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# Scoring of Renewable Projects for Siting Risk and Environmental Issues

## CPUC 33% RPS Implementation Analysis

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# 1. Introduction to Phase I and the Composite Environmental Metric

## 1.1 Need to Rank Resources for RPS Need

This white paper is part of Phase I of the work plan for CPUC study of 33% RPS Implementation Analysis. Phase I focuses on identifying the new generating resources needed to fill the RPS need. Aspen Environmental Group (Aspen) shows a way of scoring individual projects according to their potential for siting risk or environmental permitting timelines. Phase II deals with timelines for generation and transmission implementing the 33% RPS and barriers to implementation.

New generating resources to fill the RPS need in the CPUC 33% RPS implementation analysis are derived from the CPUC Energy Division database, the Renewable Energy Transmission Initiative (RETI) Phase 1B process, and other sources that are unique to this analysis. Given the variety of resources and the different levels of available information depending on the data source, this white paper identifies a way of discerning which projects would be likely to have the least siting risk or the shortest environmental permitting timelines.

Our composite environmental metric relies on the RETI Environmental Working Group (EWG) Phase 1B process that presented a set of criteria for estimating the level of environmental concern associated with development of renewable generation in the Competitive Renewable Energy Zones (CREZs) identified in the RETI process. However, the assessment performed by the RETI EWG is not intended for use in evaluating individual projects, and the EWG makes no recommendations for the level of environmental concern for resources outside of defined CREZs (Non-CREZ), outside a scored sub-CREZ (portions of CREZs with differing economic profiles), or areas outside of California. RETI EWG Phase 1B results are limited to environmental ranking of certain CREZs, rather than all CREZs, and the EWG rating methodology provides an aggregate ranking for each CREZ, rather than discerning which types of projects within a ranked CREZ might have a lower or higher level of environmental concern. We believe publicly-available data exists that can be used to identify the individual generating projects that are most likely to minimize site permitting risk and environmental permitting timelines.

Permitting risk is not associated simply with potential environmental impacts. It requires consideration of whether a project is likely to receive the required permits and approvals within a normative reasonable timeframe. CREZs that are ranked for a lower level of environmental concern may include projects that would experience the fewest implementation hurdles. Projects outside of ranked CREZs may have similar siting risk. Comparable projects that fall within the same ranked CREZ may have different siting risk or permitting timelines that vary depending on factors specific to the developer and the site. To reflect this, we select pre-identified projects, projects without proximity to sensitive lands, and projects without federal permitting involvement as factors influencing siting risk.

To highlight location-specific environmentally-driven implementation hurdles for projects, our composite environmental metric assigns an environmental score to individual generation projects. Each project identified in the RETI Phase 1B report has been assigned a new project-specific environmental ranking score using the rules defined in Section 3 of this paper. This method has been expanded to projects that are outside of RETI-ranked CREZs, as well as to projects in the CPUC Energy Division database.

## 1.2 Reliance on Renewable Energy Transmission Initiative

**Summary of RETI Process.** Because the 33% RPS cases heavily on RETI data and are being prepared concurrent with RETI's ongoing work, it is helpful to review the work plan and schedule for RETI. RETI's work is divided into the following phases:

- **RETI Phase 1 – Identification and ranking of CREZs**
  - Phase 1A – Literature and data review to compile data on renewable resource potential; develop assumptions and evaluation methodologies; high level assessment of promising resources and characterize technologies.
  - Phase 1B – Identify specific renewable projects and evaluate them in terms of cost and environmental impacts; develop supply curves based on rankings; group projects into CREZs based on proximity, timeframe of development, transmission constraints, economic benefits; describe and rank all CREZs according to cost effectiveness, environmental impacts, and schedule certainty. The RETI Phase 1B Report was published in two drafts in November and December 2008, and finalized on January 5, 2009.
  - **RETI Phase 1 Deliverable/Outcome:** Statewide renewable resource assessment; creation of a short-list of top-priority CREZs.
- **RETI Phase 2 – Refinement of CREZ analysis for priority zones and development of statewide conceptual transmission plan.** Tasks include expansion and refinement of priority CREZs; identification of environmental, jurisdictional, and technological prohibitive issues for transmission and generation siting; preparation of development resource mix scenarios and model capacity expansion; develop conceptual transmission plans.
  - **RETI Phase 2 Deliverable:** Statewide conceptual renewable resources transmission plan with recommended CREZ development scenarios – coordinated with and informed by CAISO and transmission plans developed by Publicly-Owned Utilities (POUs). The Phase 2 Draft Report is was posted for public comment in June of 2009.
- **RETI Phase 3 – Develop plans of service for transmission accessing identified high-priority CREZs and initiation of the permitting process for high priority, near-term transmission projects.**

### 1.3 RETI Environmental Working Group

The RETI EWG determined how environmental considerations should be factored into CREZ development and ranking. The EWG's work was first presented in its August 15, 2008 Interim Phase 1B Report, and finalized in the January 2009 Phase 1B Report as a 46-page appendix addressing "Environmental Assessment of CREZs". This EWG effort is described in that report as an endeavor to identify:

1. Those areas in which energy development is prohibited or severely restricted by existing law or policy.
2. Those CREZs in which renewable energy development is expected to raise fewer environmental concerns.

The RETI EWG was very clear that "the assessment performed by the EWG of potential environmental concerns associated with energy development in CREZs is intended to provide guidance to RETI on the relative merits of development in these areas for the purpose of designing conceptual and specific transmission plans, and is *not* intended for use in evaluating the merits of individual projects" (RETI 2008, p. 1-1).

In addition to developing data to evaluate CREZs, the EWG also developed categories of lands that should not be included in CREZs:

- **Category 1 Lands** are those where no renewable energy projects have been identified, and include areas like national parks and designated wilderness.
- **Category 2 Lands** are areas where some development may be permitted but restrictions impose significant limits on both the scope and location of projects. Only pre-identified projects (applicant proposed projects), have been placed in Category 2 Lands.

The rating methodology of the RETI Phase 1B report gives scores to 30 CREZs in terms of environmental indicators. The CREZ-wide scores assigned by the RETI EWG use eight criteria to estimate the level of environmental concern for each CREZ (RETI 2008):

1. **Energy Development Footprint** (acres per megawatt, normalized for annual energy output)
2. **Transmission Footprint** (amount of land needed for new transmission line Right-of-Way [ROW])
3. **Sensitive Areas in CREZs** (Category 1 and 2 lands within each CREZ)
4. **Sensitive Areas in CREZ Buffer Areas** (Category 1 and 2 lands within 2 miles of a CREZ)
5. **Significant Species** (species of significant concern using two California Department of Fish and Game [CDFG] databases)
6. **Wildlife Corridors** (miles of known wildlife corridors from CDFG)

7. **Important Bird Areas** (acres of important areas within each CREZ based on National Audubon Society data)
8. **Land Degradation** (oil and gas lands, abandoned mines, and contaminated areas were identified from data provided by Bureau of Land Management [BLM], CA Dept of Conservation, and US Environmental Protection Agency [EPA])

See the RETI Phase 1B Final Report<sup>1</sup> for more information on economic and environmental rankings of the CREZs and descriptions of the resources within each CREZ.

## 2. New Resources and Types of Renewable Projects Scored

The 33% RPS cases are made up of generation resources that are each given a composite score. The following types of projects are involved:

- **Projects Identified by RETI:** All projects included in the RETI Phase 1B process (779 projects) except for solar photovoltaic (PV) projects (1357 projects). For assigning an environmental metric to each project, they can be divided into the following categories:
  - Projects located within ranked CREZs.
  - Projects located in sub-CREZs that were not ranked.
  - Projects located outside of any CREZs.
  - Projects located outside of California (in other states, Canada, or Mexico).
  - Solar PV projects that were identified by RETI are not scored here because they have been replaced in the CPUC Energy Division's 33% RPS cases with a wholesale distributed generation scenario (presented to the 33% RPS Implementation Analysis Working Group on January 15, 2009).
- **Projects Identified by CPUC's Energy Division:** All projects (280 projects) that were provided by the CPUC's Energy Division (ED). These are projects that are either under contract with IOUs or are short-listed. Most contracts have been approved by the CPUC. These projects fall into two categories:
  - Projects that can be matched to RETI "pre-identified" projects, and so are scored using the process defined for RETI projects.
  - Projects that are not identifiable as specific RETI projects. For these projects, scoring was done slightly differently because geographic boundaries must be assumed. Section 3.2 explains the scoring strategy for these projects.

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<sup>1</sup> Available at: <http://www.energy.ca.gov/reti/documents/index.html>.

### 3. Detailed Scoring Methodology

#### 3.1 Five Scoring Components

In order to build upon the assessment performed by the RETI EWG and establish a metric for siting risk that could be applied to individual resources, we have developed a project scoring system that considers five separate factors. This composite environmental metric aims to discern the individual projects that may have the fastest or the slowest environmental permitting timelines. After summing the five factors, projects with the lowest scores are associated with the lowest permitting risk and fastest permitting timelines.

**Factor 1: All RETI Environmental Issues.** Our first factor captures the total ranking score of each CREZ as defined by the RETI EWG Phase 1B report. The RETI EWG ranking scores are lower when reflecting the least potential environmental concerns and higher when indicating the likelihood of more severe environmental concerns. For use as one of our five factors, the RETI EWG score is normalized to a 0 to 1 scale. This becomes 20% of the total score in our composite metric.

**Factor 2: Transmission Footprint.** Transmission permitting constraints are often cited as a barrier to timely development of renewable resources. We wanted to give emphasis to the constraint represented by the need for new transmission line ROW. The permitting of new transmission lines can be especially time consuming and challenging. Therefore, the ranking score from the RETI EWG second criterion (Transmission Footprint), is normalized to a 0 to 1 scale and used as the second 20% of the five scores in our composite metric.

Table 1 shows the normalized RETI EWG ranking results that we use for Factors 1 and 2.

**Table 1. California CREZ Environmental Ranking Results in Normalized Terms**

CREZ	EWG Total Result	EWG Transmission ROW Result	Factor 1	Factor 2
			Normalized EWG Total Score	Normalized EWG Transmission ROW Score
Imperial North-A	2.71	0.10	0.1035	0.0200
Twentynine Palms	2.84	0.40	0.1084	0.0800
Mountain Pass	3.92	0.41	0.1497	0.0820
Tehachapi	3.98	0.08	0.1520	0.0160
Fairmont	4.03	0.02	0.1539	0.0040
Pisgah-A	4.37	0.12	0.1669	0.0240
San Diego South	4.42	0.44	0.1688	0.0880
Imperial East	4.89	0.52	0.1867	0.1040
San Bernardino - Lucerne	4.94	0.08	0.1886	0.0160
Victorville-A	4.98	0.05	0.1901	0.0100
Iron Mountain	5.04	0.30	0.1924	0.0600
Palm Springs	5.20	0.09	0.1985	0.0180
Kramer	5.21	0.13	0.1989	0.0260
Lassen North-A	5.63	1.95	0.2150	0.3900
Inyokern	5.72	0.19	0.2184	0.0380

**Table 1. California CREZ Environmental Ranking Results in Normalized Terms**

<b>CREZ</b>	<b>EWG Total Result</b>	<b>EWG Transmission ROW Result</b>	<b>Factor 1 Normalized EWG Total Score</b>	<b>Factor 2 Normalized EWG Transmission ROW Score</b>
Owens Valley	6.17	0.41	0.2356	0.0820
Carrizo South	6.65	0.57	0.2539	0.1140
Carrizo North	6.78	0.41	0.2589	0.0820
Barstow	6.87	0.19	0.2623	0.0380
Solano	7.11	0.08	0.2715	0.0160
Needles	7.23	0.69	0.2761	0.1380
Riverside East-A	7.26	0.28	0.2772	0.0560
Imperial South	7.29	0.33	0.2784	0.0660
Cuyama	7.35	0.66	0.2806	0.1320
Victorville-B	8.43	0.08	0.3219	0.0160
San Bernardino - Baker	8.76	0.23	0.3345	0.0460
Santa Barbara	9.05	1.18	0.3456	0.2360
Round Mountain-A	9.22	0.44	0.3520	0.0880
San Diego North Central	15.02	0.08	0.5735	0.0160
Lassen South-A	26.19	5.00	1.0000	1.0000
<b>Best 1/3 of EWG Scores</b>	<b>4.98</b>	<b>—</b>	<b>0.1901</b>	<b>—</b>
<b>Mean EWG Score</b>	<b>6.91</b>	<b>0.52</b>	<b>0.2638</b>	<b>0.1034</b>

Source: RETI Phase 1B-Environmental Assessment of CREZ, Appendix C, Environmental Working Group, Final Report, December 31, 2008.

There are three additional issues that were considered in some way in the RETI Phase 1B process, but that we wanted to give a greater weight. These issues are used as a way of discerning which projects would be likely to have shorter timelines, even if comparable projects fall within the same ranked CREZ. Timelines for individual projects within a CREZ will vary depending on factors specific to the developer and the site. As such, we select pre-identified projects, projects without proximity to sensitive lands, and projects without federal permitting involvement as three additional factors contributing an additional 20% each to the total environmental composite metric.

**Factor 3: Pre-Identified versus Proxy Projects.** Projects not yet identified by applicants but located in areas with resource potential were identified in the RETI Phase 1B process and called “proxy projects.” Because these projects have no sponsor, they are likely to take substantially longer to permit than the “pre-identified projects” that have been developed by specific applicants.

**Factor 4: Proximity to Sensitive Lands.** This factor was used as a proxy for visual and aesthetic impacts (views from sensitive lands are generally the highest priority for protection), cumulative impacts, and public opposition. Siting of generation or transmission near sensitive lands generally increases the likelihood of public opposition. Assigning a score for resources close to sensitive lands allows separation of comparable projects from within the same RETI ranked CREZ. A project that is within a RETI ranked CREZ but also happens to be closer to sensitive lands would be expected to have a longer permitting timeline than a similar project within the same CREZ but distant from sensitive lands. For purposes of this factor, “sensitive lands” were the Category 1 and 2 lands identified by the EWG for RETI Phase 1B.

**Factor 5: Projects on Federal Land.** Federal site permitting can take much longer than the state-only process due to requirements to comply with the National Environmental Policy Act

(NEPA), often in addition to the state California Environmental Quality Act (CEQA) requirements. We believe that federal land management agencies are understaffed to handle the huge number of pending (and anticipated) applications for renewable generation and transmission projects, so we wanted to add consideration of this factor to the scoring system.

### 3.1.1 Factor 1: RETI EWG Total Score

- For a project within or near a CREZ having a RETI EWG ranking result, that score (normalized as shown in Table 1) was used. Projects in a better CREZ score better (0 to 1 scale, 0=best, 1=worst).
- For projects outside of a RETI EWG-ranked CREZ (for example, Non-CREZ projects and those in unscored sub-CREZs), a placeholder score is assigned that does not penalize the projects for being outside of a CREZ. RETI-like scores were created based on generation technology types, as follows:
  - Projects in a non-scored sub-CREZ are scored equivalent to the scored sub-CREZ, because sub-CREZ designations are presumed to reflect economic parameters more readily than environmental.
  - **Geothermal** and **Biomass** projects outside a ranked CREZ were scored equivalent to projects within the lowest scored CREZs (in one of the best one-third or top 33rd percentile CREZs). Permitting risk for geothermal and biomass projects is expected to be similar to projects within a “good” CREZ due to a somewhat flexible footprint (smaller size overall).
  - **Solar** and **Wind** projects outside a ranked CREZ were scored equivalent to projects within the average-scored CREZ (using the mean of CREZ scores). This was intended not to penalize them for being outside of a CREZ. For projects in locations that are remote from transmission, a penalty is given in the transmission ROW category rather than in the total CREZ score category.

### 3.1.2 Factor 2: Transmission Permitting Constraints

- Projects within a CREZ were given a ROW ranking score from RETI EWG “Transmission Footprint” score (normalized between 0 and 1 as shown in Table 1). Projects in a CREZ with lower transmission ROW requirements score better (0=best, 1=worst).
- Projects outside of a RETI EWG-ranked CREZ (e.g., Non-CREZ) are given the highest score (indicating more permitting challenges) equivalent to that of the worst CREZ transmission footprint (score of 1). These isolated projects are not located in a CREZ where a single transmission line could serve multiple projects, so the permitting for new transmission lines would likely be more difficult.

### 3.1.3 Factor 3: Pre-Identified Versus Proxy Projects

- Pre-Identified projects rank best (scoring 0) in comparison with Proxy Projects (scoring 1). This scoring differential indicates the greater likelihood of a sponsored project clearing the permitting process.

### 3.1.4 Factor 4: Proximity to Sensitive Lands

- Projects outside of a 2-mile buffer of RETI EWG sensitive areas rank better than those closer to sensitive lands. Projects completely outside of the buffer area score 0, and projects within the 2-mile buffer score 1. Any portion of a project being within two miles of a sensitive area leads to the worst score (a score of 1) given that such a project site would generally increase the likelihood of public opposition.
- Out-of-state projects and projects in Canada and Mexico receive the best score (a score of 0). The basis of this score is that geographic data sources provided by the RETI process do not include sensitive lands outside of California, out-of-state projects may have a lower level of sensitivity, and permitting processes outside of California allow less opportunity for public input regarding proximity and aesthetics.

### 3.1.5 Factor 5: Projects on Federal Land

- Projects located on lands managed by U.S. federal government agencies rank the worst because there is likely to be a longer permitting timeline.
- Projects in Canada and Mexico ranked worst (a score of 1), identical to those on federal land, because they would require a federal approval from the U.S. Department of Energy (“Presidential Permit”) for transmission interconnection across the border with Mexico or Canada.
- Projects whose boundaries encompass up to 10 percent of their area on federal lands were scored as not requiring federal involvement (a score of 0). This is based on the assumption that the boundaries of these projects are somewhat flexible and that that project developers will seek to avoid federal involvement by configuring projects away from federal lands.
- Out-of-state projects ranked worst (a score of 1), identical to those on federal land, because they would require approvals by entities not subject to California’s RPS or climate change goals, which could adversely affect permitting timelines. Given permitting experience of the Devers-Palo Verde Number 2 Transmission Line with the Arizona Corporation Commission, involvement of state agencies outside California could make such projects more likely to be denied.

## 3.2 Energy Division Project Scoring

Projects from the ED Project database are treated with a methodology that follows the treatment for RETI projects as closely as possible. ED projects are given an approximate geographical shape centered on the location of the project provided by IOUs in November 2008 in a confidential response to an Energy Division data request.

The location of each ED project determines whether it is within or near a ranked CREZ. If it is within or near a ranked CREZ, it is given the same scores for Factors 1 and 2 as a RETI project would be given in that CREZ. For Factor 3, the score is 0 because all ED projects are by definition “pre-identified.” For Factors 4 and 5, the approximate geographical shape of the project is a circle that covers sufficient area to produce the project capacity. Then the area is calculated for its proximity to sensitive lands or location on federal land as a RETI project would be scored. The approximate area of each ED project is assumed to be 1 acre per MW for geothermal, biomass, or biogas, 20 acres per GWh/yr for wind, or 3 acres per GWh/yr for solar (footprint conversion factors are approximations derived from RETI Phase 1B appendices).

### 3.3 Summary of Scoring the Composite Environmental Metric

Table 2 summarizes the scoring methodology for each of the five factors and for each type of project.

**Table 2. Summary of Scoring Methodology for Different Project Types**

Project Type	1. EWG Total Ranking Score	2. EWG Transmission ROW Score	3. Pre-ID vs. Proxy Projects	4. Proximity to Sensitive Lands	5. Federal permitting
<b>RETI Project in Scored CREZ</b>	EWG CREZ score (normalized)	EWG ROW score (normalized)			
<b>RETI Project outside of Scored CREZ (Non-CREZ)</b>	Geothermal or Biomass = best 1/3 of EWG total score Wind or Solar = mean EWG total score	Worst score = 1	Pre-ID = 0 Proxy = 1	>2 miles = 0 <2 miles = 1	In state & non-federal land = 0 >10% on federal land = 1 Out of state = 1
<b>RETI Proxy project</b>	If in scored CREZ = EWG CREZ score	In scored CREZ = CREZ ROW score	Proxy = 1		
<b>ED Projects</b>	If not, see cell above	If not, worst score = 1	Pre-ID = 0		

### 3.4 Environmental Metric for Each Project

For each project, a single score has been developed based on the sum of the 0 to 1 scores for each of the five factors. The maximum project score for all 5 factors is 5, representing the greatest risk (or worst score). The best score is 0.

To provide input into the modeling that provides scenario output, the composite scores were assembled into categories:

- Projects that score less than **2 are Least Risk Projects**, indicating likely fastest permitting timeline.
- Projects that score **between 2 and 3 are Medium Risk Projects**, indicating likely moderate timeline.
- Projects that **score greater than 3 are Greater Risk Projects**, indicating likely slowest environmental permitting timeline.

The portfolio selection model converted each of these three risk categories into cost factors to incorporate into the overall ranking methodology.

## 3.5 Project Scoring Examples

### Siting Risk - Example 1

- Least Risk solar thermal project in San Bernardino County
  1. Has CREZ score better than mean (= 0.24)
  2. Has very good ROW score (=0.07)
  3. Is pre-identified (=0)
  - 4. Is within 2 miles of sensitive lands (=1)**
  5. Is not located on federal land (=0)
- Total Score = 1.31

### Siting Risk - Example 2

- Medium Risk solar thermal project in Imperial County
  1. Has very good CREZ score (=0.09)
  2. Has very good ROW score (=0.08)
  3. Is pre-identified (=0)
  - 4. Is within 2 miles of sensitive lands (=1)**
  - 5. Is located on federal land (~20% of its area)(=1)**
- Total Score = 2.17

### Siting Risk - Example 3

- Greater Risk solar thermal project in the San Bernardino County
  - 1. Has CREZ score worse than mean (0.37)**
  2. Has very good ROW score (0.07)
  - 3. Is not pre-identified (=1)**
  - 4. Is within 2 miles of sensitive lands (=1)**
  - 5. Is located on federal land (~60% of its area)(=1)**
- Total Score = 3.44

## Acronyms & Abbreviations

AFC: Application for Certification (CEC)	IOU: Investor Owned Utilities
CAISO: California Independent System Operator	MND: Mitigated Negative Declaration (CEQA)
BLM: Bureau of Land Management	MW: megawatts; GW: gigawatts; GWh: gigawatt-hours
CEQA: California Environmental Quality Act	NEPA: National Environmental Policy Act
CEC: California Energy Commission	RETI: Renewable Energy Transmission Initiative
CPCN: Certificate of Public Convenience & Necessity (CPUC)	RETI EWG: The RETI Environmental Working Group
CREZ: Competitive Renewable Energy Zone	RFO: Request for Offers
EA: Environmental Assessment (NEPA)	RFP: Request for Proposals
ED: Energy Division of CPUC Staff	RPS: Renewable Portfolio Standard
EIR: Environmental Impact Report (CEQA)	SB-L: San Bernardino-Lucerne CREZ
EIS: Environmental Impact Statement (NEPA)	Utilities: Investor Owned Utilities and Publicly Owned Utilities
GHG: Greenhouse Gas	

## References

RETI (Renewable Energy Transmission Initiative) 2008. RETI Phase 1B – Environmental Assessment of Competitive Renewable Energy Zones. Prepared by the RETI Environmental Working Group. Final Report. (<http://www.energy.ca.gov/reti/documents/index.html>) December 31.