



# **33% RPS Implementation Analysis**

## **Preliminary Results**

CPUC Presentation at  
“Electricity System Implications of  
33 Percent Renewables”  
Energy Commission Workshop

June 29, 2009

# Purpose and Scope of Analysis

- CPUC's Energy Division staff initiated this analysis in order to answer two key questions:
  - What steps will the state need to take to reach a 33% RPS by 2020?
  - How much will it cost to meet a 33% RPS by 2020?
- Scope of analysis included:
  - Estimate the amount of generation and transmission needed to reach a 33% RPS
  - Several procurement strategies (cases) for achieving a 33% RPS by 2020
  - Calculated the projected cost of different RPS cases in the year 2020
  - Timelines for generation and transmission facilities needed to reach a 33% RPS

# 33% RPS Resources Needed

<b>20% RPS Reference Case would require</b>	<b>33% RPS Reference Case would require</b>
<b>35 TWh</b> of new renewable electricity in 2020, in addition to <b>27 TWh</b> of generation from renewables in existence at the end of 2007	<b>75 TWh</b> of new renewable electricity in 2020, in addition to <b>27 TWh</b> of generation from renewables in existence at the end of 2007
4 New Major Transmission Lines	7 Additional Major Transmission Lines

- Renewable need calculated using 2007 IEPR Load Forecast projected out to 2020, minus renewable generation at the end of 2007

# Evaluated Renewable Portfolio Options for Achieving 33% RPS

Case Name	Description
<b>20% RPS Reference Case</b>	Utilities procure 35 TWh of additional renewables to meet a 20% RPS target by 2020.
<b>33% RPS Reference Case</b>	Utilities procure 75 TWh of additional renewables to meet a 33% RPS target by 2020. There is heavy emphasis on projects that are already either contracted or short-listed with California IOUs, which includes a significant proportion of solar thermal and solar photovoltaic resources.
<b>High Wind Case</b>	Assumes less reliance on in-state solar thermal and more reliance on the less expensive wind resources in California and Baja.
<b>High Out-of-State Delivered Case</b>	Allows construction of new, long-line, multi-state transmission to allow California utilities to procure large quantities of low-cost wind and geothermal resources in other western states. Does not use tradable renewable energy certificates as a compliance tool. Thus, all out-of-state electricity is delivered to California.
<b>High DG Case</b>	Assumes limited new transmission corridors are developed to access additional renewable resources to achieve a 33% RPS. Instead, extensive, smaller-scale renewable generation is located on the distribution system and close to substations.

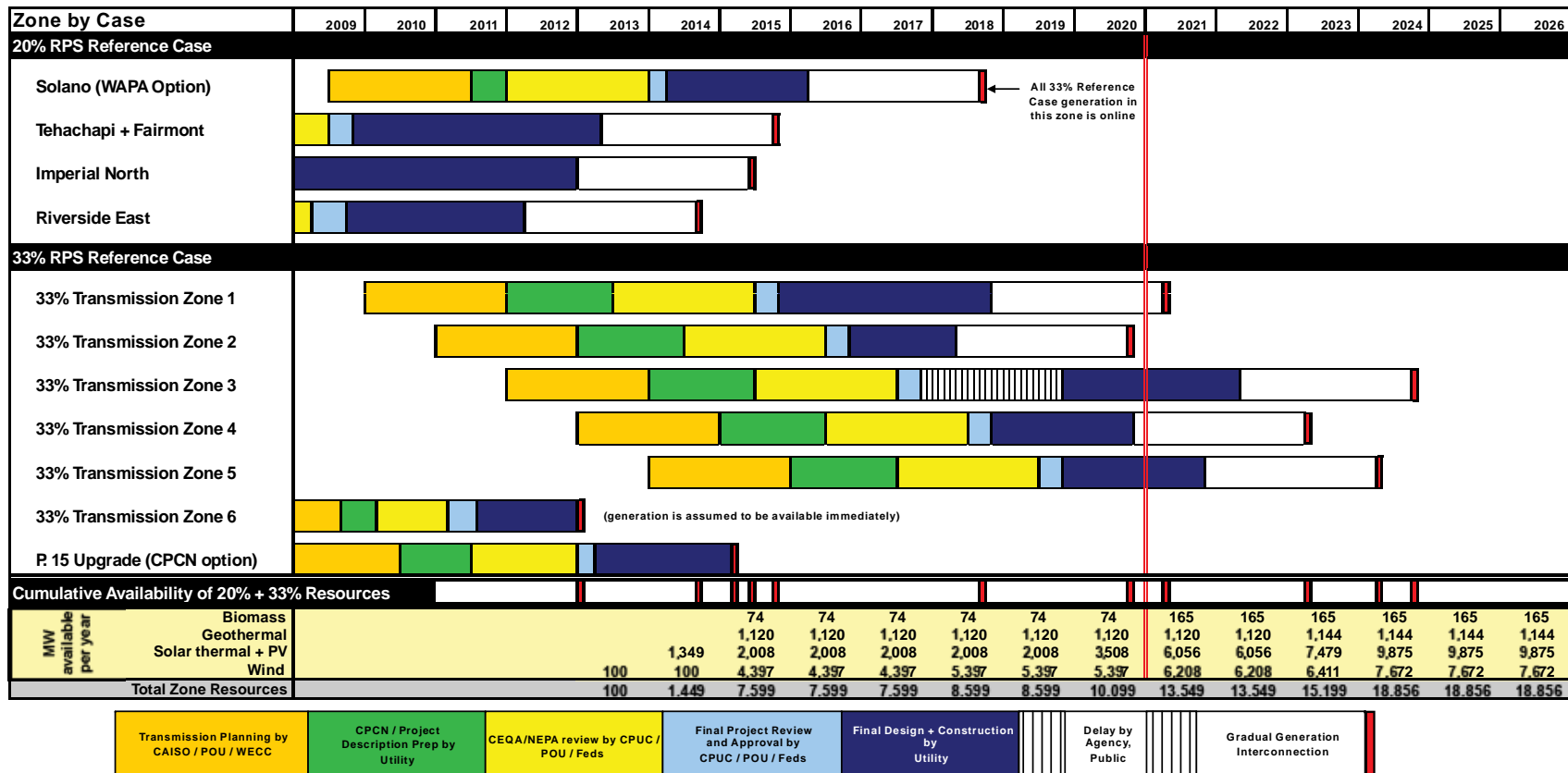
- 33% RPS reference case is current RPS portfolio plus planned procurement
- Implementation assessment only done on 20% and 33% RPS reference cases
- More analysis is needed to determine if alternative 33% RPS cases can be implemented

# 33% RPS Reference Case

## Timelines

- **Timeline 1 (Historical experience without process reform)**
  - 33% RPS achieved in 2024
  - Assumes no external risks and that planning, permitting, and construction processes are almost entirely sequential
- **Timeline 2A (Current practice with process reform & no external risks)**
  - 33% RPS achieved in 2021
  - Assumes successful implementation of reforms currently in process
  - Timeline assumes no delays due to external risks beyond state control
- **Timeline 2B (Current practice with process reform & external risks)**
  - 33% RPS not achieved
  - Assumes state successfully implements reforms, but factors outside state control (e.g., technology failure, financing risk, environmental risk, and public opposition/legal challenges) cause delay or failure of some transmission and generation projects

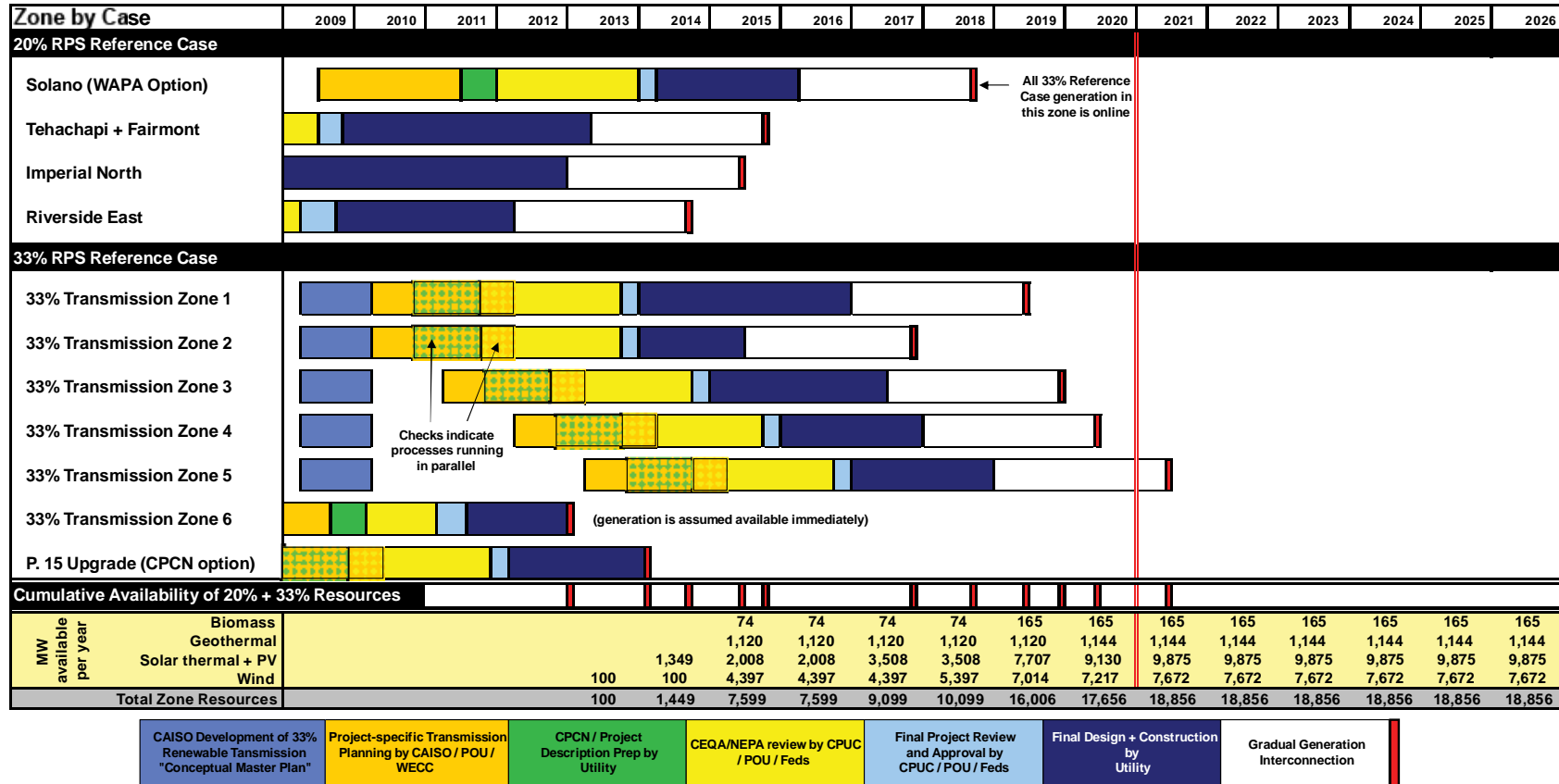
# Timeline 1 - Historical Experience Without Process Reform



Source: CPUC/Aspen

- **Result: 33% RPS achieved in 2024**

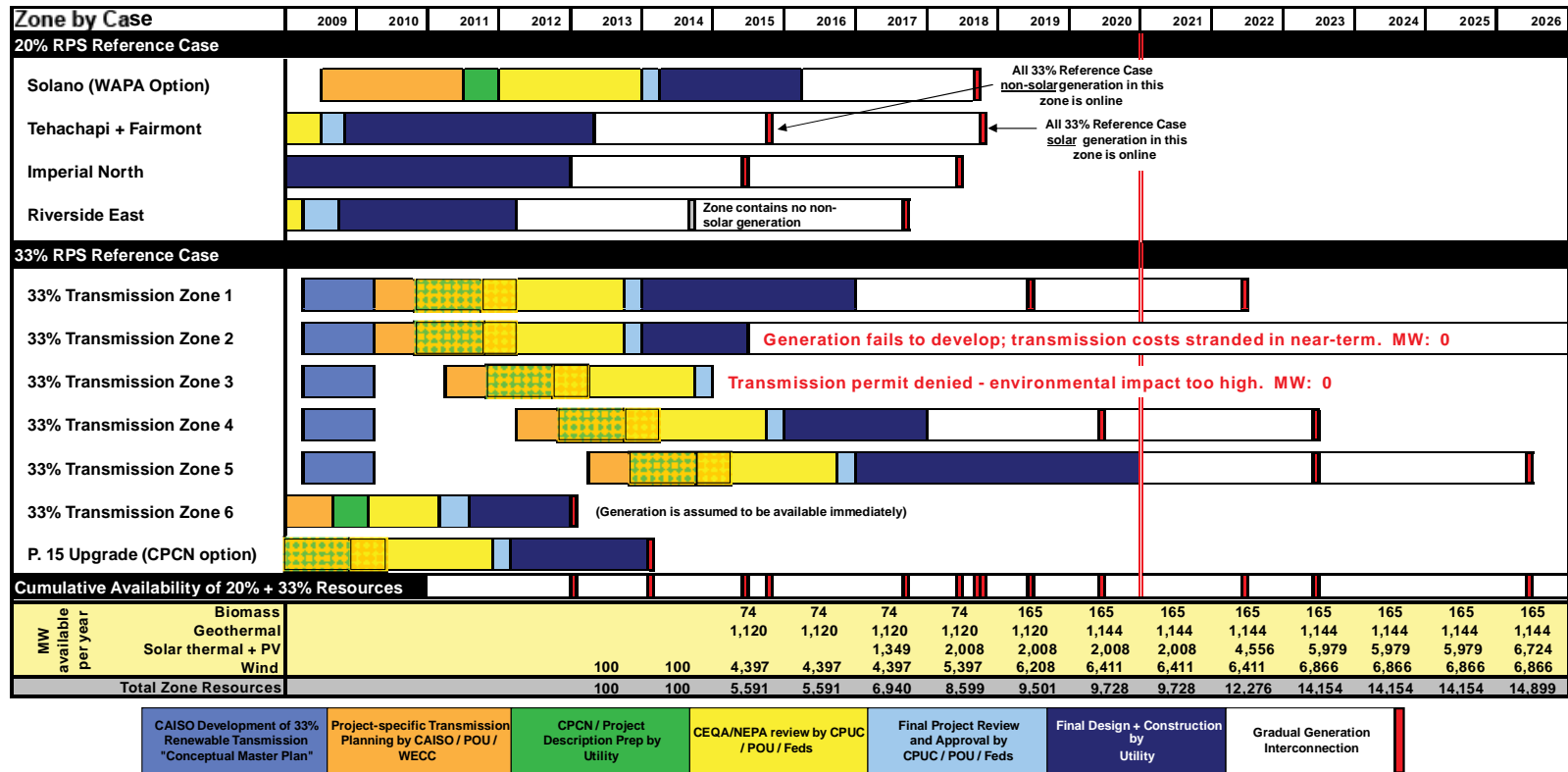
# Timeline 2A - Current Practice With Process Reform & No External Risks



Source: CPUC/Aspen

- **Result: 33% RPS achieved in 2021**

# Timeline 2B - Current Practice With Process Reform & External Risks

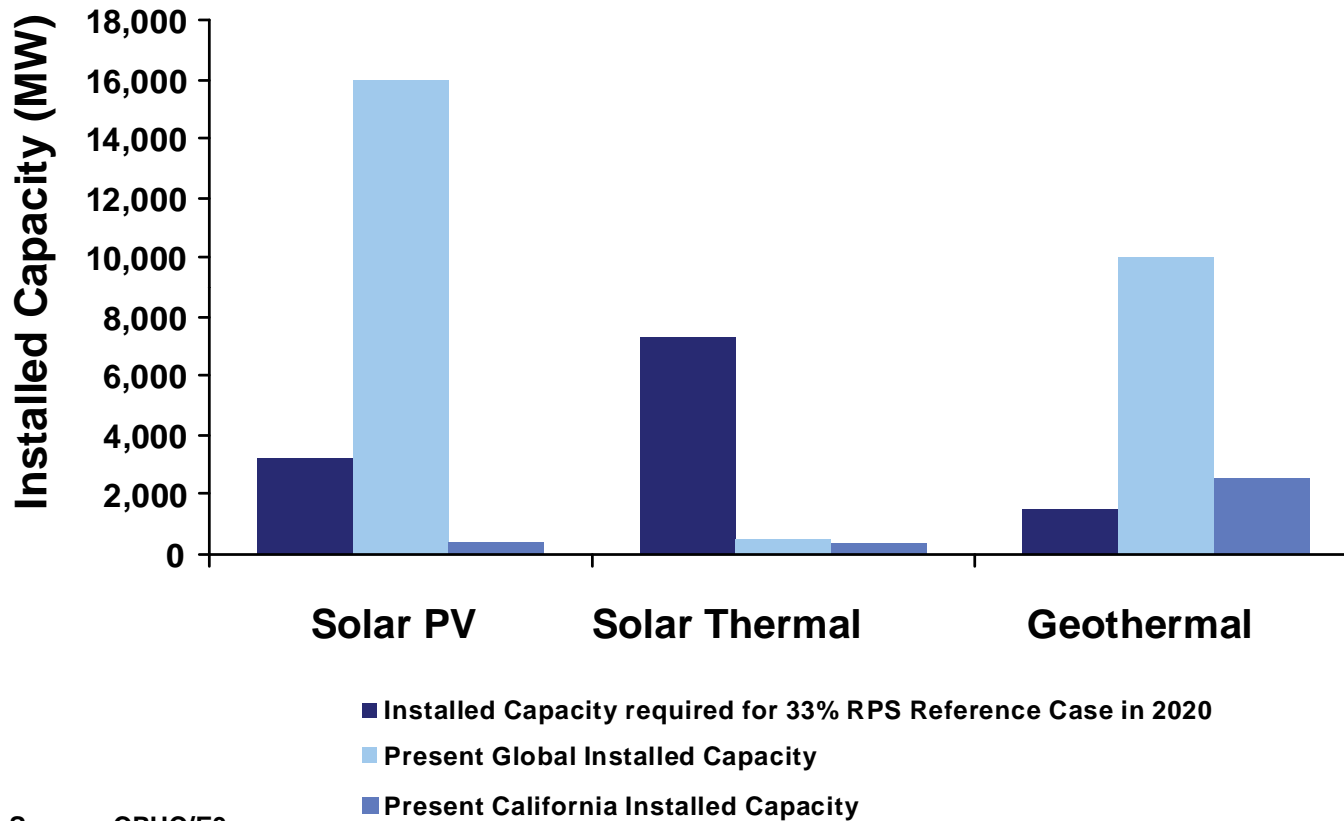


Source: CPUC/Aspen

- **Result: 33% RPS is not achieved, mitigating strategies are needed**



# Example of External Risk Technology Risk

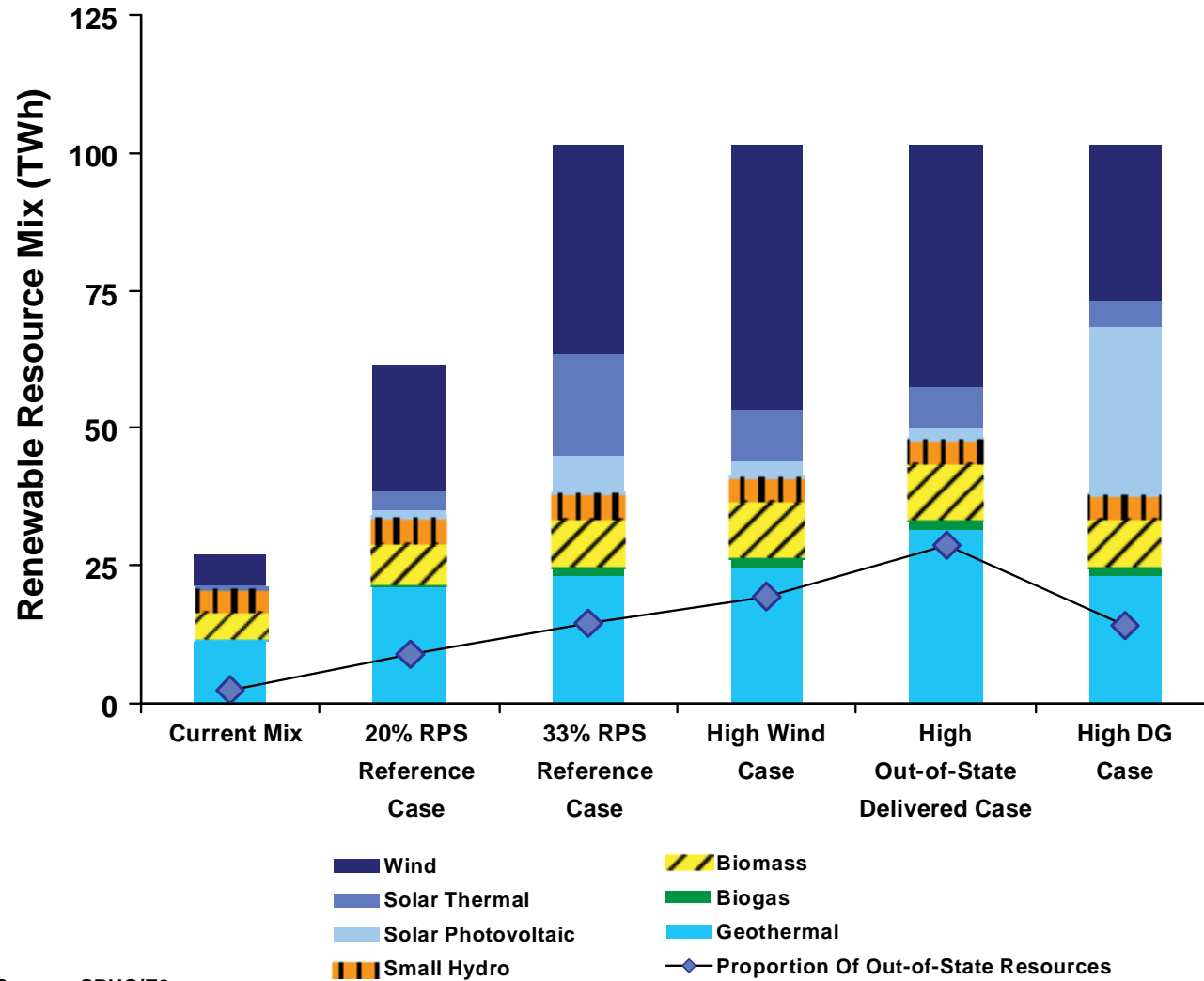


- 33% RPS Reference Case includes over 7,000 MW of proposed solar thermal projects and over 3,000 MW of proposed solar PV

# Examples of Mitigating Strategies

- Current procurement path is focused almost solely on central station renewable generation that is dependent on new transmission
- Procurement strategy that adequately considers the time and risk, in addition to price, associated with particular renewable generation resources is needed
- The state may also wish to adopt risk mitigation strategies, such as:
  - Planning for more transmission and generation than needed to reach just 33%
  - Pursuing procurement, such as distributed solar PV, which is not dependent on new transmission
  - Concentrating renewable development in pre-permitted land that would be set aside for a renewable energy park

# Renewable Resource Mixes in 2020 Under Different Cases



Source: CPUC/E3

# Electricity Costs Will Increase in 2020, Regardless of RPS Requirements

Category	2008	All-Gas Scenario in 2020	20% RPS Reference Case in 2020	33% RPS Reference Case in 2020
Existing and New Conventional Generation Fixed Costs*	\$8.5	\$11.8	\$11.1	\$9.9
Existing and New Conventional Generation Variable Costs*	\$13.2	\$16.5	\$14.2	\$11.6
Existing Transmission and Distribution*	\$15.1	\$20.5	\$20.5	\$20.5
New Transmission for Renewables*	N/A	N/A	\$0.5	\$1.8
New Renewable Generation and Integration*	N/A	N/A	\$4.3	\$10.8
CO <sub>2</sub> Allowances* <sup>(1)</sup>	N/A	\$0.4	-\$0.03	-\$0.5
<b>Total Statewide Electricity Expenditures*</b>	<b>\$36.8</b>	<b>\$49.2</b>	<b>\$50.6</b>	<b>\$54.2</b>
<b>Average Statewide Electricity Cost per kWh</b>	<b>\$0.132/kWh</b>	<b>\$0.154/kWh</b>	<b>\$0.158/kWh</b>	<b>\$0.169/kWh</b>

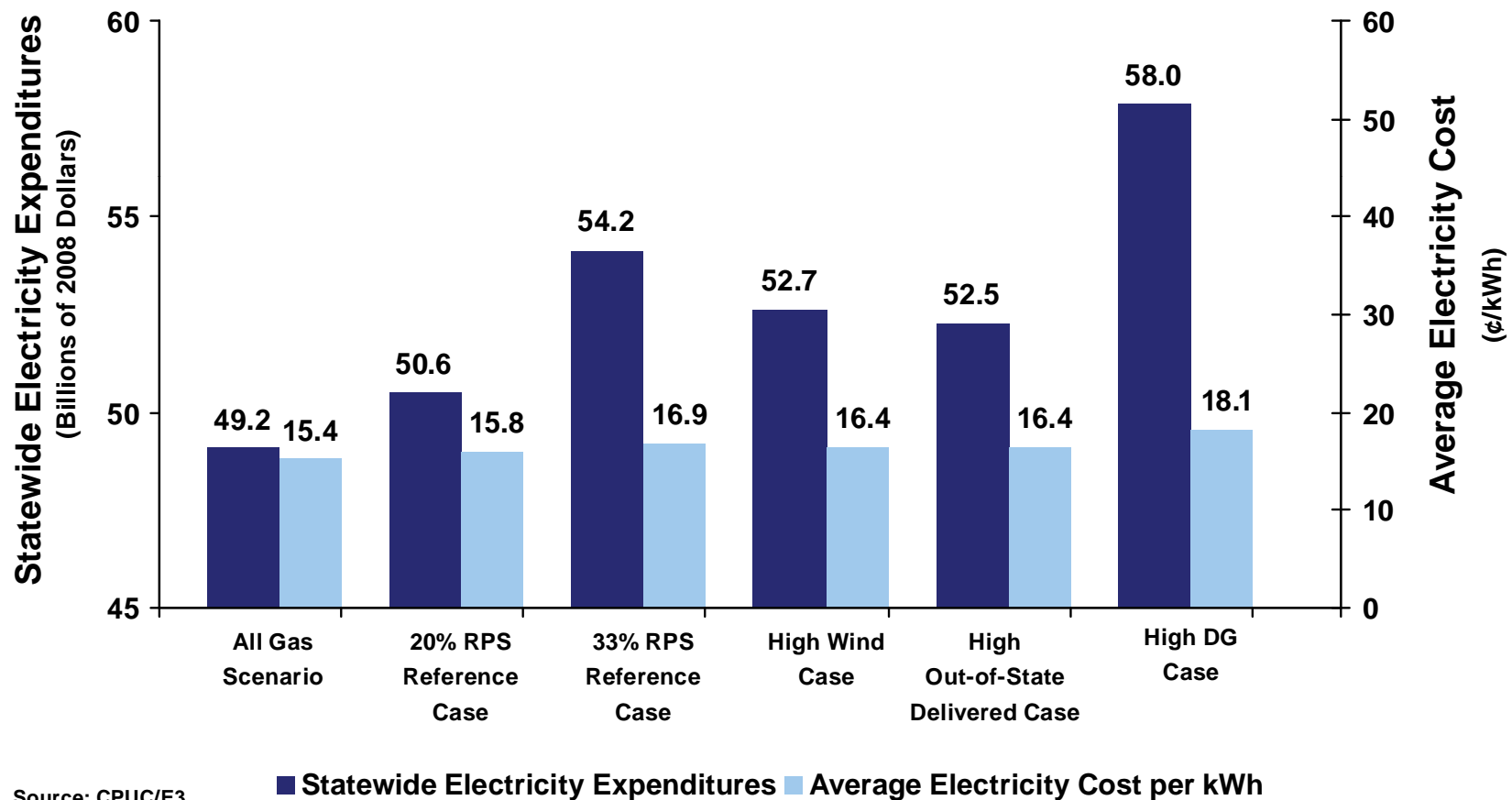
\*Expressed in billions of 2008 dollars in 2020.

# 33% RPS Reference Case 7.1% Higher than 20% RPS Reference Case

Category	20% RPS Reference Case	33% RPS Reference Case	33% High Wind Case	33% High Out-of-State Delivered Case	33% High DG Case
Total Statewide Electricity Expenditures*	\$50.6	\$54.2	\$52.7	\$52.5	\$58.0
Average Statewide Electricity Cost per kWh	\$0.158/kWh	\$0.169/kWh	\$0.164/kWh	\$0.164/kWh	\$0.181/kWh
Difference Relative to 20% RPS Reference Case*	N/A	+\$3.6	+\$2.1	+\$1.9	+\$7.4
Percent Difference Relative to 20% RPS Reference Case	N/A	+7.1%	+4.2%	+3.8%	+14.6%
Difference Relative to 33% RPS Reference Case*	N/A	N/A	-\$1.5	-\$1.7	+\$3.8
Percent Difference Relative to 33% RPS Reference Case	N/A	N/A	-2.8%	-3.1%	+7.0%

\*Expressed in billions of 2008 dollars in 2020.

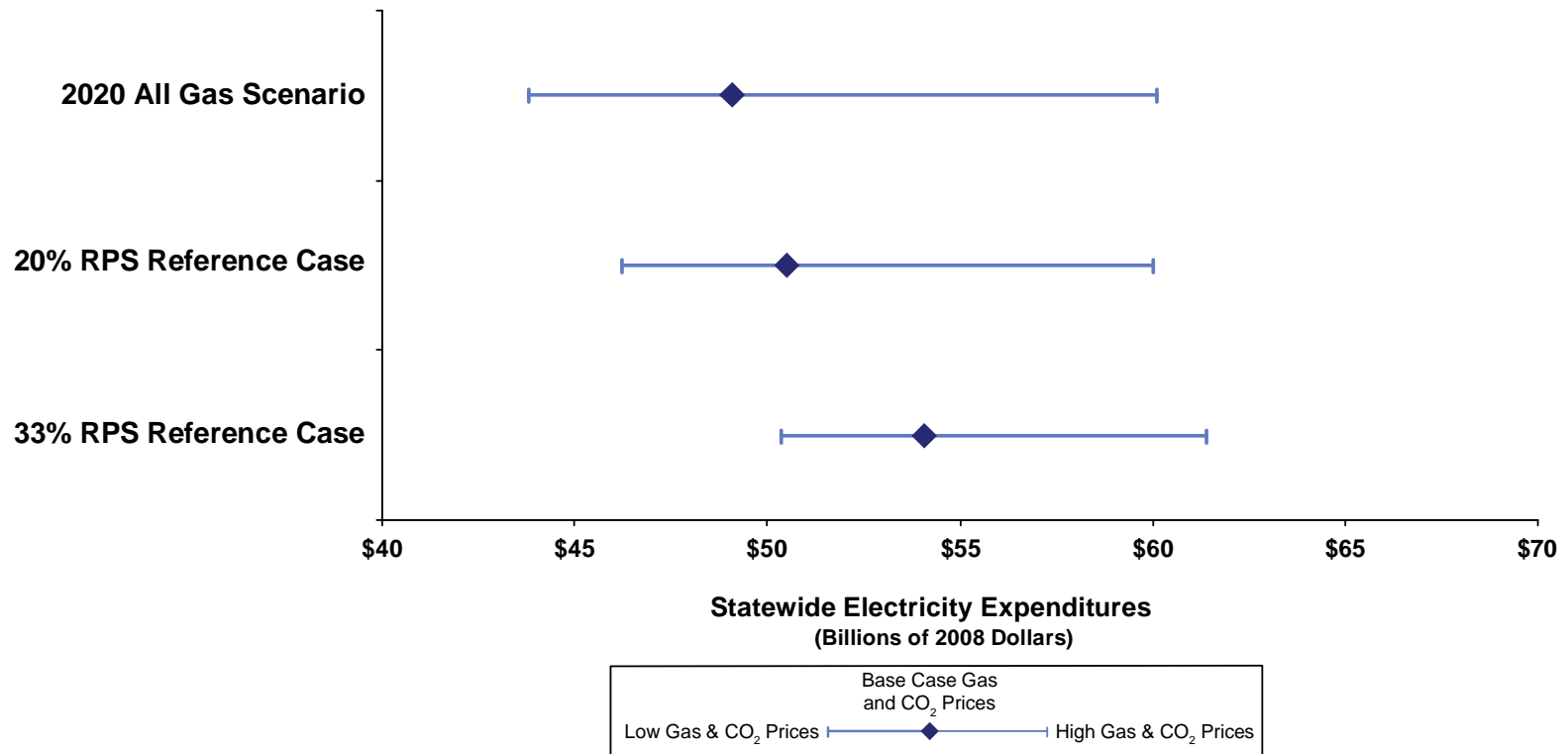
# The 33% RPS Reference Case is the Most Expensive Case that Needs New Transmission



# Sensitivity Analysis

- Projecting the costs of different renewable and fossil-fired energy sources out to 2020 requires numerous assumptions about future conditions including:
  - Natural gas and GHG allowance prices
  - Load growth (low-load scenario)
  - Technology costs (solar PV cost reductions)
- Many of these variables are highly uncertain, and some significantly influence the model's results

# Impact of Gas and CO<sub>2</sub> Allowance Prices on Statewide Expenditures



- A 33% RPS can serve as a hedge against natural gas prices, but only under very high natural gas and GHG allowance prices
- Hedging value in itself is not a very strong justification to do a 33% RPS



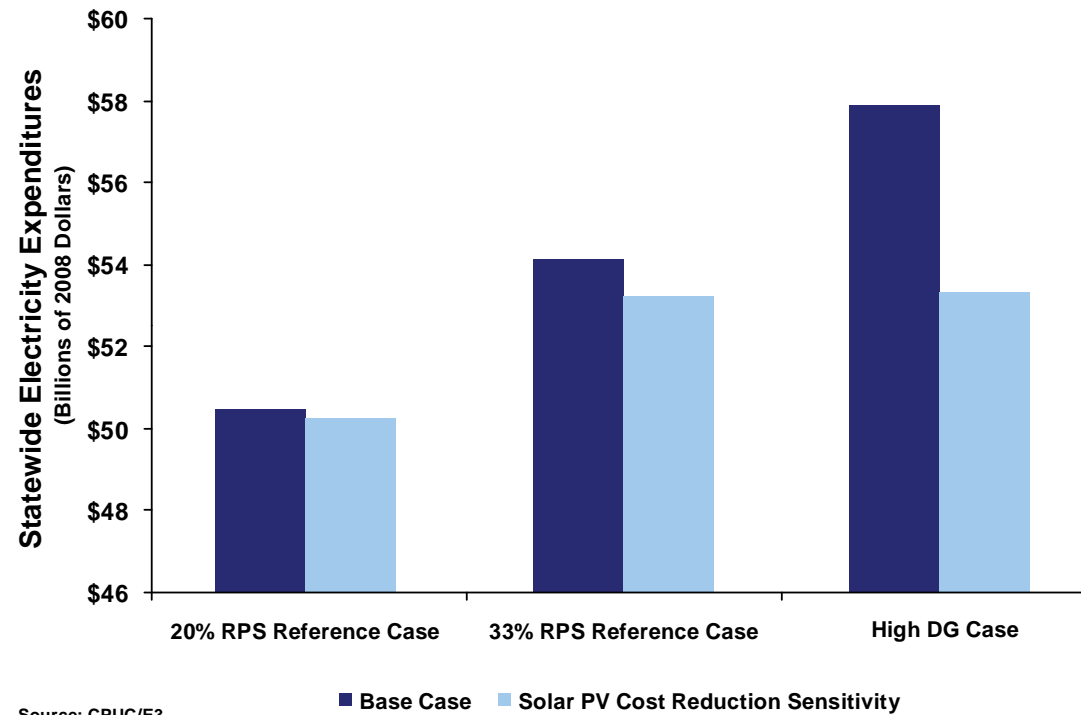
# Impact of High Energy Efficiency Achievement (Low-Load Sensitivity)

Costs	Base Case Loads	Low-Load Sensitivity
Total Electricity Expenditures, 20% RPS Reference Case *	\$50.6	\$46.4
Total Electricity Expenditures, 33% RPS Reference Case *	\$54.2	\$50.4
Incremental cost of 33% RPS Reference Case *	\$3.6	\$4.0
Percent Difference Relative to 20% RPS Reference Case	7.1%	8.6%

\*Expressed in billions of 2008 dollars in 2020.

- The interplay between energy efficiency achievement and renewable energy procurement highlights the need to analyze and plan for the interactions among the state's various policy goals
- If the state does not plan for interactions, then a 33% RPS by 2020 could result in a surplus of energy or capacity and excess consumer costs

# Cost Savings Due to Solar PV Cost Reduction Sensitivity



- Dramatic cost reductions in solar PV could make a solar DG strategy cost-competitive with central station renewable generation
- More analysis is necessary to determine the programmatic strategies necessary to achieve a high-DG scenario as well as the feasibility of high penetrations of solar PV on the distribution grid

# Achieving a 33% RPS requires tradeoffs between various policy goals and objectives

Criteria	33% RPS Reference Case	High Wind Case	High Out-of-State Delivered Case	High-DG Case
Cost	●	●	●	○
Timing	○	●	●	●
GHG Emission Reductions	●	●	●	●
Resource Diversity (Hedging Value)	●	●	●	●
Local Environmental Quality Air Quality	●	●	○	●
Local Environmental Quality Land Use	○	●	●	●
In-state Economic Development	●	●	○	●
Long-Term Transformation	●	○	○	●
Technology Development Risk	○	●	●	○

**Legend:**

- Case performs well
- Case performs poorly
- Case is neutral

# Next Steps

- Final report targeted for the end of 2009
- Report will be updated with the following analyses:
  - RETI/California ISO Conceptual Transmission Plans
  - California ISO renewable integration analysis
  - Energy Commission once-through cooling analysis

## More Information

- 33% RPS Report and RPS Calculator:
  - <http://www.cpuc.ca.gov/PUC/energy/Renewables/hot/33implementation.htm>
- CPUC RPS Website
  - [www.cpuc.ca.gov/renewables](http://www.cpuc.ca.gov/renewables)

