using the protection categories, we can represent levels of “constraint”



Resource availability

Constraint Level 1

Lands available meeting technical development criteria after removing Category 1



Resource availability

Constraint Level 2

Lands available meeting technical development criteria after removing Category 1 & 2



No. overlapping technologies

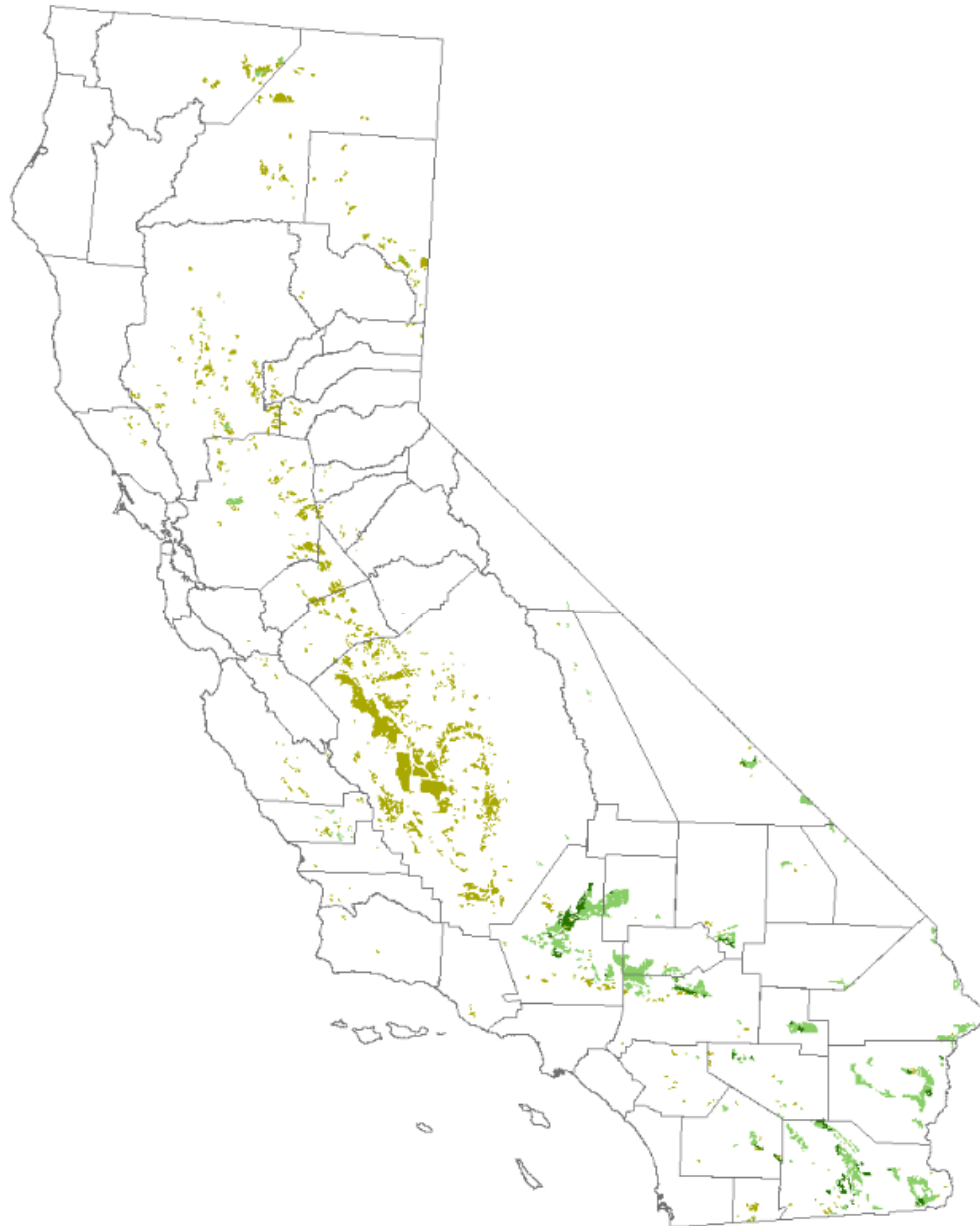
1 2 3

Super CREZ boundaries

Resource availability

Constraint Level 3

Lands available meeting technical development criteria after removing Category 1, 2 & 3



No. overlapping technologies

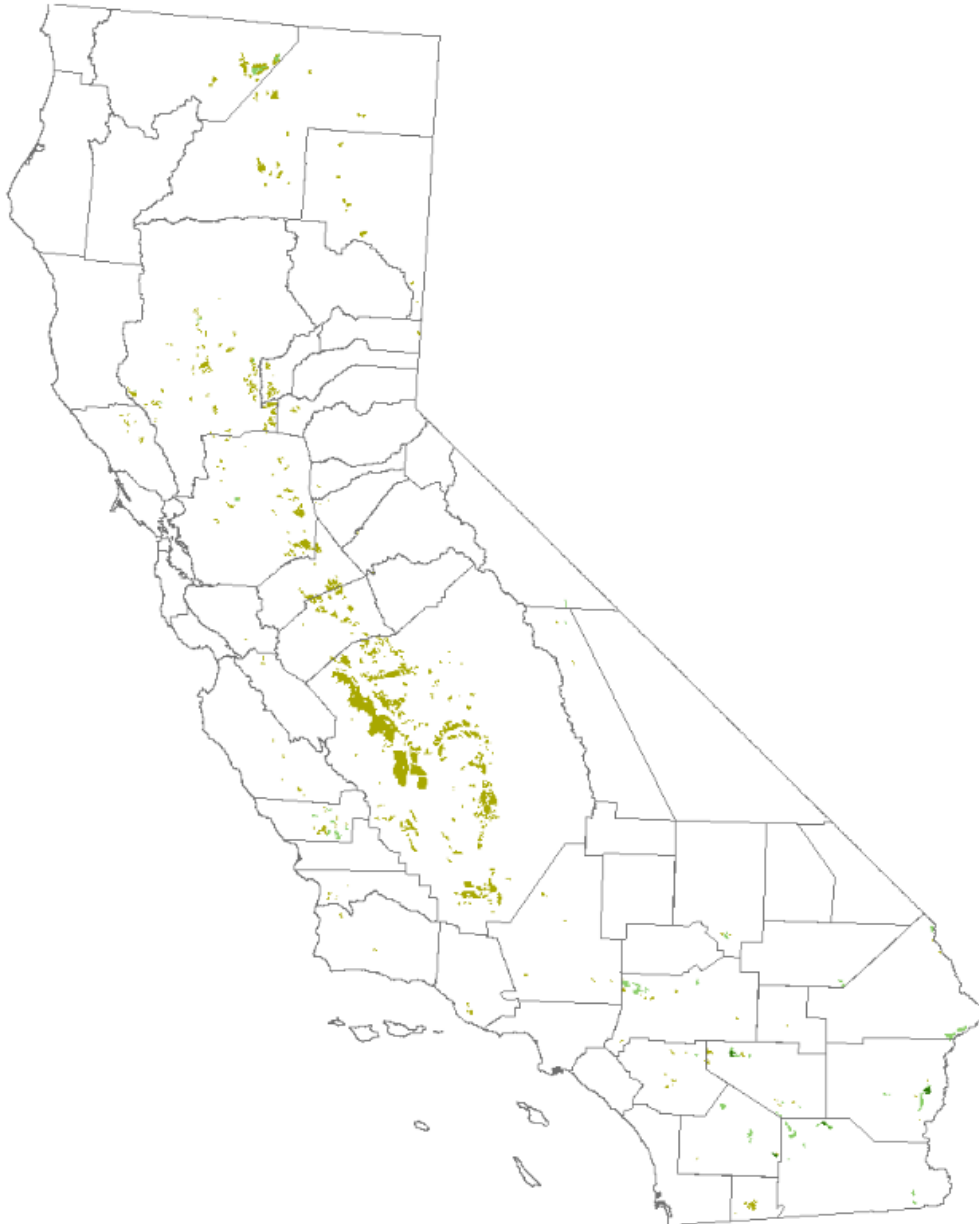
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Super CREZ boundaries

Resource availability

Constraint Level 4

Lands available meeting technical development criteria after removing Category 1, 2, 3 & 4



No. overlapping technologies

1 2 3

Super CREZ boundaries



RESULTS AND FINDINGS

Selected sites

Constraint Level 1



■ Wind ■ Solar PV ■ Solar CSP ■ Geothermal □ Super CREZ boundaries

Environmental exclusions change the mix of land cover types and the spatial distribution of sites selected to meet 50% in-state RPS

Selected sites

Constraint Level 2



Environmental exclusions change the mix of land cover types and the spatial distribution of sites selected to meet 50% in-state RPS

■ Wind ■ Solar PV ■ Solar CSP ■ Geothermal □ Super CREZ boundaries

Selected sites

Constraint Level 3



Environmental exclusions change the mix of land cover types and the spatial distribution of sites selected to meet 50% in-state RPS

■ Wind ■ Solar PV ■ Solar CSP ■ Geothermal □ Super CREZ boundaries

Selected sites

Constraint Level 4



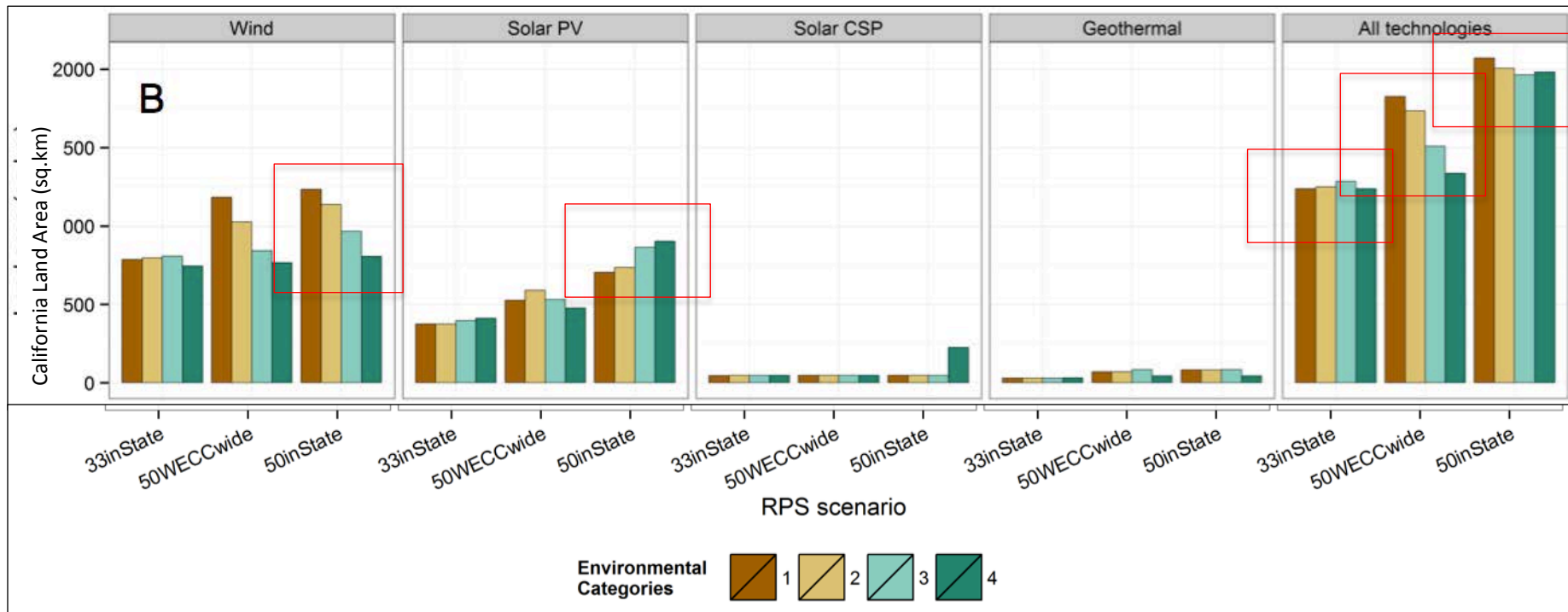
Environmental exclusions change the mix of land cover types and the spatial distribution of sites selected to meet 50% in-state RPS

Category 4 reduces Sacramento Valley wind and pushes solar development toward the north

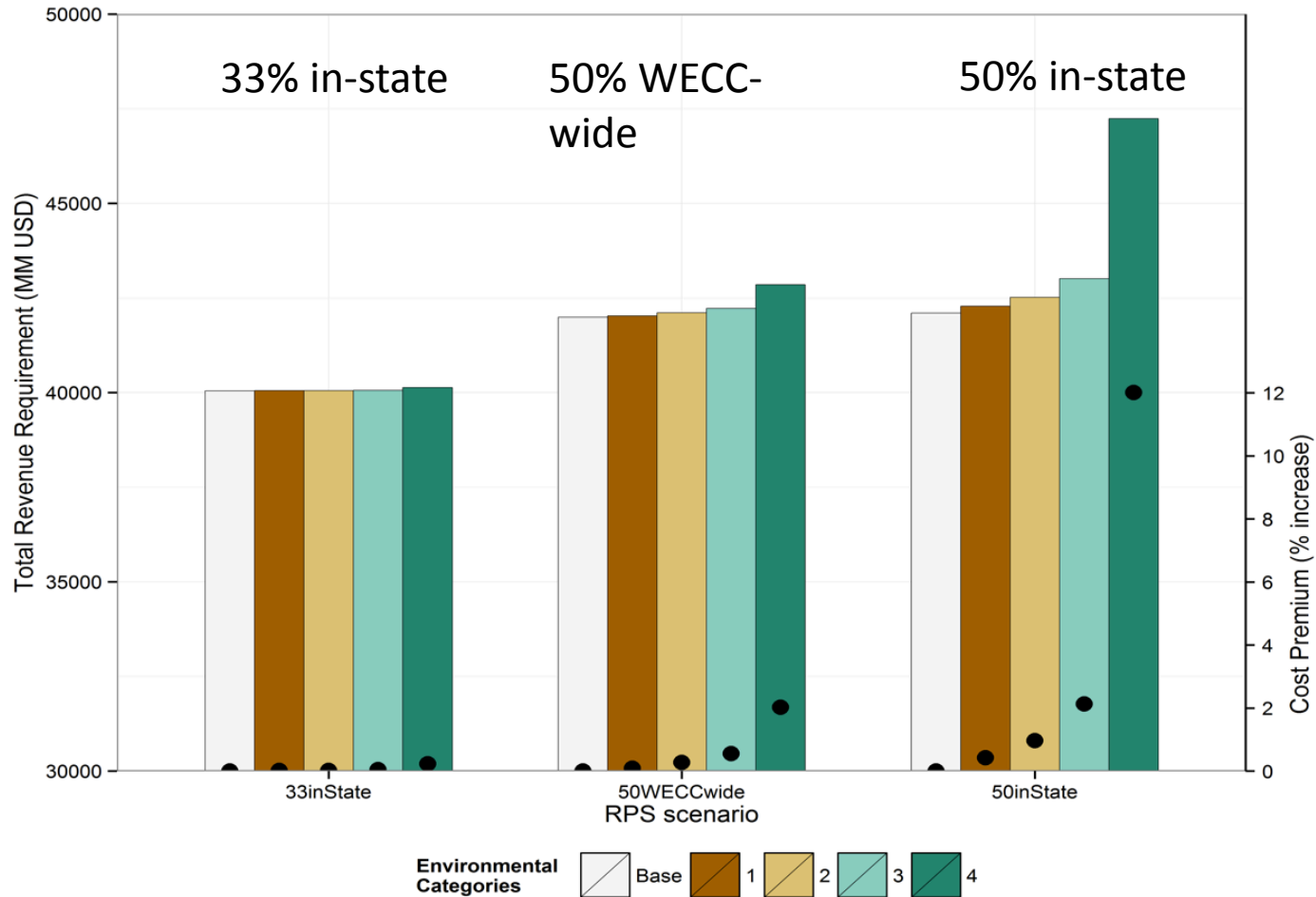
■ Wind ■ Solar PV ■ Solar CSP ■ Geothermal □ Super CREZ boundaries

California Land Area Requirements

- Total land area requirements increase with level of RPS (%)
- Environmental constraints change generation mix
- For 50% in-state, stronger exclusions reduce wind, increase solar
- For 50% WECC-wide, stronger exclusions reduce CA land area



Cost premium for most scenarios is minimal

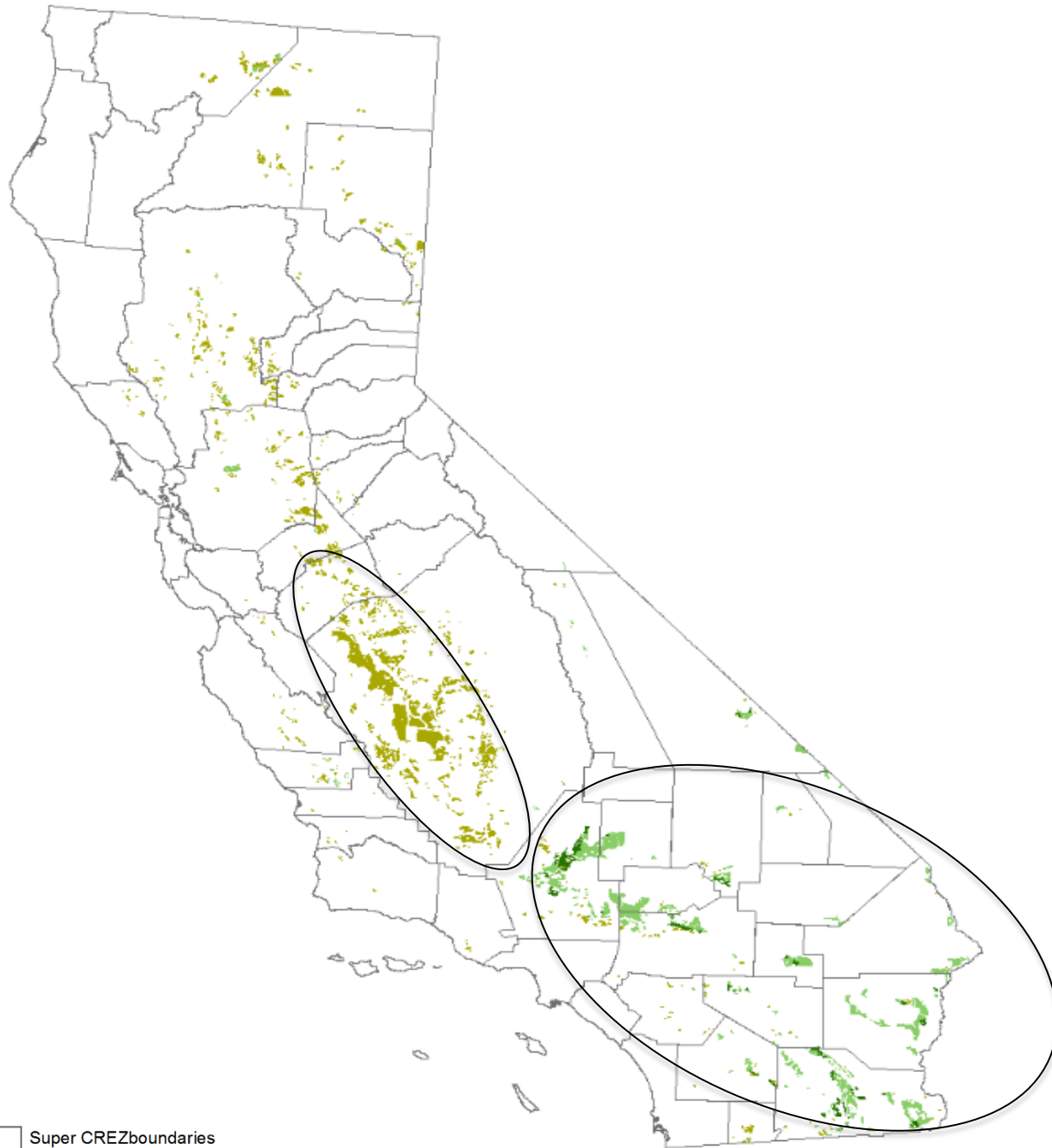


Key Results

- 50% renewables portfolio with a low impact to important natural areas can be achieved at a cost premium of 2% or less.
- Environmental constraints increase geographic diversity.
- Solar PV land impacts can be largely avoided.



FOCAL GEOGRAPHIES

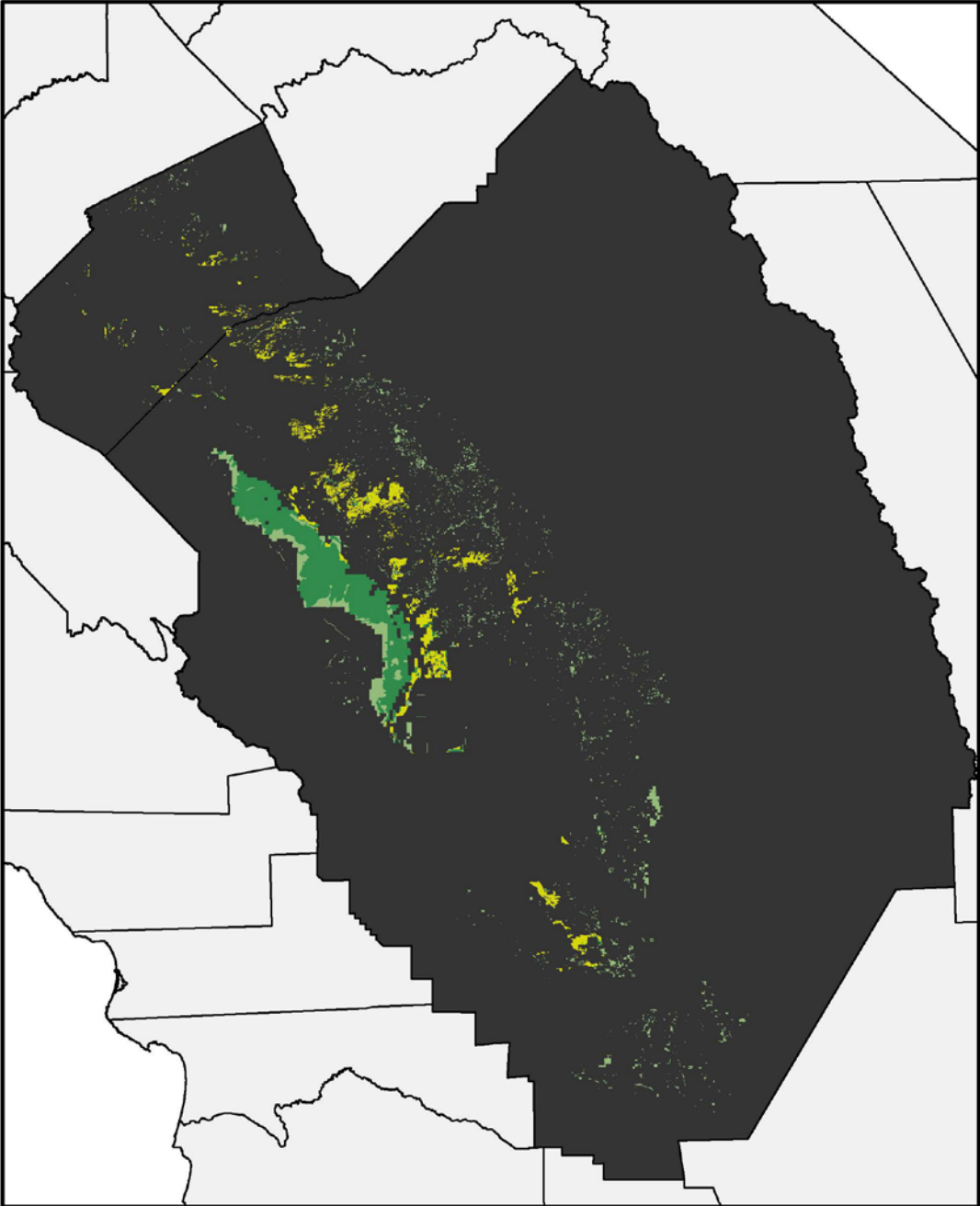


No. overlapping technologies

1 2 3

Super CREZ boundaries

San Joaquin Valley



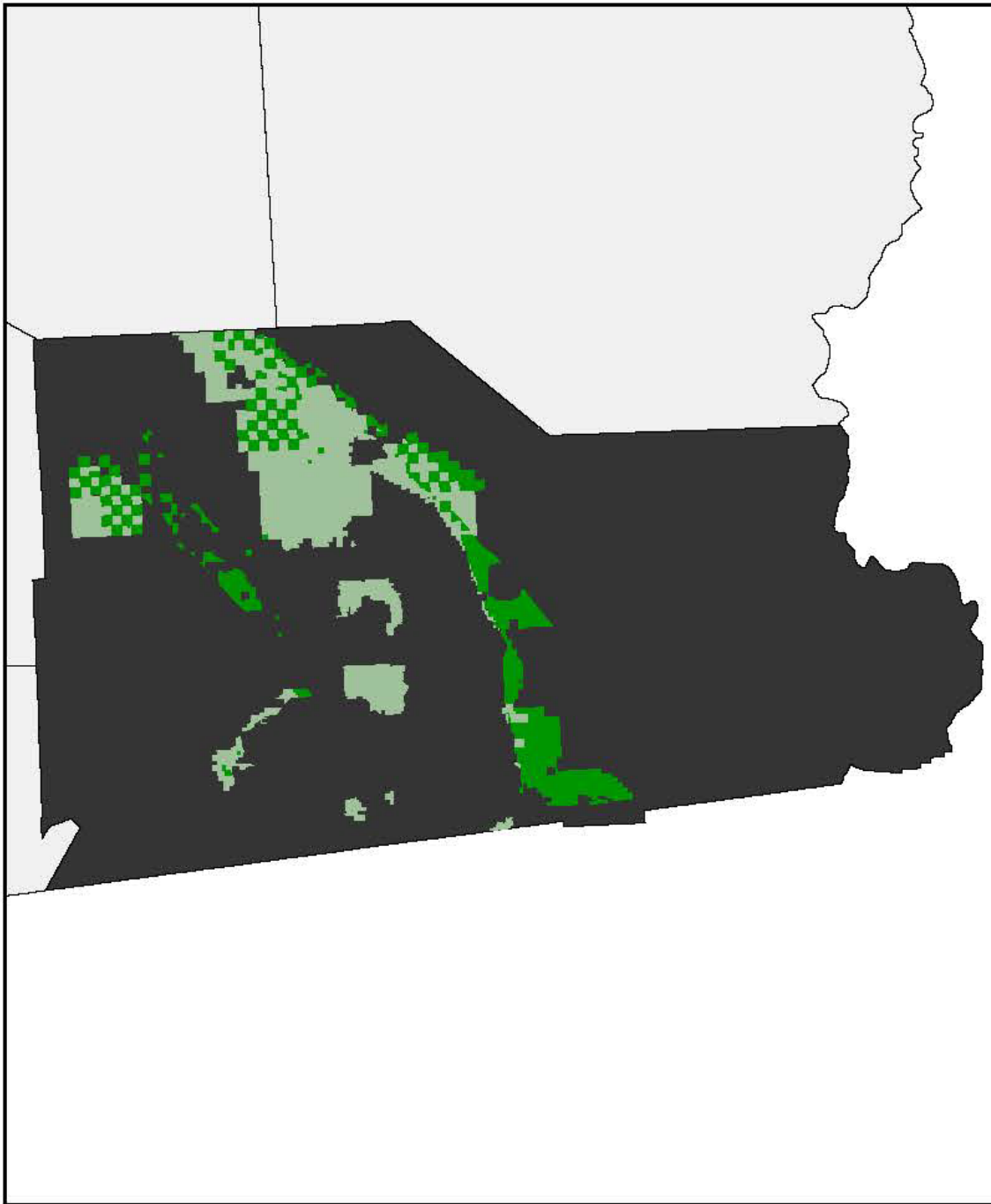
SJVP - Least Conflict Composite Area




Least Conflict Areas

- Priority Least Conflict Areas
- Least Conflict Areas
- Potential Least Conflict Areas

Low conflict areas

Imperial



-  DRECP LUPA DFA select areas
-  Imperial private lands RE areas
-  Super CREZ focal areas

DRECP



Recommendations

- Leverage planning investments
- Incorporate and build off of the science, data, and analyses from existing efforts
- Integrated policies needed for electricity planning

For More Information

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http://www.scienceforconservation.org/downloads/ORB_report