



# Renewable Energy Transmission Initiative Phase 1B Update

**Black & Veatch**

**Stakeholder Steering Committee**

**June 18, 2008**

# Agenda

- Phase 1B Work Group Items
  - Resource valuation modeling
    - Cost of Generation tool
    - Transmission valuation
    - Energy price forecast
  - Net short calculation
  - Project characterization & identification
- Generator Request For Information on planned/proposed projects

## Phase 1B Work Group Issues

- Energy price forecast –reference and sensitivities
- Net short calculation
- Resource valuation model review
- Project characterization & identification
- Transmission valuation
- Uncertainty assumptions - cost and CF data by resource type
- Advise on sensitivity analyses and data



1 week

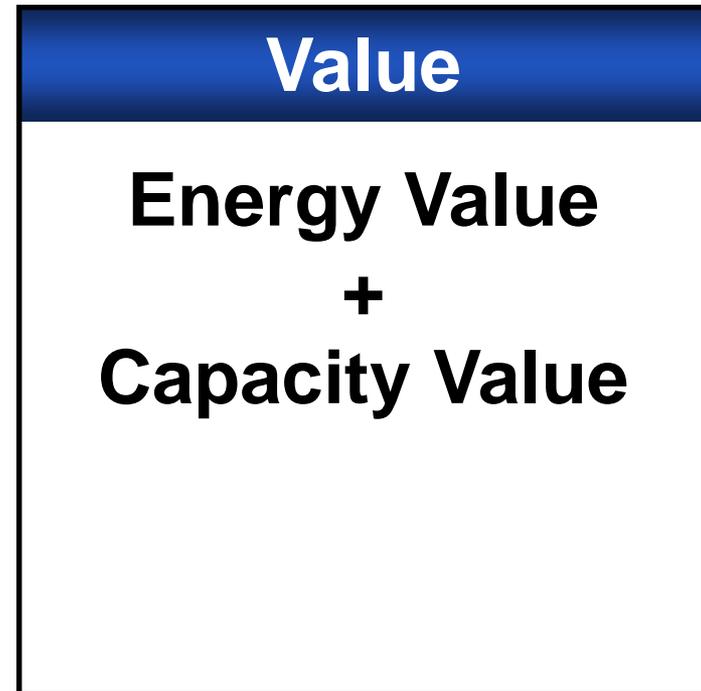
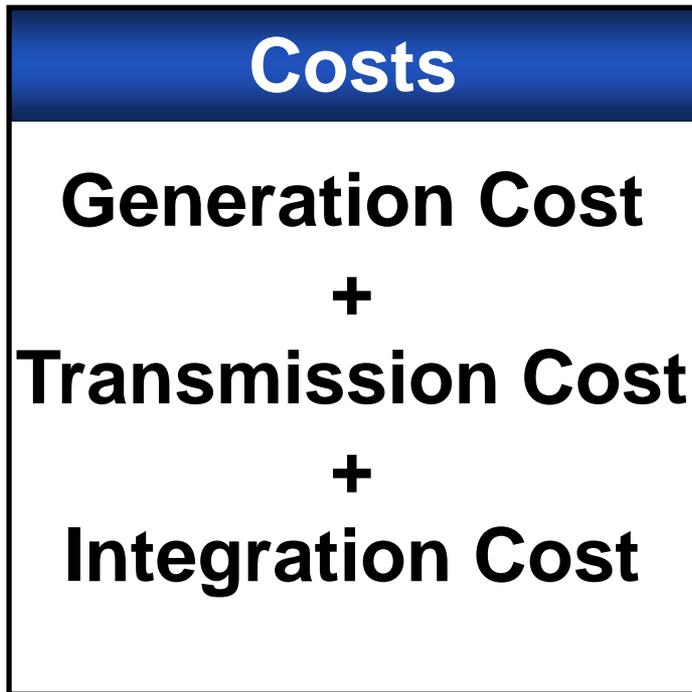
1 week

TBD

TBD

# Resource Valuation Methodology

**Ranking Cost = Costs - Value**



# Resource Valuation Modeling – Cost of Generation Calculation

## Simple pro forma model to determine the cost of generation for individual projects

- Spreadsheet based tool
- Allows disparate renewable energy projects to be valued on similar basis
- Provides single levelized cost of generation (\$/MWh) representing the cost of generation over the plant life
  - Implements the PTC, the ITC, and several different depreciation schedules
  - Includes developer return on investment

# Resource Valuation Modeling – Cost of Generation Tool

## Cost of Generation Calculator

All inputs are in blue.

Technology Assumptions	
Project Capacity (MW)	100
Capital Cost (\$/kW)	\$1,900
Fixed O&M (\$/kW)	\$50
Fixed O&M Escalation	2.5%
Variable O&M (\$/MWh)	\$0
Variable O&M Escalation	2.5%
Fuel Cost (\$/MBtu)	\$0
Fuel Cost Escalation	2.5%
Heat Rate (Btu/kWh)	0
Capacity Factor	40%

Financial/Economic Assumptions	
Debt Percentage	60%
Debt Rate	7%
Debt Term (years)	15
Economic Life (years)	20
Depreciation Term (years)	5
Percent Depreciated	100%
Cost of Generation Escalation	2.5%
Tax Rate	40%
Cost of Equity	15%
Discount Rate	9%

Incentives	
PTC (\$/MWh)	\$20
PTC Escalation	2.5%
PTC Term (years)	10
ITC	0%

Outputs	
NPV for Equity Return	\$0
Levelized Cost of Generation	\$51.61

Year	1	2	3	4	5	6	7	8	9	10
Annual Generation (MWh)	350,400	350,400	350,400	350,400	350,400	350,400	350,400	350,400	350,400	350,400
Cost of Generation	\$43.27	\$44.35	\$45.46	\$46.60	\$47.77	\$48.96	\$50.18	\$51.44	\$52.72	\$54.04
<b>Operating Revenues</b>	<b>\$15,162,805</b>	<b>\$15,541,875</b>	<b>\$15,930,422</b>	<b>\$16,328,683</b>	<b>\$16,736,900</b>	<b>\$17,155,322</b>	<b>\$17,584,205</b>	<b>\$18,023,810</b>	<b>\$18,474,406</b>	<b>\$18,936,266</b>
Fixed O&M	\$5,000,000	\$5,125,000	\$5,253,125	\$5,384,453	\$5,519,064	\$5,657,041	\$5,798,467	\$5,943,429	\$6,092,014	\$6,244,315
Variable O&M	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Fuel Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
<b>Operating Expenses</b>	<b>\$5,000,000</b>	<b>\$5,125,000</b>	<b>\$5,253,125</b>	<b>\$5,384,453</b>	<b>\$5,519,064</b>	<b>\$5,657,041</b>	<b>\$5,798,467</b>	<b>\$5,943,429</b>	<b>\$6,092,014</b>	<b>\$6,244,315</b>
Interest Payment	\$7,980,000	\$7,662,439	\$7,322,649	\$6,959,073	\$6,570,047	\$6,153,789	\$5,708,393	\$5,231,819	\$4,721,886	\$4,176,257
Principal Payment	\$4,536,587	\$4,854,148	\$5,193,939	\$5,557,514	\$5,946,540	\$6,362,798	\$6,808,194	\$7,284,768	\$7,794,701	\$8,340,331
<b>Debt Service</b>	<b>\$12,516,587</b>	<b>\$12,516,587</b>	<b>\$12,516,587</b>	<b>\$12,516,587</b>	<b>\$12,516,587</b>	<b>\$12,516,587</b>	<b>\$12,516,587</b>	<b>\$12,516,587</b>	<b>\$12,516,587</b>	<b>\$12,516,587</b>
Tax Depreciation	\$38,000,000	\$60,800,000	\$36,480,000	\$21,888,000	\$21,888,000	\$10,944,000	\$0	\$0	\$0	\$0
Taxable Income	(\$35,817,195)	(\$58,045,564)	(\$33,125,352)	(\$17,902,843)	(\$17,240,212)	(\$5,599,508)	\$6,077,345	\$6,848,562	\$7,660,505	\$8,515,694
PTC	\$7,008,000	\$7,358,400	\$7,358,400	\$7,708,800	\$7,708,800	\$8,059,200	\$8,059,200	\$8,409,600	\$8,409,600	\$8,760,000
ITC	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
<b>Taxes</b>	<b>(\$21,334,878)</b>	<b>(\$30,576,626)</b>	<b>(\$20,608,541)</b>	<b>(\$14,869,937)</b>	<b>(\$14,604,885)</b>	<b>(\$10,299,003)</b>	<b>(\$5,628,262)</b>	<b>(\$5,670,175)</b>	<b>(\$5,345,398)</b>	<b>(\$5,353,722)</b>
<b>Total</b>	<b>(76,000,000)</b>	<b>18,981,096</b>	<b>28,476,913</b>	<b>18,769,250</b>	<b>13,297,588</b>	<b>13,306,133</b>	<b>9,288,697</b>	<b>4,897,413</b>	<b>5,233,969</b>	<b>5,211,202</b>

MACRS Depreciation Schedules										
5	0.2		0.192	0.1152	0.1152	0.0576	0	0	0	0
7	0.1429	0.2449	0.1749	0.1249	0.0893	0.0892	0.0893	0.0446	0	0
15	0.05	0.095	0.0855	0.077	0.0693	0.0623	0.059	0.059	0.0591	0.059
20	0.0375	0.07219	0.06677	0.06177	0.05713	0.05285	0.04888	0.04522	0.04462	0.04461

# Transmission Valuation



Gen-tie	Connection to nearest substation (Collector point) - new or existing
	Equipment costs based on facility size (i.e. 50 MW, 50-200 MW, >200 MW)
Collector Point	New or existing substation upgraded. Station capacity based on total MW of projects
Trunk line	Connects connector points to existing HV transmission
	Line size based on total resource capacity (345 kV or 500 kV)
	Alignment based on existing lines where possible
	Cost = \$/MW-mile based on terrain
HV Substation	New or existing substation upgraded. Station capacity based on total MW of projects
Network Costs	Grid interconnection costs. Use TRCR cost if HV substation is named.

# Resource Valuation Modeling – Energy Price Forecast

- Energy Forecast will be prepared by Ventyx
- Based on CEC IEPR Modeling of California system
  - “CEC 2007 IEPR Scenario IB”
- Assumes California Policy goals achieved:
  - RPS goals
  - CSI goals
  - Energy efficiency targets

# Resource Valuation Modeling – Energy Price Forecast

- Reference case:
  - CEC 2007 IEPR Scenario 1B
    - w/ GED (Ventyx) 2007 high fuel price forecast
    - Greenhouse gas values used in the CPUC's MPR determination

# Resource Valuation Modeling – Energy Price Forecast Sensitivity Cases

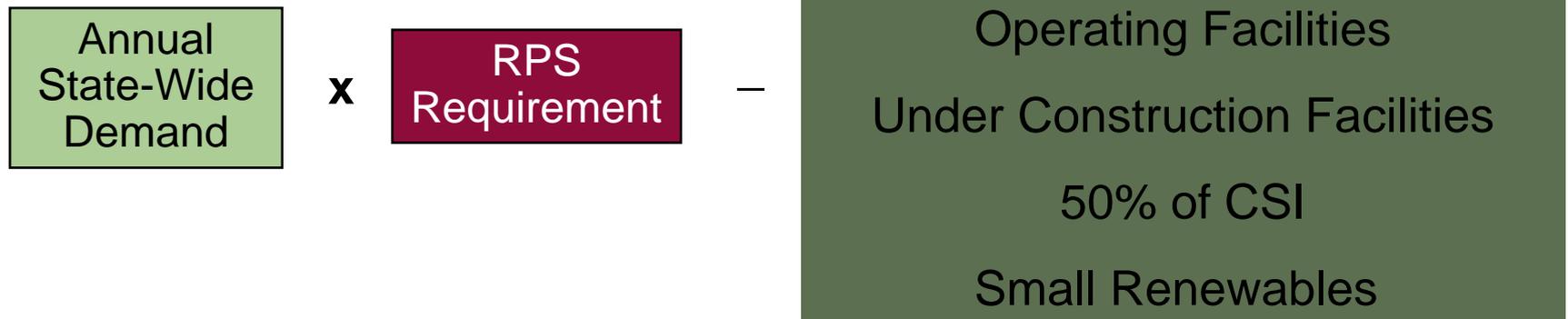
- Low energy price scenario
  - CEC IEPR Scenario 1B
    - Base energy price forecast
    - Greenhouse gas values used in the CPUC's MPR determination
- High energy price scenario
  - CEC IEPR Scenario 1B
    - Gas price forecast based on MPR gas price methodology using current traded gas prices
    - Greenhouse gas values used in the CPUC's MPR determination

# Resource Valuation Modeling – Energy Price Forecast Case Comparison

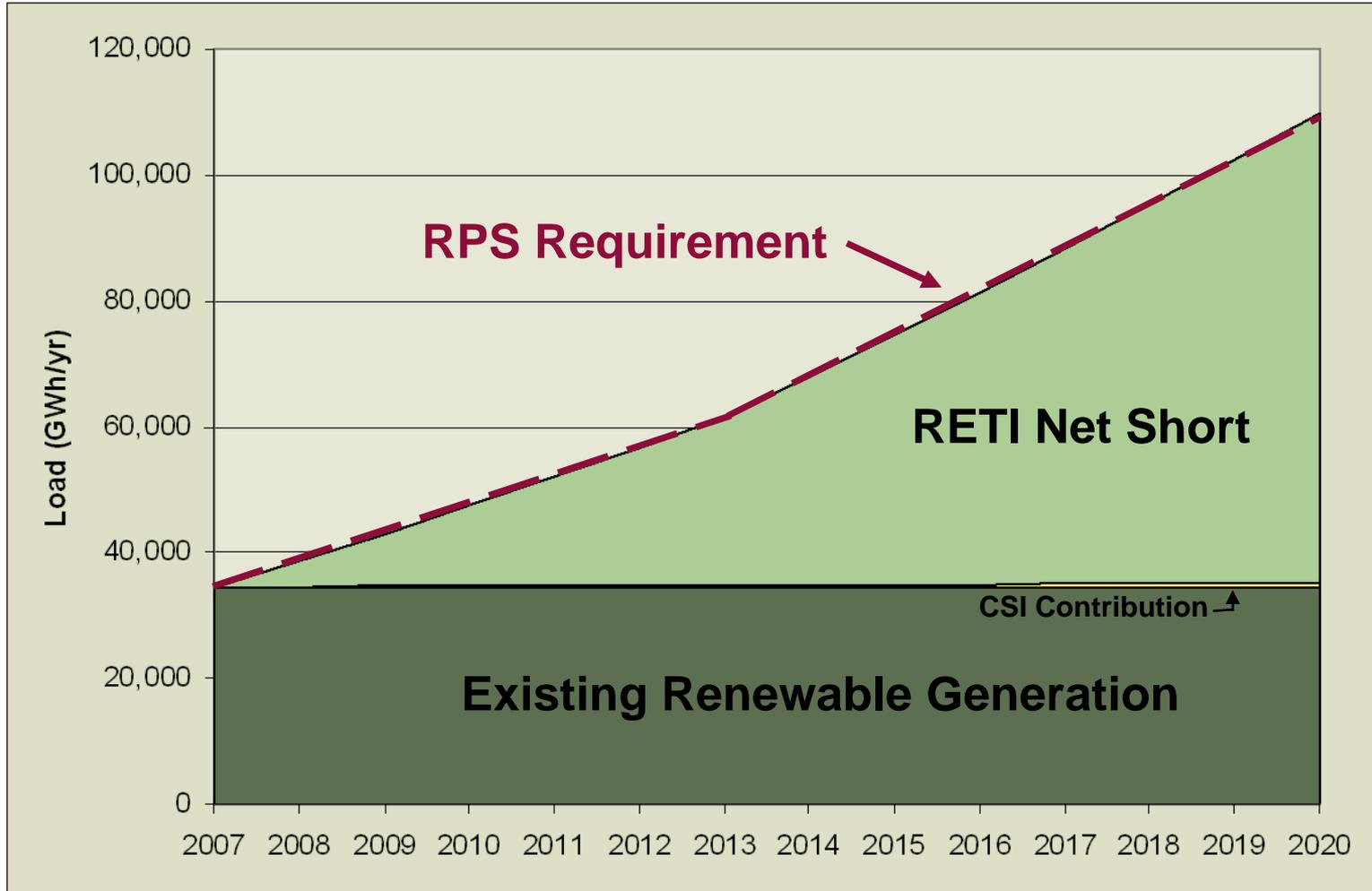
<b>Assumption</b>	<b>CEC IEPR</b>	<b>RETI Reference Case</b>	<b>RETI Low Case</b>	<b>RETI High Case</b>
Modeling	CEC sensitivity 1B	CEC sensitivity 1B	CEC sensitivity 1B	CEC sensitivity 1B
Gas Price	GED Base fuel price for CEC , 2007	GED High fuel price for CEC , 2007	GED Base fuel price for CEC , 2007	2008 CPUC MPR gas price forecast (w/CEC high fuel price forecast for other fuels
Carbon Cost	N/A	CPUC MPR adder	CPUC MPR adder	CPUC MPR adder

# RPS Net Short Calculation

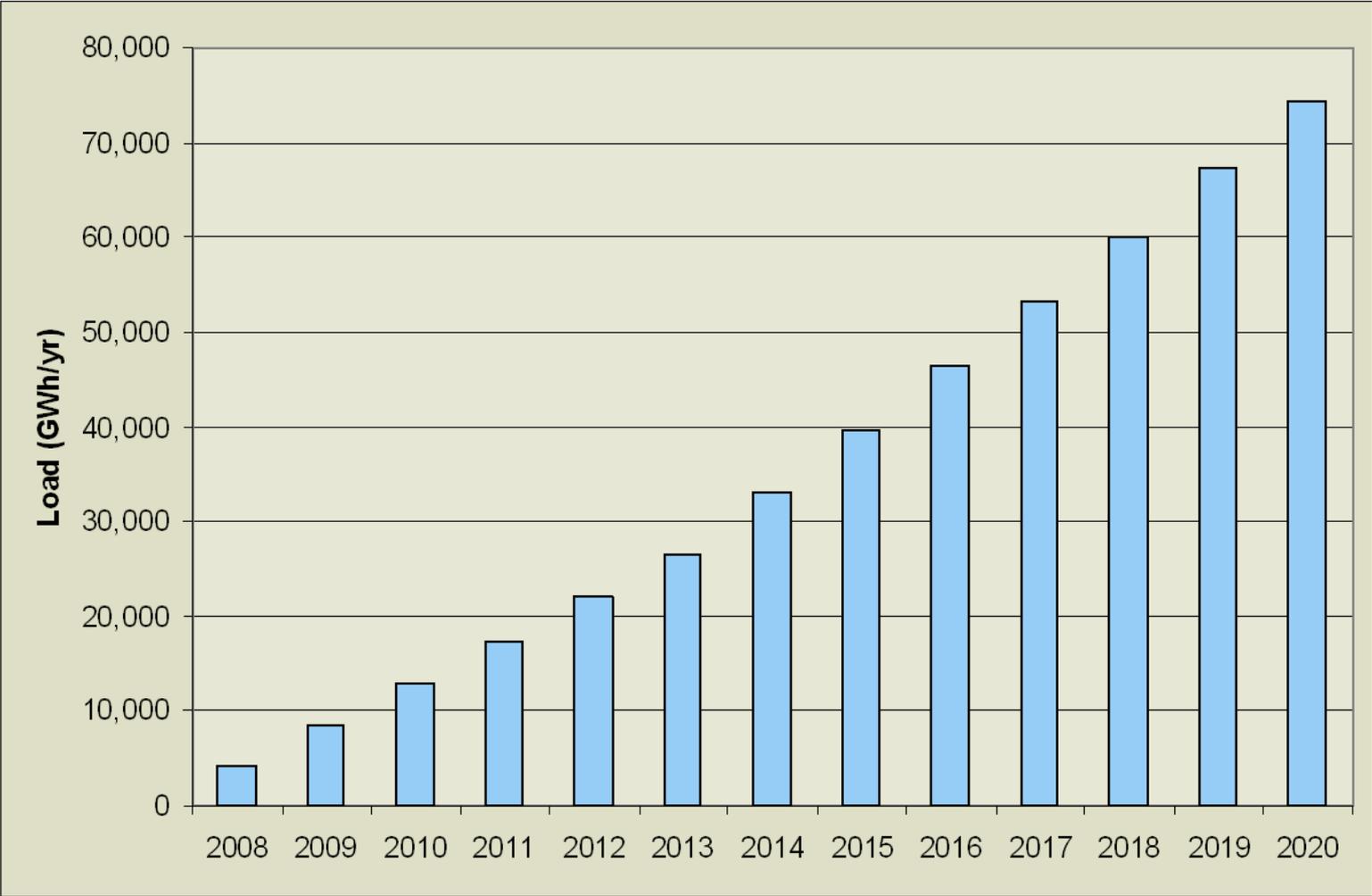
- Identify renewable resource requirements to meet RPS goals
- Formula



# Net Short Calculation



# Net Short



# Data Sources and Assumptions - RPS

## Load Forecast

- Source: California Energy Demand 2008-2018 Staff Revised Forecast, CEC (<http://www.energy.ca.gov/2007publications/CEC-200-2007-015/CEC-200-2007-015-SF2.PDF>)
- Years 2019 and 2020 are extrapolated from forecasted trends.

## RPS Requirement

- Assumed to be equal to existing renewable capacity in base year.
- 20% in 2013 (with flexible compliance)
- 33% in 2020
- Straight line interpolation between the above three points.

# Existing Generation - Data Sources and Assumptions

## Operating Facilities and Facilities Under Construction

- This number will see the most refinement going forward.
- The calculation in these slides is based on the CEC report of 10.9% California gross system renewable power in 2006.  
([http://www.energy.ca.gov/electricity/gross\\_system\\_power.html](http://www.energy.ca.gov/electricity/gross_system_power.html))
- This number will better represent the “Base Case” as defined in the Phase 1A report.
- Sources will include:
  - CEC list of RPS eligible facilities
  - Global Energy Decisions’ “Energy Velocity” database
  - Other public information

## CSI Generation

- CSI forecast from California Energy Demand 2008-2018 Staff Revised Forecast.
- 50% assumption of RECs applied to RPS

# Project Characterization & Identification

- Biomass
- Solar Photovoltaic
- Solar Thermal
- Wind
- Geothermal

# Generator Request for Information

- Goal – Identify and update project information
- Voluntary Effort
  - Project status – on-line date
  - Location – for CREZ development
  - Facility Operating Data – economic analysis
  - Transmission interconnection status
- Request information be provided by June 30



# Thank You!

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