



# Renewable Energy Transmission Initiative

## Generator Meeting RETI 101

**Black & Veatch**

**February 6, 2008**

# RETI Phase 1

Objective: Identify Competitive Renewable Energy Zones (CREZ)

- Phase 1A:
  - Deliverables
    - List of sources – Jan. 22 (available on RETI web site)
    - March 14, 2008 Report
      - Assumptions
      - Methodology
      - Identify resources to be included in Phase 1B analysis
- Phase 1B:
  - Project & CREZ identification and characterization

# Disclaimers

- Please don't read anything into any of the examples
  - To demonstrate form only
  - Completely hypothetical and not realistic
- We've signed a contract to carry out the Phase 1A scope
  - Phase 1B scope is not clearly defined – that's the point of Phase 1A



# **RETI Phase 1A**

## **January – March, 2008**

# RETI Phase 1A – Scope of Work

1. Literature review (delivered Jan. 22)
2. Assumptions
3. Methodology
4. Resource screening by geographic region

## Task 2 - Assumptions

- Financial assumptions for use in modeling
- Renewable energy incentives
- Renewable energy demand
- Transmission availability and cost
- Economic assumptions to support resource valuation
- Renewable technology-specific assumptions

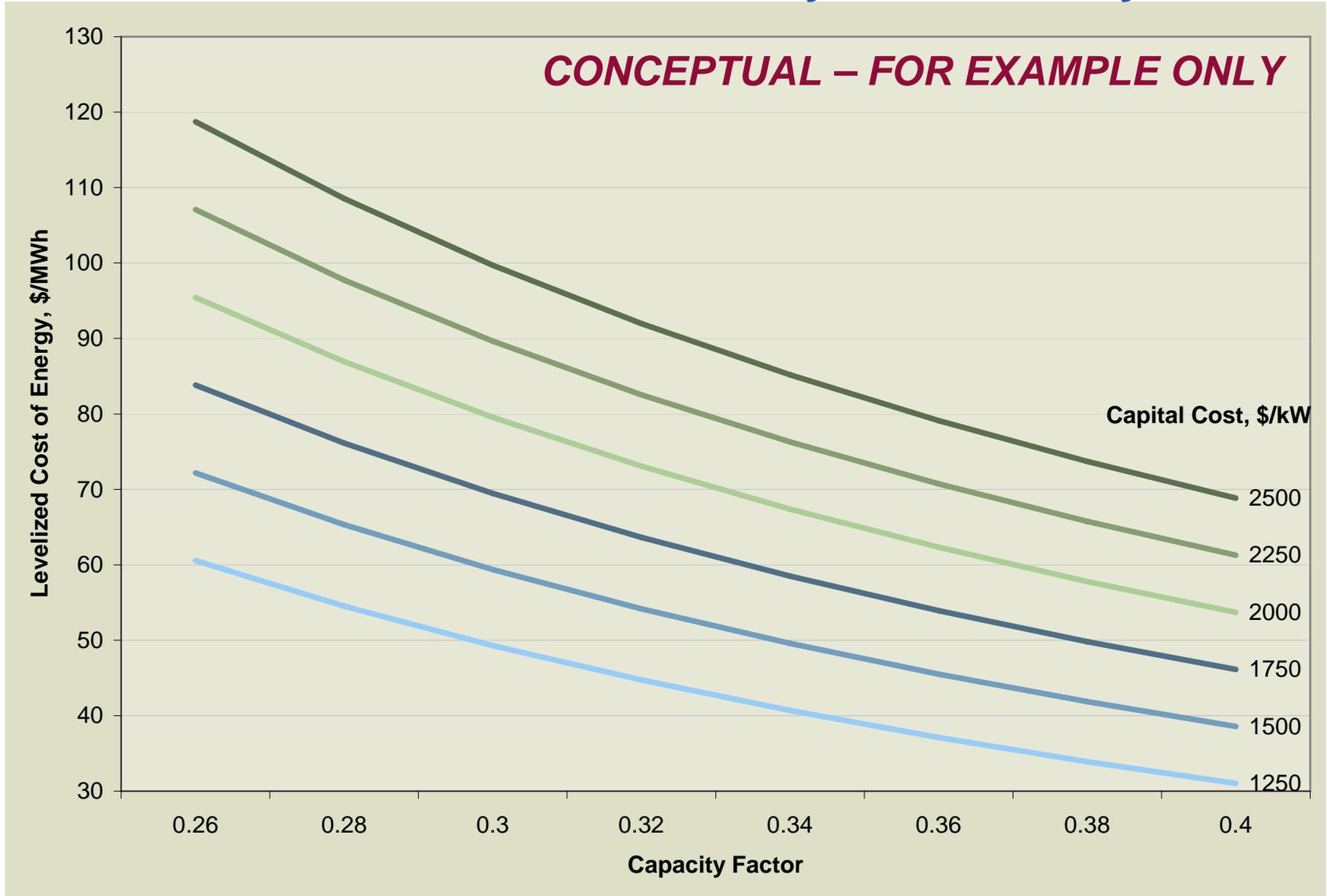
## Assumptions – Renewable technologies

- Renewable technology assumptions will be generic at first (Phase 1A), for example:

<b>Technology</b>	<b>Wind</b>
Output, MW	100
Capital Cost, \$/kW	2,000-2,500
Capacity Factor	30% - 40%
O&M, \$/kW-yr	50
Busbar Levelized Cost of Energy, \$/MWh	52-98

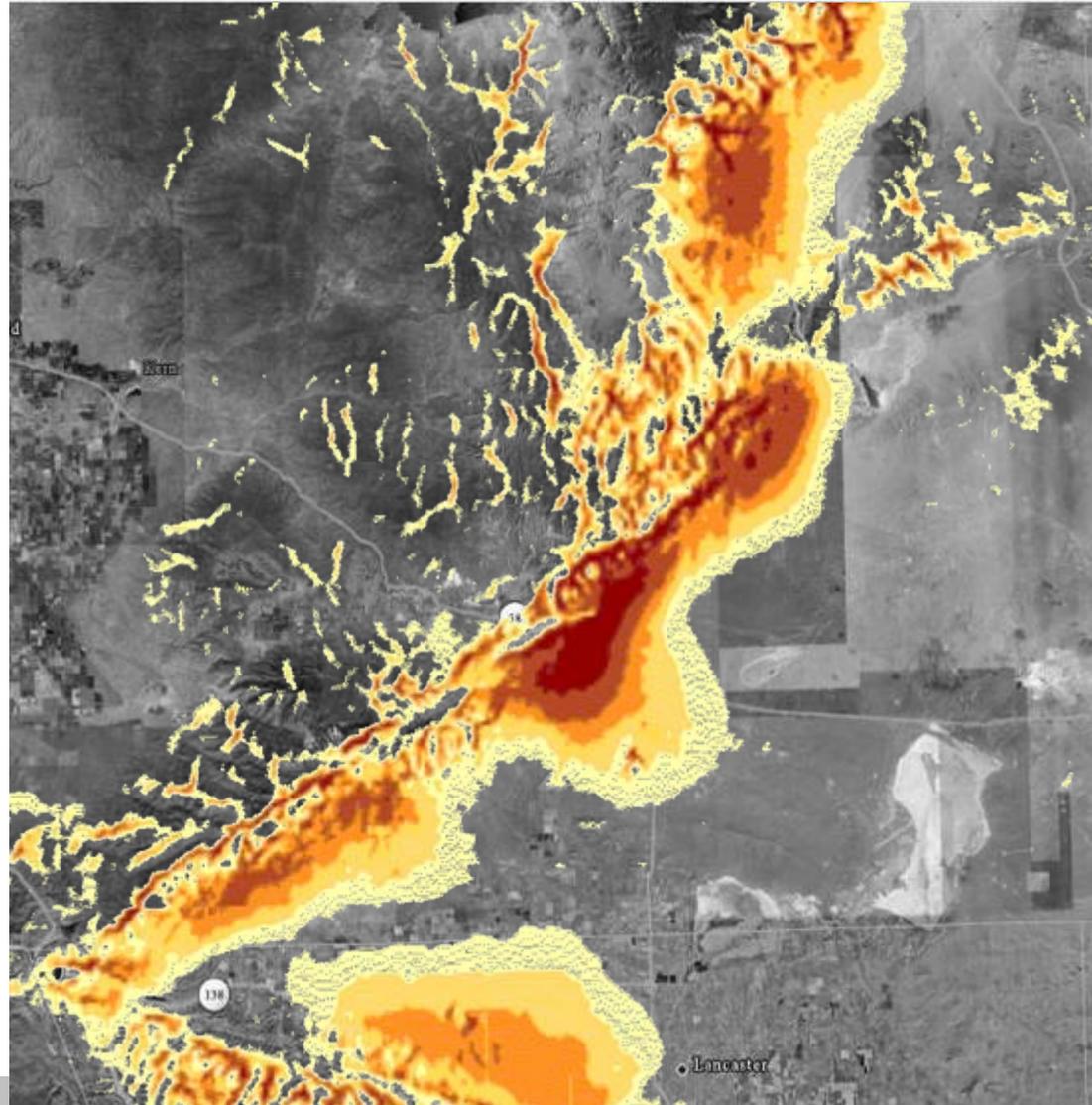
# However, the Economics of Wind Vary Substantially

**CONCEPTUAL – FOR EXAMPLE ONLY**



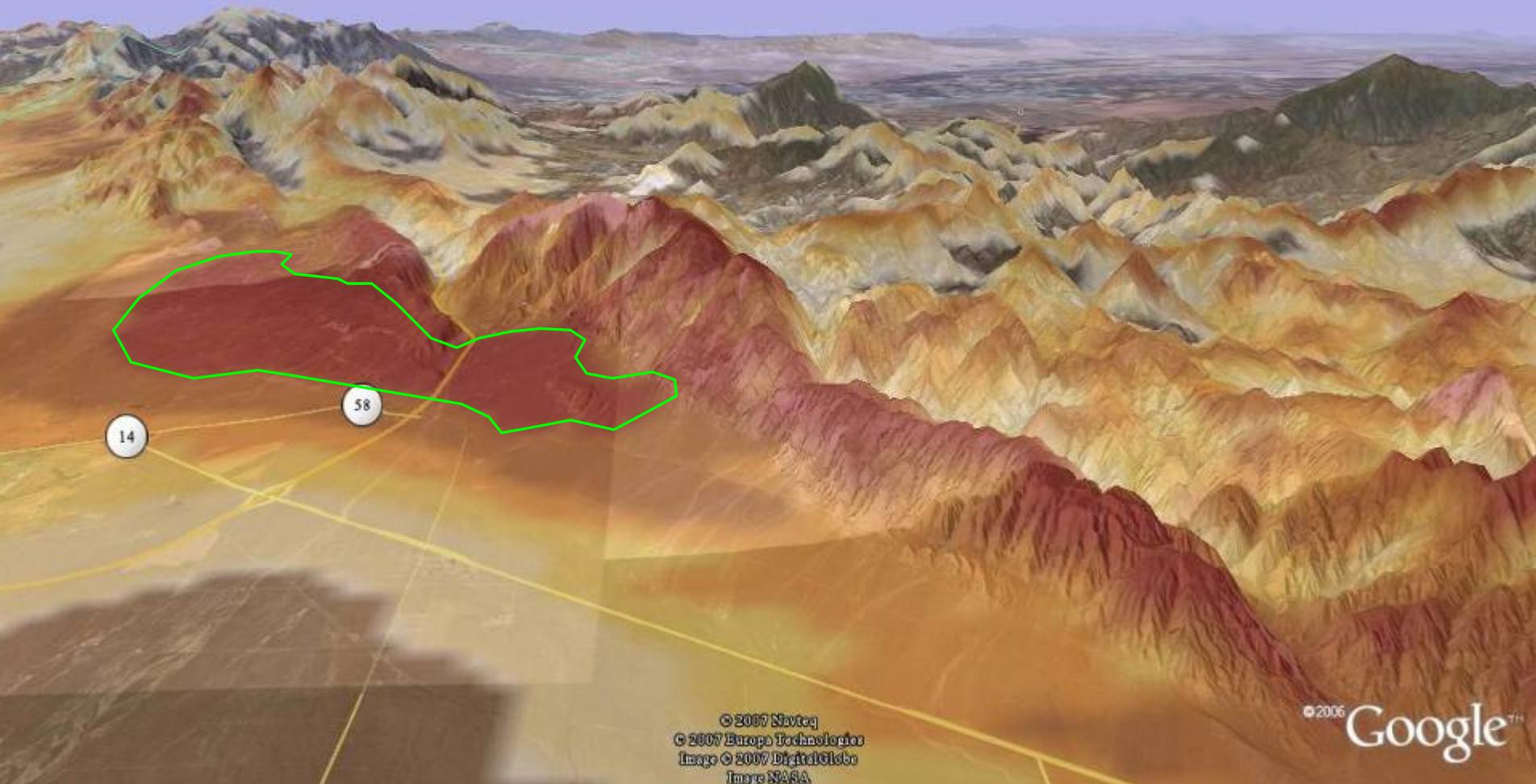
# Phase 1B will Require more Resolution on cost variations

- Tehachapi example



# Tehachapi California Area Wind Resources

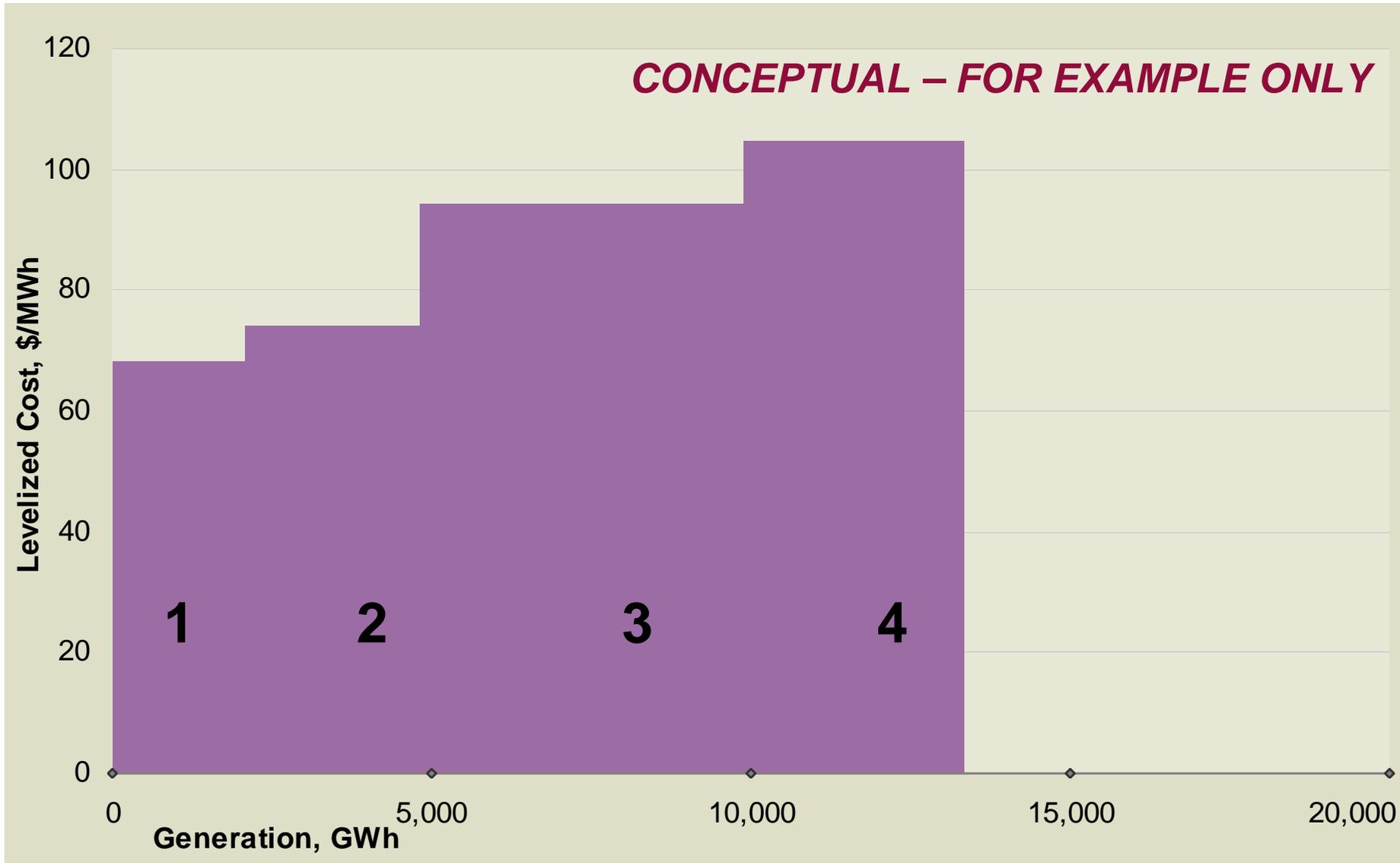
Wind Power Density at 50m (Source: AWS)



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# Simplified Tehachapi Wind Supply Curve



## Task 3 - Methodological Issues

1. Resource assessment
2. Project identification, characterization and screening
3. CREZ identification, characterization and economic ranking
4. Treatment of existing contracts, short-listed contracts and transmission queue
5. Technology development
6. Resource valuation
7. Supply curve creation

# Methodological Issues - Resource Valuation

- Busbar Generation Cost
- Transmission Cost
- System Integration Cost
- Capacity Value
- Energy Value

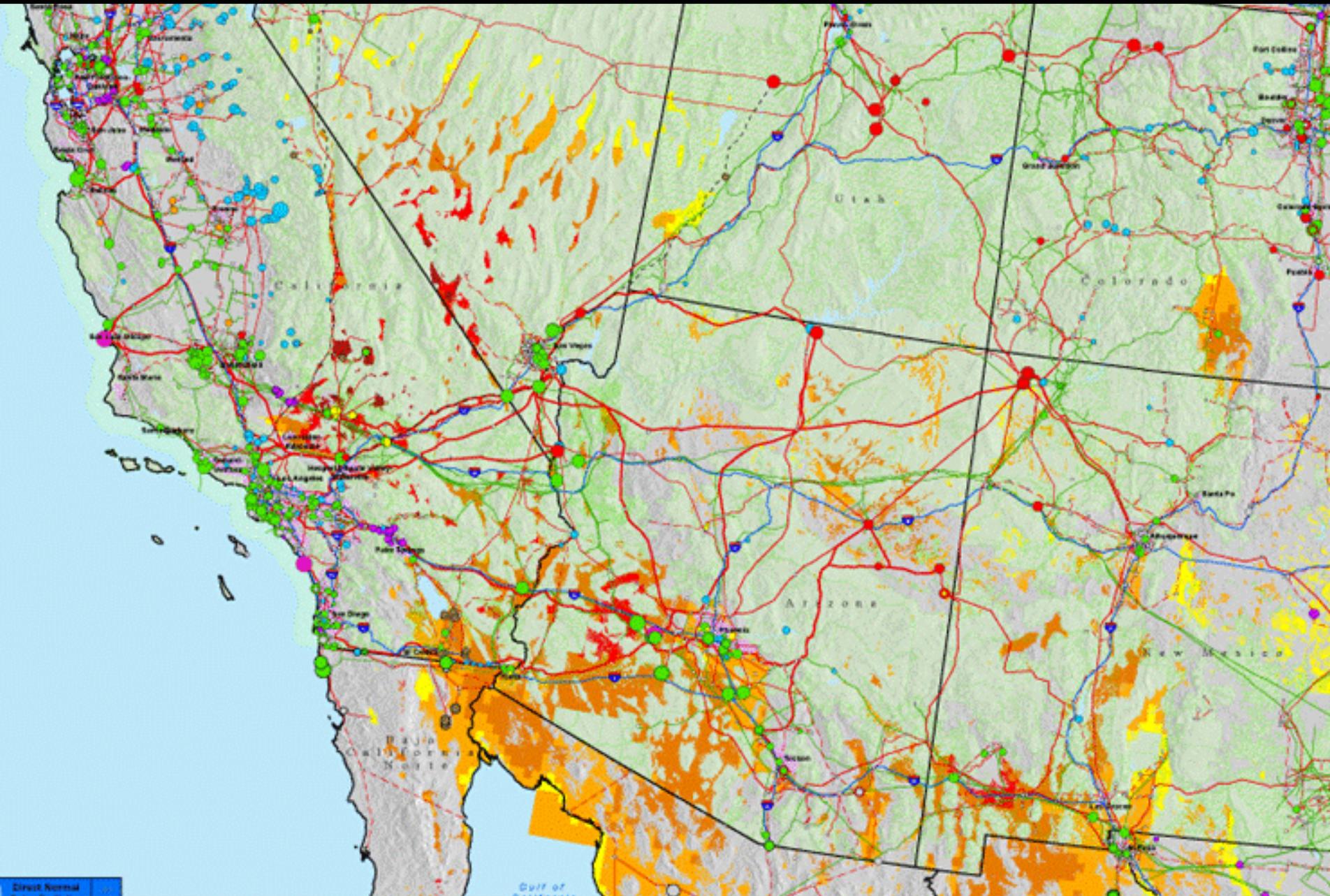
## Task 4 – Resource Screening

	CA	OR	WA	NV	AZ	MX	BC
Landfill Gas							
Digester Gas							
Solid Biomass							
Solar Photovoltaic							
Solar Thermal							
Hydropower							
Onshore Wind							
Offshore Wind							
Geothermal							
Wave Energy							
Marine Current							

# Task 4 – Resource Screening

	CA	OR	WA	NV	AZ	MX	BC
Landfill Gas							
Digester Gas							
Solid Biomass							
Solar Photovoltaic							
Solar Thermal							
Hydropower							
Onshore Wind							
Offshore Wind				No	No		
Geothermal							
Wave Energy				No	No		
Marine Current				No	No		

# Phase 1A Assessment: Solar Thermal Resources (with land exclusions)



# Phase 1B Assessment: Solar Thermal Projects



247

4.73 mi

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# Phase 1B Assessment: Solar Thermal Projects

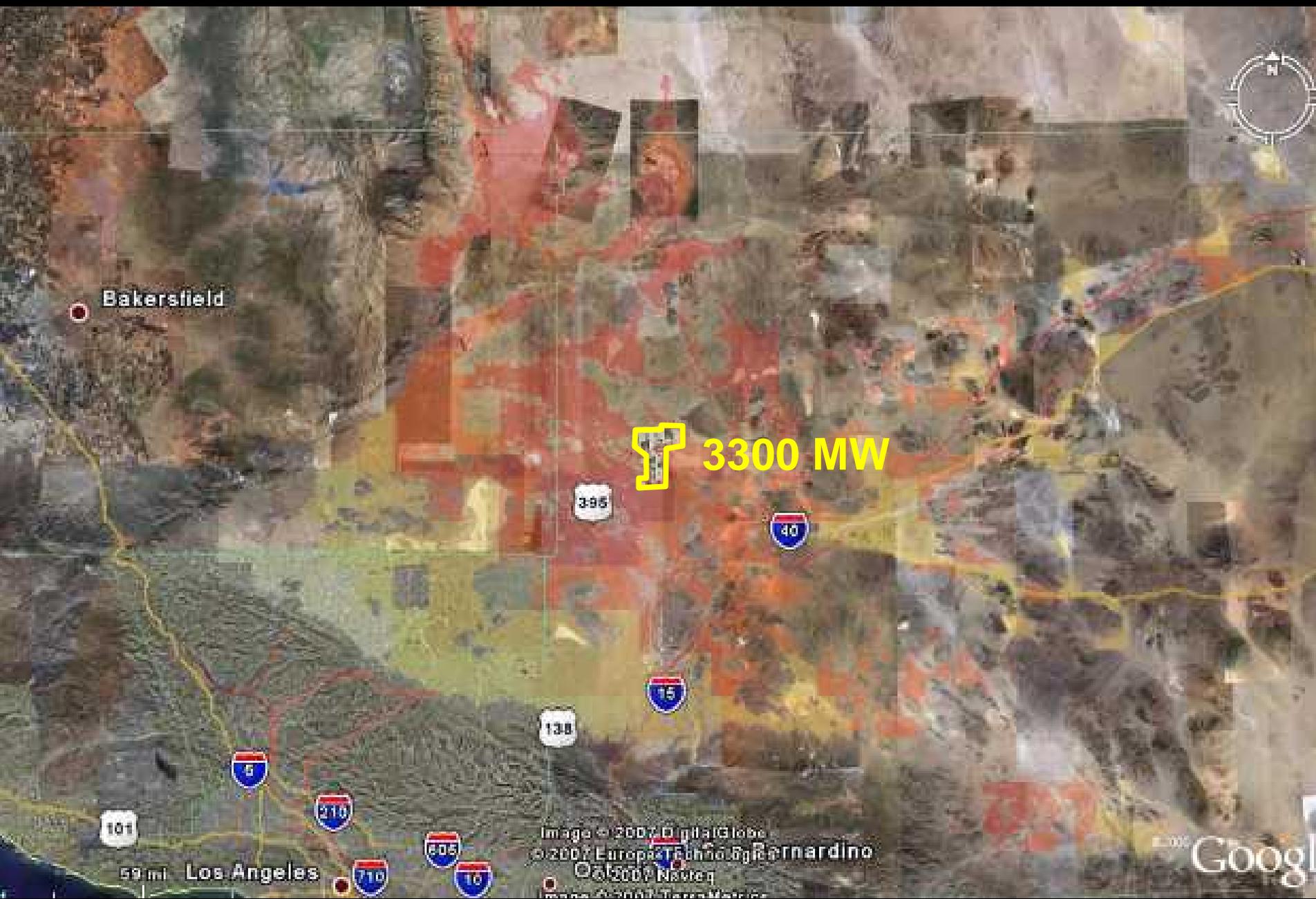


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# Phase 1 – Opportunities for Participation

- February 27 (San Francisco) Stakeholder Steering Committee Meeting
  - Preliminary high-level resource assessment of theoretical/tech potential
  - Preliminary identification of non-viable resources proposed to be removed from assessment
  - General study assumptions (technology capital cost, O&M cost, financing assumptions, future cost and performance, etc.)
  - Approach to resource valuation and forecasting technology development

We anticipate input from Phase 1 Working Group over the next month

# Phase 1 – Opportunities for Participation

- March 14 – Phase 1A Report released

**We will expect written comments to the Phase 1A report**

- March 19 (Sacramento) Stakeholder Steering Committee Meeting
  - Present and discuss results of Phase 1A report
  - Approach to project identification
  - Approach to characterization and screening
  - Approach to supply curve creation
  - Approach to CREZ identification and characterization



# **RETI Phase 1B**

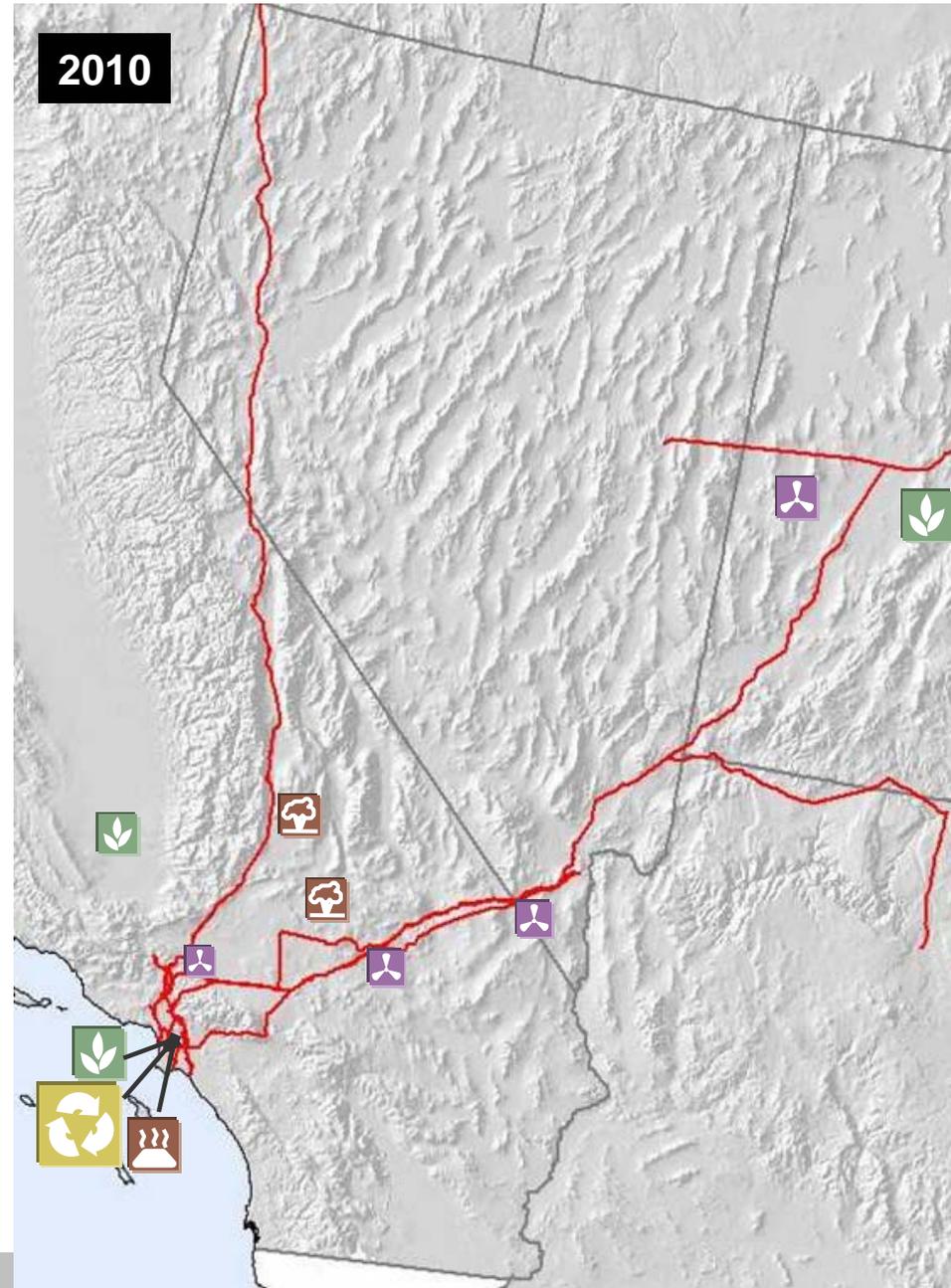
## **April – August, 2008**

## Phase 1B Scope

- Project identification and characterization
  - Specific projects where information available
  - “Generic” projects based on developable potential of resource and location
- Resource valuation
- Development of supply curves
- System integration modeling
- CREZ identification

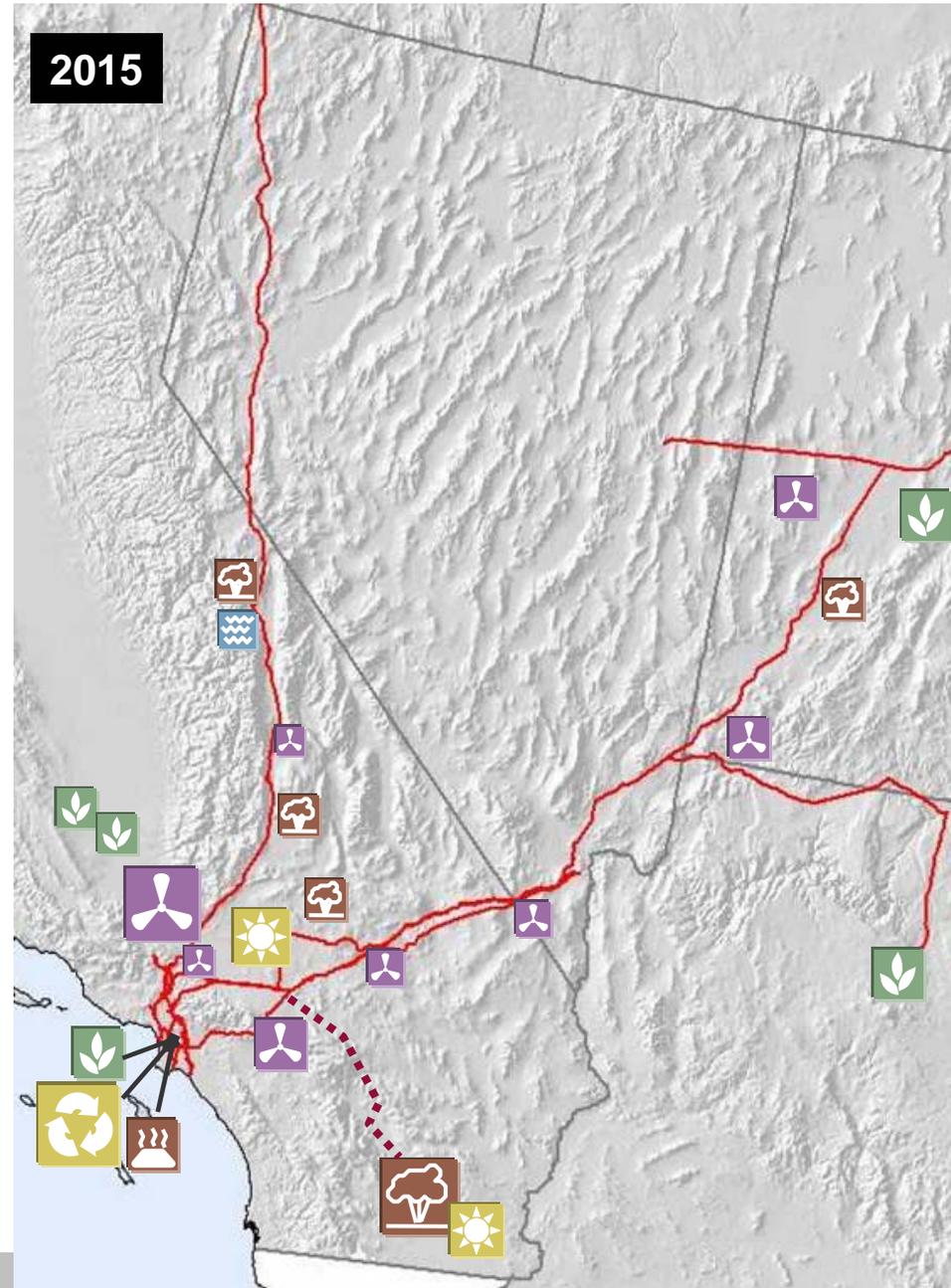
# Example Project Build Scenario

- |   |                 |
|---|-----------------|
|    | Hydro           |
|    | Wind            |
|    | Biomass         |
|    | Landfill Gas    |
|    | Waste to Energy |
|   | Solar           |
|  | Geothermal      |



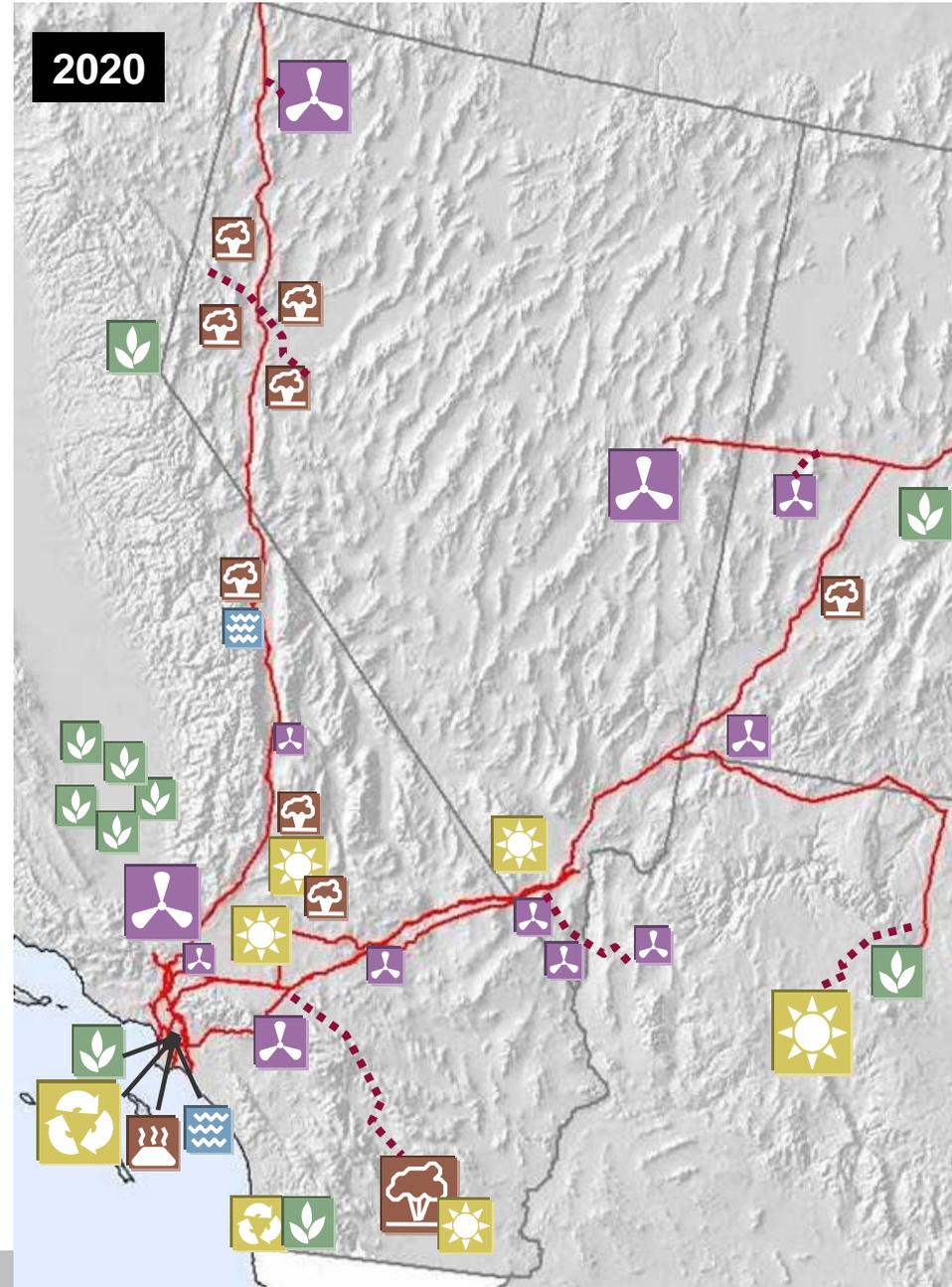
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# Example Project Build Scenario



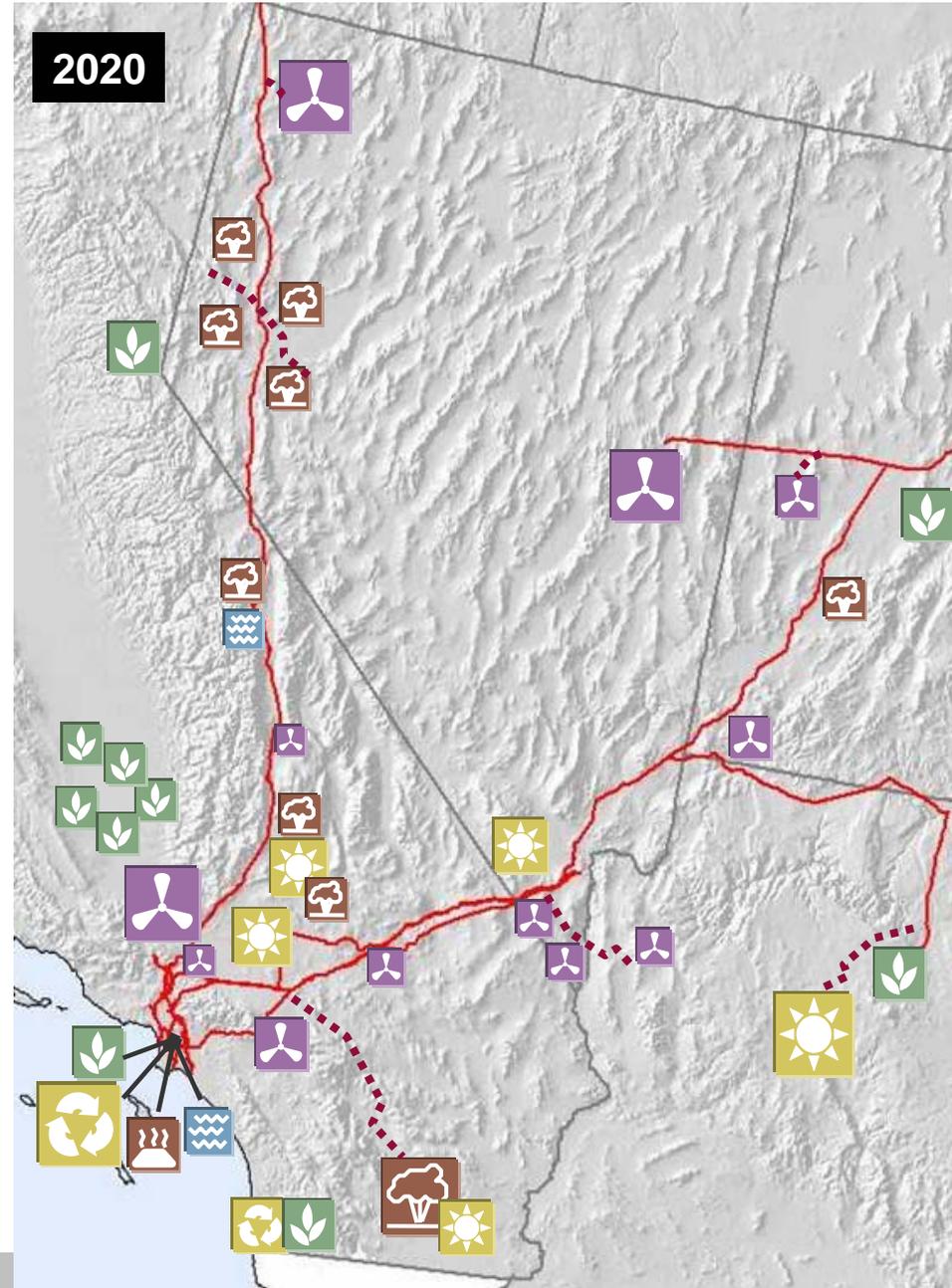
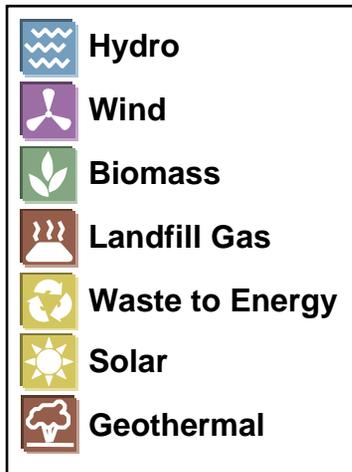
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# Example Project Build Scenario



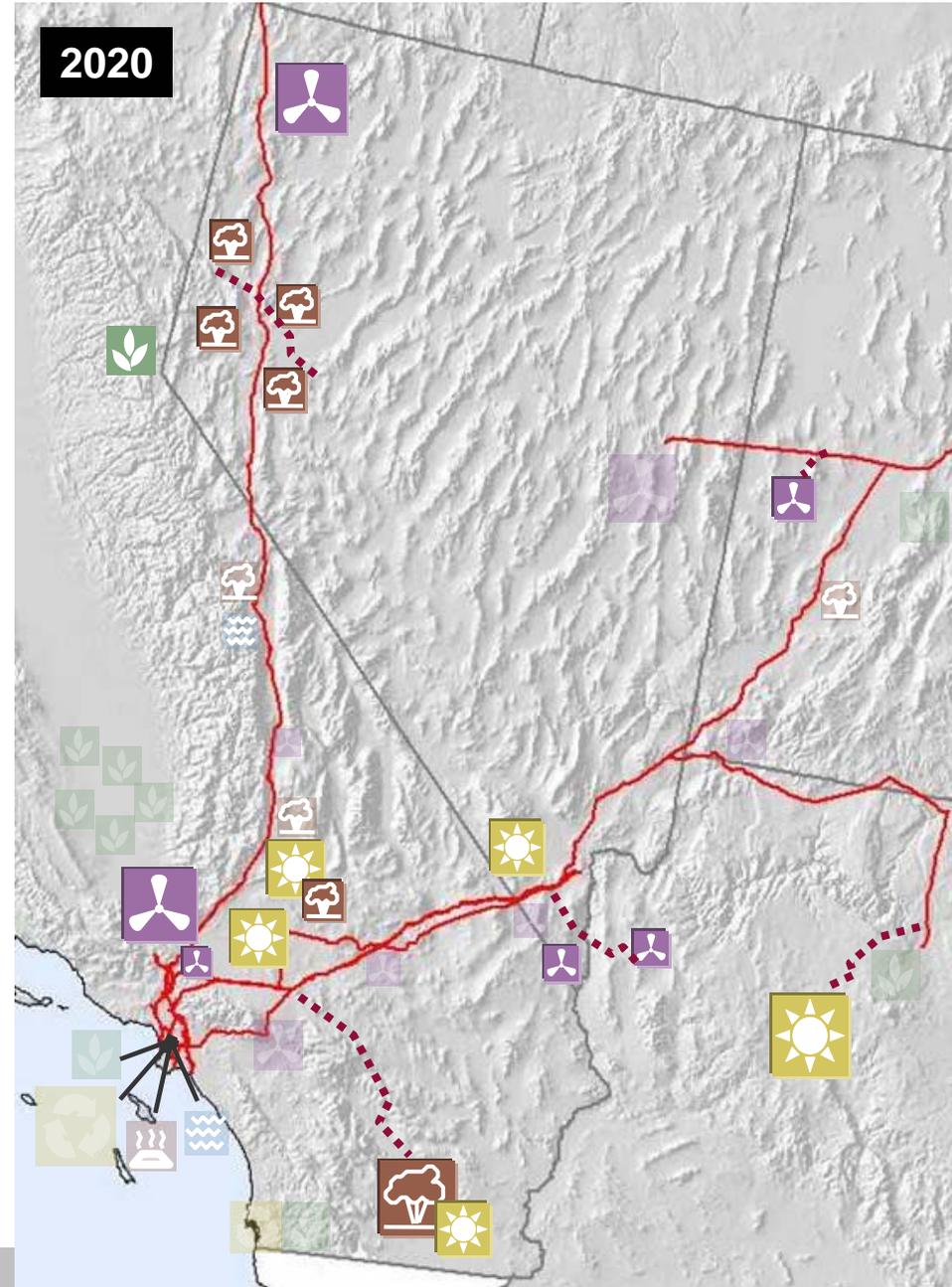
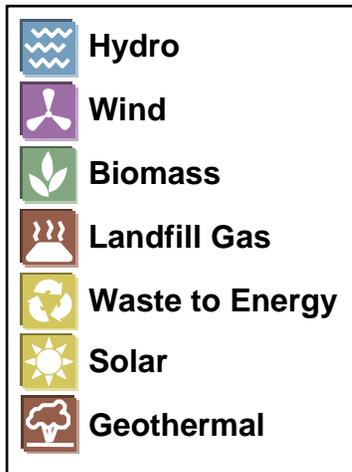
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# Example CREZ Identification



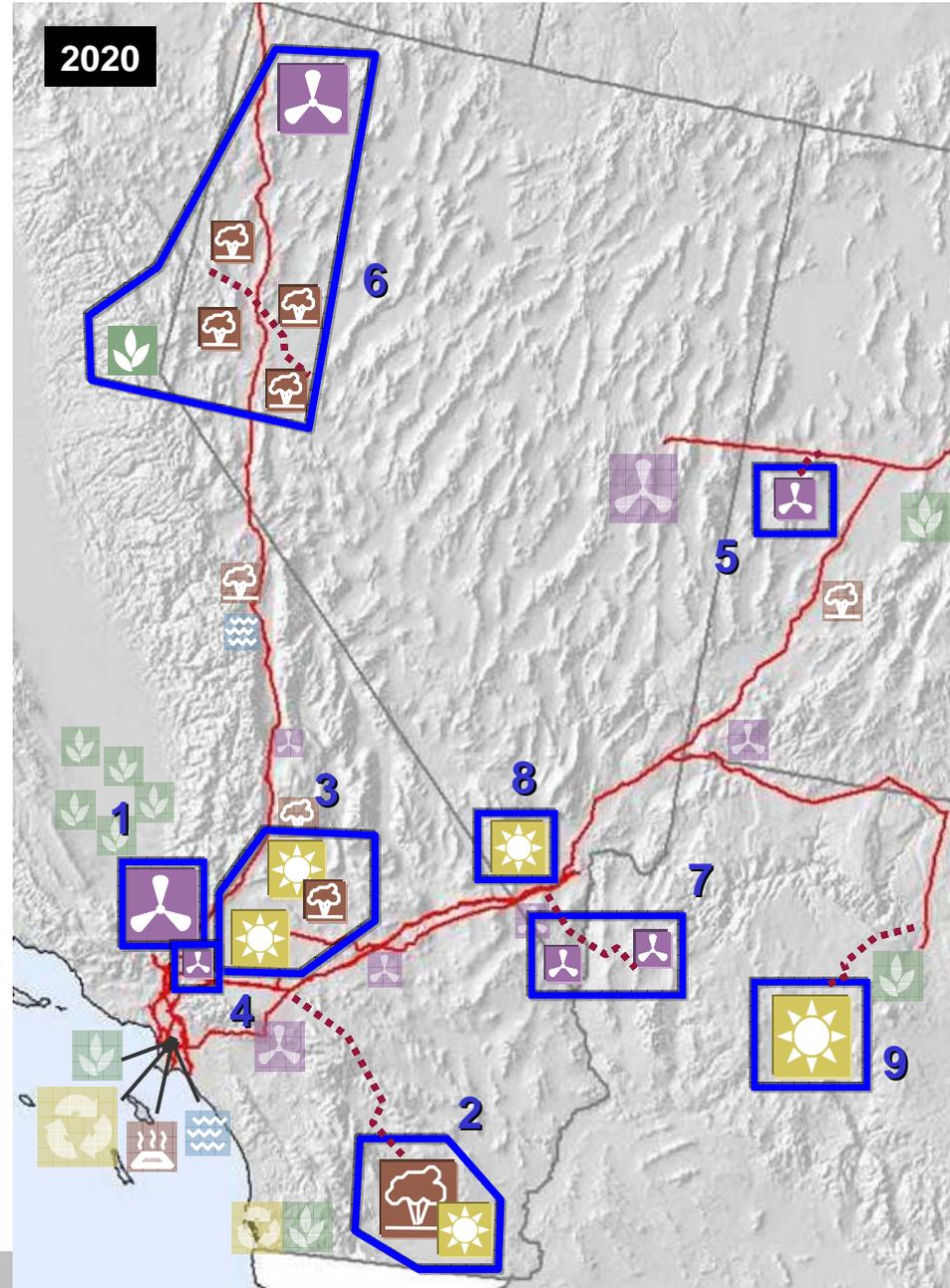
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# Example CREZ Identification



**CONCEPTUAL – FOR EXAMPLE ONLY**

# Example CREZ Identification



**CONCEPTUAL – FOR EXAMPLE ONLY**

# Example CREZ Characteristics Table

	First Year Available	Annual Generation (GWh)				Location		Resource Valuation (2008\$/MWh)					Ranking Cost
		Wind	Geo	Solar	Hydro	State	County	Gen	Trans.	Energy	Capacity	Integr.	
CREZ 1	2012		300			CA	Imperial	75	5	75	14	0	-9
CREZ 2	2011	255				CA	Humboldt	75	0	73	7	1	-4
CREZ 3	2013		500			CA	Imperial	78	10	75	14	0	-1
CREZ 4	2013		150			CA	Imperial	84	12	75	14	0	7
CREZ 5	2018	1,350	1,100			NV	Washoe	75	20	70	10	2	17
CREZ 6	2012				135	CA	Merced	88	2	65	7	0	18
CREZ 7	2011	2,250				CA	Kern	85	12	70	7	2	22
CREZ 8	2013	3,300				CA	Kern	88	15	70	7	3	29
CREZ 9	2014	2,400				CA	Kern	91	17	70	7	4	35
CREZ 10	2015	900		1,350		CA	Kern	113	22	85	17	4	37
CREZ 11	2015	600		1,800		CA	Kern	130	20	90	24	3	39
CREZ 12	2018	2,280				NV	Washoe	107	5	70	7	5	40
CREZ 13	2013			750		CA	S. Bern.	150	10	95	27	2	40
CREZ 14	2013			750		CA	S. Bern.	152	15	95	27	3	48
CREZ 15	2014			1,200		CA	S. Bern.	152	15	95	27	3	48
CREZ 16	2014			1,350		CA	S. Bern.	153	15	95	27	4	50

**CONCEPTUAL – FOR EXAMPLE ONLY**



# Thank You!

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