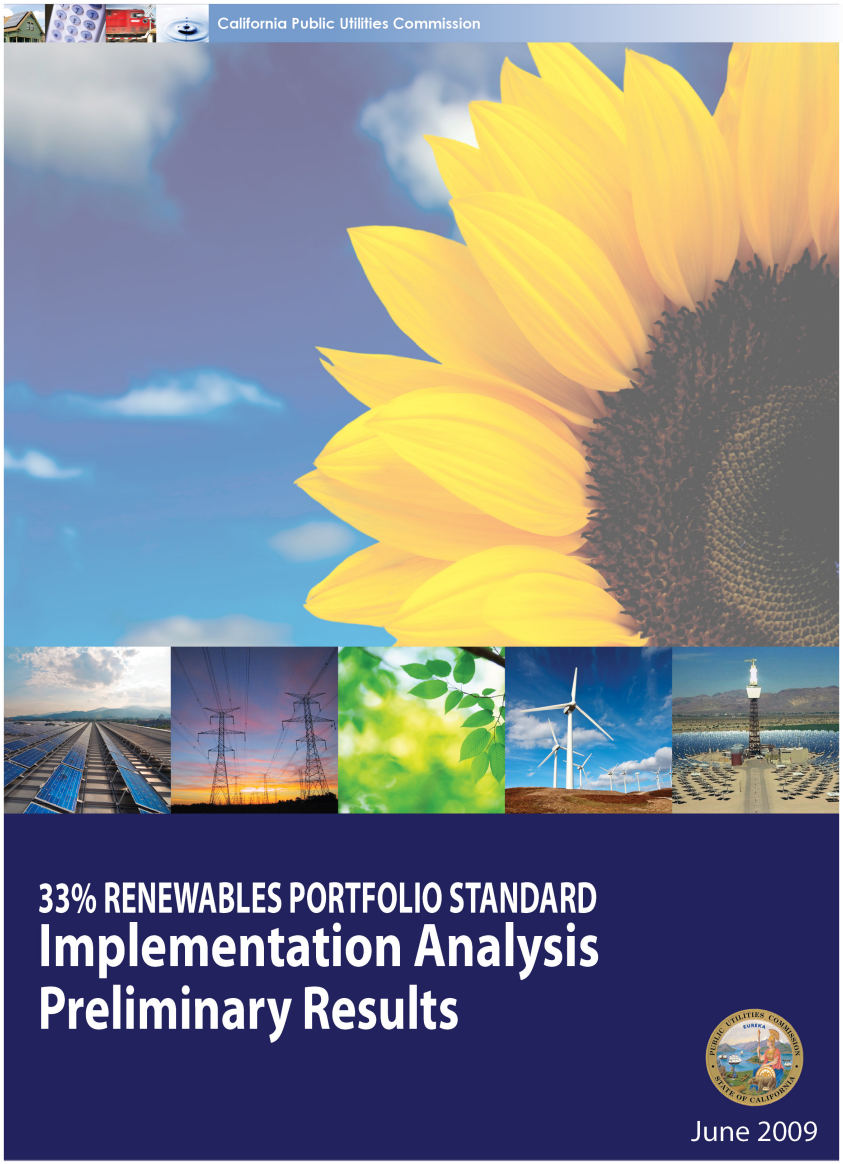

Renewables Portfolio Standard

California Public Utilities Commission

October 19, 2009

Presentation Overview

- Purpose and Structure of the Renewables Portfolio Standard (RPS) Program
- Current status of 20% RPS by 2010 target
- Project development barriers
- CPUC's 33% RPS Implementation Analysis

Presentation Overview

- ✓ **Purpose and Structure of the Renewables Portfolio Standard (RPS) Program**
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Overview of 20% RPS Program

- Retail energy sellers must procure **20% renewable energy by 2010**
  - Original legislation (SB 1078, 2002) required 20% by 2017. Target was accelerated to 2010, effective January, 2007 (SB 107, 2006)
  - All RPS-obligated retail sellers* must procure an incremental 1% of retail sales per year until 2010
  - 20% obligation continues post-2010
- RPS procurement compliance is measured in terms of electricity deliveries, **not signed contracts**
- California has set itself a further goal of 33% by 2020

*RPS-obligated load-serving entities (LSEs) include: Investor Owned Utilities, Energy Service Providers and Community Choice Aggregators. Municipal utility RPS obligations are voluntary

Agency Responsibilities

- **California Public Utilities Commission** is responsible for
  - Determining each load-serving entity's baseline and annual RPS procurement targets
  - Approving utility procurement plans, and approving or rejecting contracts executed to procure RPS-eligible electricity
  - Establishing the Market Price Referent (MPR)
  - Making determinations regarding RPS compliance and potentially imposing penalties for non-compliance
- **California Energy Commission** is responsible for
  - Certifying renewable generating facilities as RPS-eligible
  - Verifying the RPS-eligibility of energy procured to meet RPS targets

Eligibility Rules

Delivery Rules

§ Energy must be delivered into California

§ Energy can be consumed by any California consumer, IOUs may remarket

§ Out-of-state facilities (located in WECC) can firm and shape energy to deliver into California

Eligible Resources

- Biodiesel
- Biomass
- Conduit hydroelectric
- Digester gas
- Fuel cells using renewable fuels
- Geothermal
- Wind

§ Landfill gas

§ Municipal solid waste

§ Ocean wave, ocean thermal, tidal current

§ Photovoltaic

§ Small hydroelectric (30 MW or less)

§ Solar thermal electric

§ Hydroelectric (incremental generation from efficiency improvements

RPS Procurement Process

CPUC approves RPS procurement plans → **IOUs hold annual solicitation** → **IOU rank bids pursuant to "least-cost, best-fit" methodology** → **IOUs negotiate bids, execute contracts**

- Independent evaluator oversees solicitation, bid evaluation, and negotiations
- Utilities can also sign bilateral contracts

Once the IOU executes the contract, must submit to the CPUC for approval

CPUC RPS Contract Review

CPUC reviews contracts for price reasonableness and project viability

- Price reasonableness
  - *Per se* reasonable if at or below 'market price referent'
  - Bid supply curves for recent solicitation, technology
- Project viability
  - Technology
  - Financing
  - Permitting
  - Transmission
  - Online date
  - Developer experience

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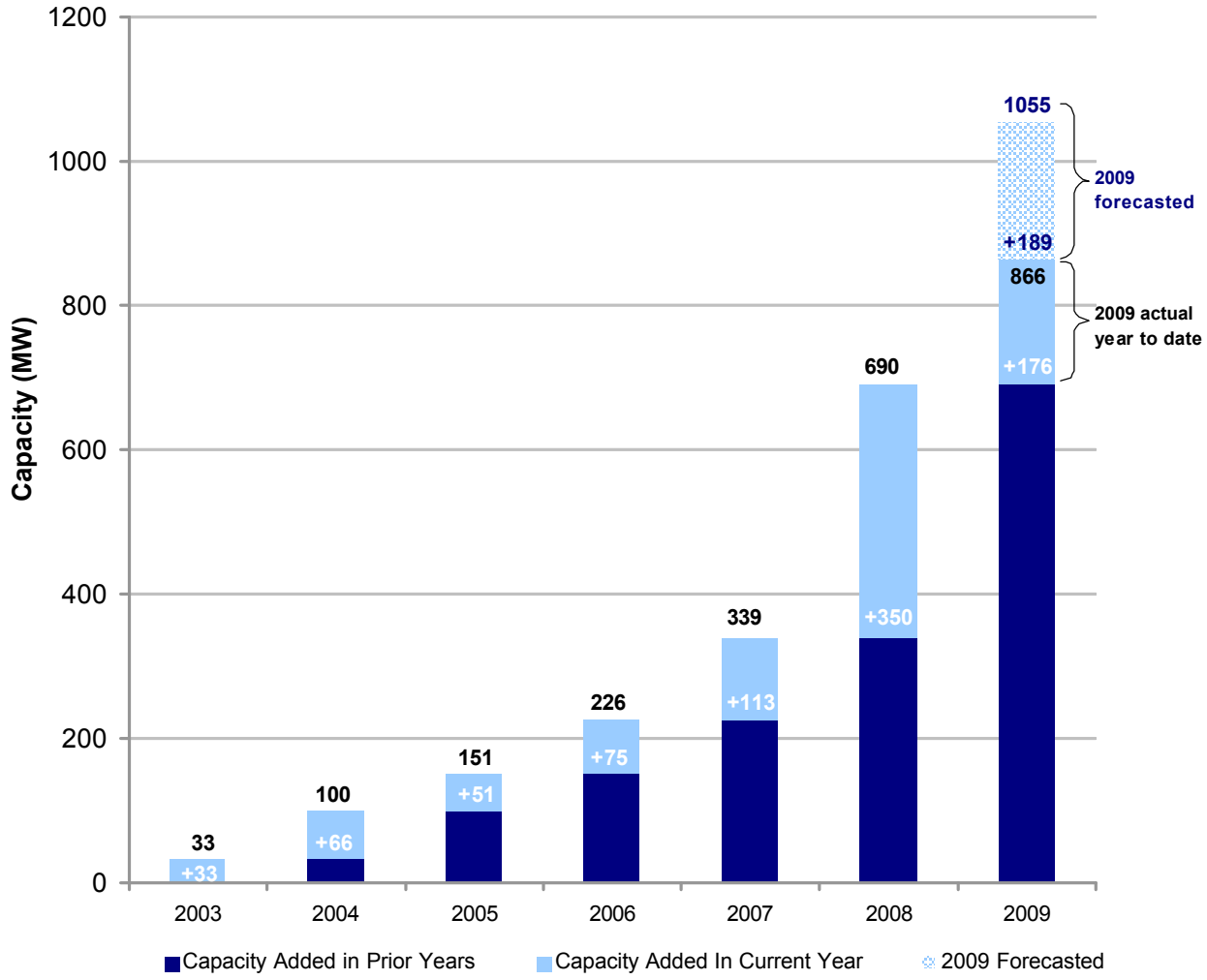
Status of 20% RPS Procurement

- CPUC has approved **118 contracts** for over **8,000 MW** of new and existing eligible renewable energy capacity.
  - **4,000 MW** of long term contracts currently under review.
- 866 MW of renewable energy has come online since the start of RPS program
  - Additional 190 MW is forecasted to come online by end of 2009
- IOUs are forecasted to achieve 20% RPS in the 2013 – 2014 timeframe
- Recent RPS solicitations have been robust:
  - Increased participation from larger and more experienced developers
  - IOUs shortlisting 10x their incremental procurement targets
  - California renewable market is maturing

Large IOU New Online RPS Capacity

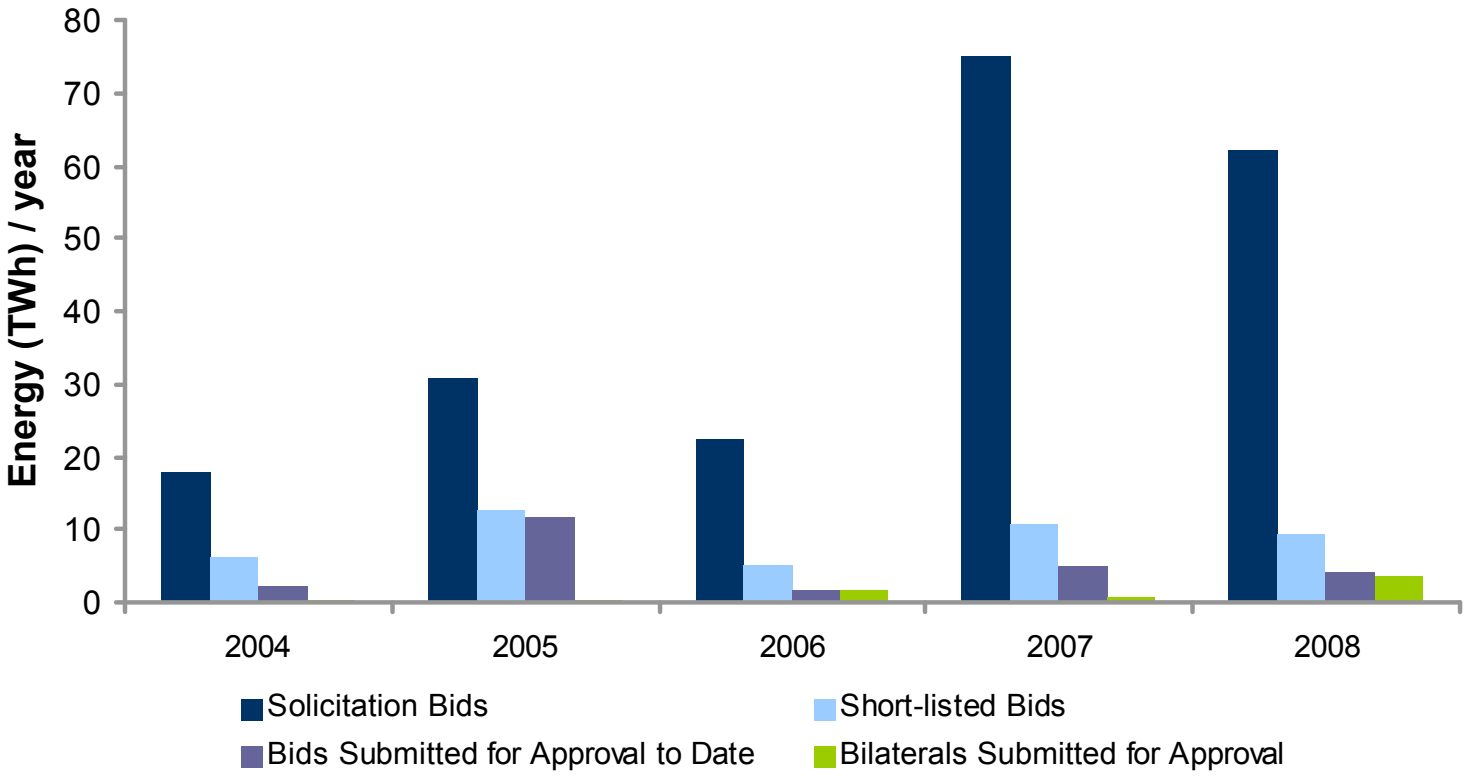


Source: California Public Utilities Commission, 3rd Quarter 2009

2008: First year that growth in RPS generation outpaced load growth

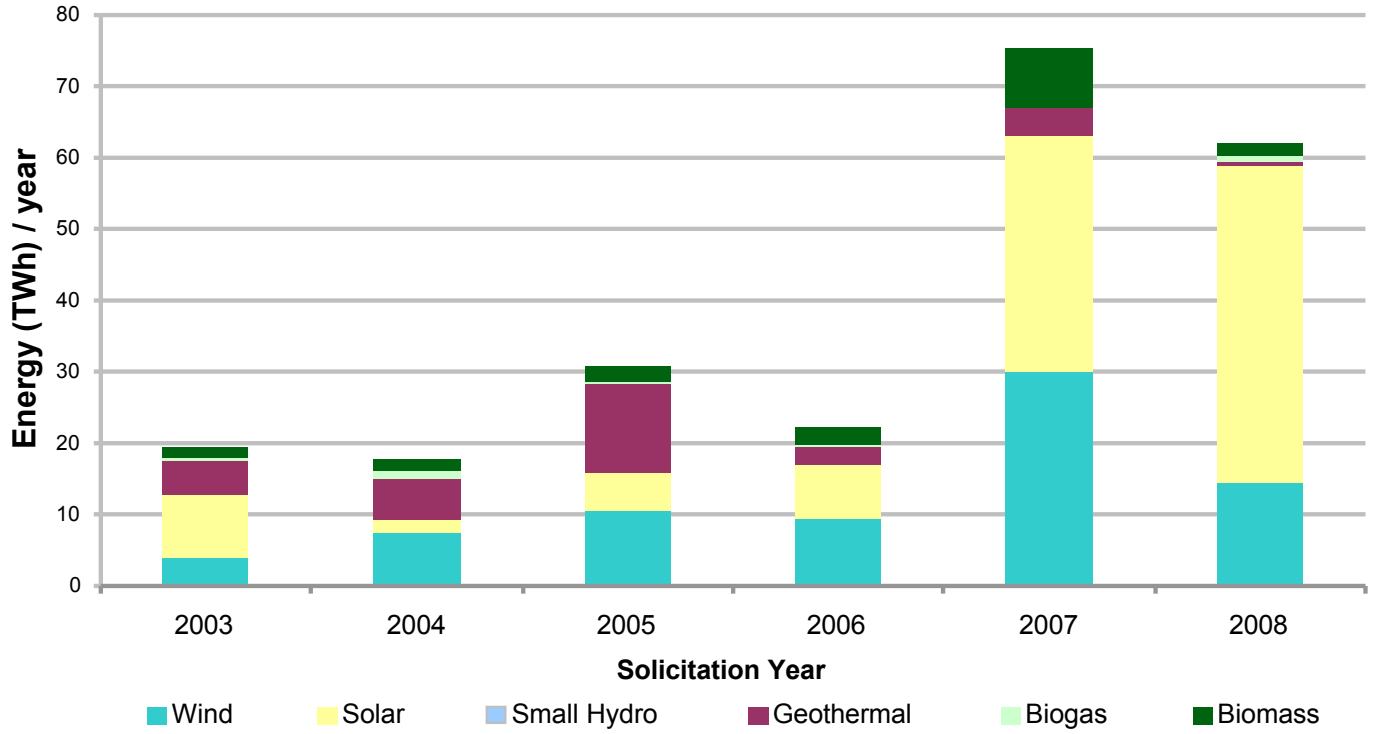
		2003	2004	2005	2006	2007	2008
PG&E	RPS Eligible GWh	8,828	8,575	8,543	9,114	9,047	9,774
	RPS GWh as % of bundled sales	12.4%	11.6%	11.7%	11.9%	11.4%	11.9%
SCE	RPS Eligible GWh	12,613	13,248	12,930	12,706	12,465	12,573
	RPS GWh as % of bundled sales	17.9%	18.2%	17.2%	16.1%	15.7%	15.5%
SDG&E	RPS Eligible GWh	550	678	825	900	881	1,047
	RPS GWh as % of bundled sales	3.7%	4.3%	5.2%	5.3%	5.2%	6.1%
TOTAL	RPS Eligible GWh	21,991	22,500	22,298	22,719	22,393	23,394
	RPS GWh as % of bundled sales	14.0%	13.9%⇩	13.6%⇩	13.2%⇩	12.7%⇩	13.0%⇧

Large IOU RPS Bids and Contracts



Source: California Public Utilities Commission, 2nd Quarter 2009

RPS Solicitation Bids by Fuel Type



Source: California Public Utilities Commission, 2nd Quarter 2009

Huge Response to 2009 Solicitation

- IOUs still sorting through bids
- Response larger than in 2008
- Dominated by wind and solar; PV bids now outnumber solar thermal
- Biomass and geothermal – bid MW more than an order of magnitude less than other technologies
- More projects offering several options for pricing, size, and ownership structures
- Fourth quarter: IOUs notify short-listed bidders, receive offer deposits and submit final short-list reports, with IE report, to CPUC.

Resource Mix and Cost is Changing

- Construction costs increasing for both renewable and conventional generation
  - RPS bid prices have increased from 2002 - 2008
- Resource mix is also shifting
  - Little geothermal and biomass in response to recent RFOs
  - More bids from solar thermal and PV developers – relatively high installation costs and significant permitting challenges
- Many prime resource sites have already been developed for wind and geothermal
- Concern that constrained supply and policy-driven demand drive up costs

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Project Development has Been Slow

- CPUC identifies and ranks the development barriers for each approved RPS project
- Significant project development barriers:
  - Transmission
  - Project financing
- Other project development barriers:
  - Developer experience
  - Permitting (CEC and County)
  - Technology maturity (commercialized vs. emerging)
  - Site control (e.g., BLM application process)
  - Fuel supply (e.g., insufficient biomass fuel)
  - Equipment procurement (e.g., wind turbines)
  - Military radar

Project Development is Complicated, Involving Multiple Steps and Agencies

RPS Procurement Process

IOU issues solicitation and reviews bids

↓

IOU negotiates contracts with short-listed developers

↓

IOU submits contract for approval

↓

CPUC approves contract

Project Development Process

Permitting

- **Municipal Agencies** (authority to construct, re-zoning)
- **County Agencies** (conditional use permit, air permits, water permits, re-zoning, CEQA)
- **Energy Commission** (RPS certification, thermal facility certification, CEQA)
- **Bureau of Land Management and other federal agencies** (Use permits, NEPA)

Site Control

Bureau of Land Management, Other Federal Land Management Agencies may grant right-of-way/use permits based on studies (e.g., NEPA)

OR

Lease/ownership contract with **private party**

Transmission

- **CAISO** Generator Interconnection (Apply & enter queue; CAISO/utility performs studies; sign Interconnection Agreement)
- **CAISO Develops Overall Transmission Plan** (CAISO-utility-stakeholder process; CAISO Board approval)
- **CPUC Approval** (CEQA, CPCN)

Equipment Procurement & Construction

- Shortage of equipment (turbines, etc.)
- Escalating commodity costs (steel, concrete)

Financing

- Extension of Production and Investment Tax Credits needed

Working on Solutions for Project Development

CPUC is working to create multi-agency solutions to known barriers

- Transmission
  - Streamlined permitting process
  - Initiated Renewable Energy Transmission Initiative (RETI)
  - Working closely with California ISO on queue reform
- Permitting / Site control
  - Beginning to work with Bureau of Land Management (BLM), other relevant agencies
  - California Energy Commission (thermal facilities)
  - County agencies (wind, thermal <50 MW)
- 33% RPS Implementation Analysis

Presentation Overview

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- ✓ **CPUC's 33% RPS Implementation Analysis**

Purpose & Scope of 33% RPS 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
  - Calculated the projected cost of different RPS procurement strategies
  - Timelines for generation and transmission facilities needed to reach a 33% RPS

33% RPS Implementation Analysis - Workplan

- Phases 1 and 2 of 33% Implementation Analysis:
  - Analyzes the cost of four different 33% RPS procurement strategies
  - Assesses the transmission needs of the 33% RPS Reference Case and likely construction time
  - Identifies market and regulatory barriers to renewable development
- Preliminary results for phases 1 and 2 were released June 2009
- Updates for long-term procurement proceeding:
  - Updates integration costs based on CAISO's 33% RPS integration study
  - CEC's updated load forecast
  - More timelines based on generation and transmission forecasting

33% RPS Resources Needed

20% RPS Reference Case would require	33% RPS Reference Case would require
35 TWh of new renewable electricity in 2020, in addition to **27 TWh** of generation from renewables in existence at the end of 2007	**75 TWh** of new renewable electricity in 2020, in addition to **27 TWh** of generation from renewables in existence at the end of 2007
4 New Major Transmission Lines at cost of **$4 Billion**	**11*** Additional Major Transmission Lines at cost of **$12 Billion**

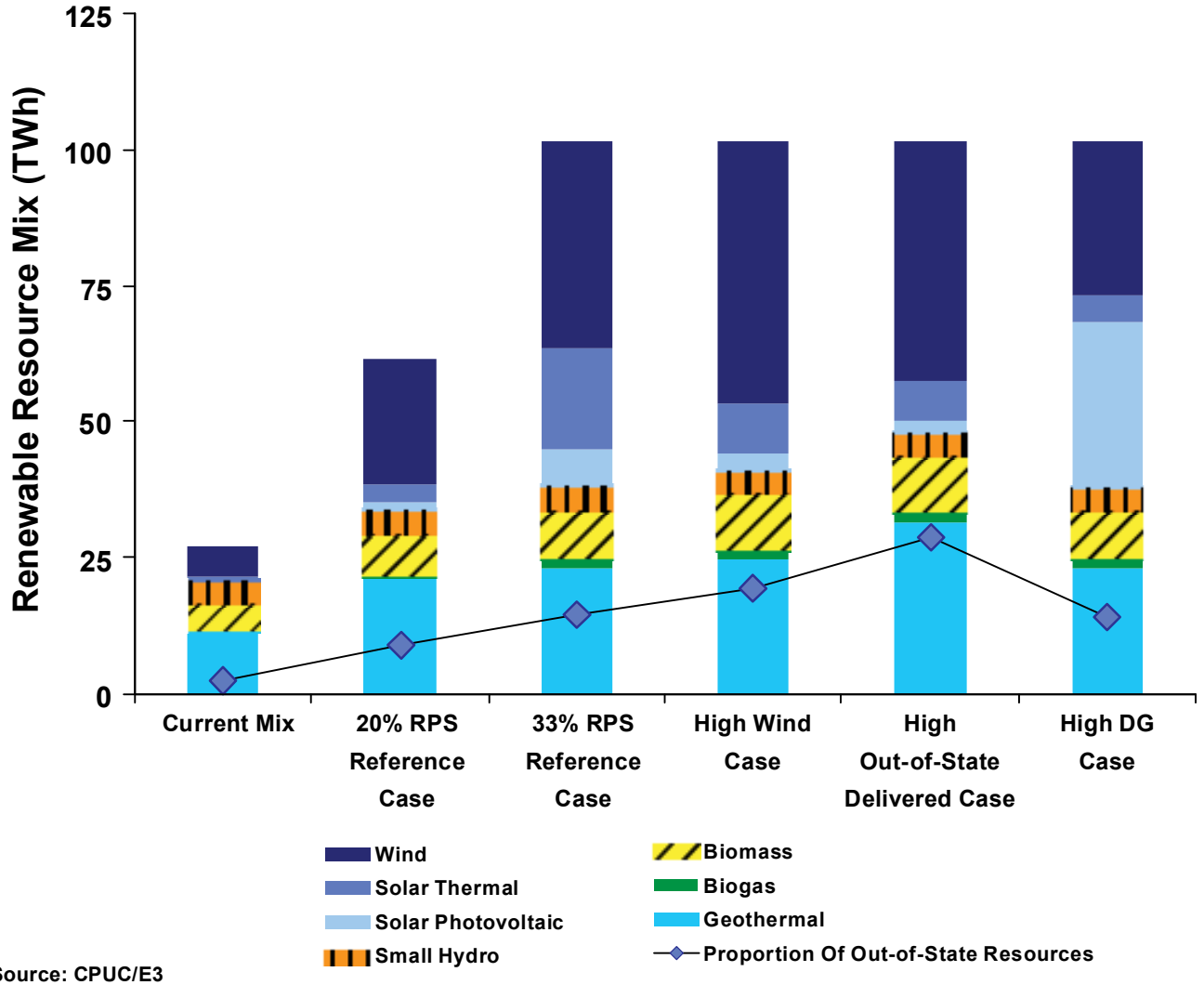
*Includes the 4 transmission lines needed for 20%

- 33% RPS Reference Case is projected to require an additional **75 terawatt hours** (TWh) of renewable electricity, or nearly a tripling compared to the **27 TWh** of renewable electricity generated at the end of 2007

Portfolio Options for Achieving 33% RPS

Case Name	Description
20% RPS Reference Case	Utilities procure 35 TWh of additional renewables to meet a 20% RPS target by 2020.
33% RPS Reference Case	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.
High Wind Case	Assumes less reliance on in-state solar thermal and more reliance on the less expensive wind resources in California and Baja.
High Out-of-State Delivered Case	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.
High DG Case	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.

Renewable Resource Mixes in 2020 Under Different Cases



Source: CPUC/E3

33% RPS Reference Case – Generation in each Resource Zone

Resource Zones Selected in Reference Cases		
Included in 20% and 33% RPS Reference Cases		
	MW	**GWh**
Tehachapi	3,000	8,862
Distributed CPUC Database*	525	3,118
Solano	1,000	3,197
Out-of-State Early*	2,062	6,617
Imperial North	1,500	9,634
Riverside East	1,350	3,153
Included in 33% RPS Reference Case Only		
Mountain Pass	1,650	4,041
Carrizo North	1,500	3,306
Out-of-State Late*	1,934	5,295
Needles	1,200	3,078
Kramer	1,650	4,226
Distributed Biogas*	249	1,855
Distributed Geothermal*	175	1,344
Fairmont	1,650	5,003
San Bernardino - Lucerne	1,800	5,020
Palm Springs	806	2,711
Baja	97	321
Riverside East Incremental	1,650	3,869
Total	**23,798**	**74,650**

* Aggregations of renewable resources that do not need new in-state transmission development.

Key Assumptions for Zone Timelines

- Transmission development timeline is driving force in each zone timeline
- 30-month delay for full interconnection of all generation in a zone is built into timeline for each zone
- Agencies face unprecedented numbers of permits, on expedited basis
- Developers in the same region may time permit applications to coincide with timing of transmission availability, potentially swamping regional offices

Key Point:

- Although transmission timing is assumed to be most critical, resource constraints at generation permitting agencies may add delay

33% RPS Reference Case Timelines

- **Timeline 1 (Historical experience without process reform)**
  - 33% RPS achieved in 2024
  - Assumes 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
  - 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 (technology failure, financing and permitting risk, and public opposition/legal challenges) cause some project delay or failure

Examples of Mitigating Strategies

- Current procurement path focused almost solely on central station renewable generation dependent on new transmission
- Need a procurement strategy that adequately considers the time and risk, in addition to price, associated with particular renewable generation resources
- 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 set aside as a renewable energy park

Major Cost Assumptions

- Projected costs are based on renewable technology costs, not the contract prices
- The cost analysis assumes current technology costs
  - No assumptions about the cost trajectory (up or down) of particular technologies over time due to potential transformation of the market
- Average electricity costs per kilowatt hour are expressed as statewide averages
  - Not indicative of individual utilities' rates or the actual bills that consumers will pay

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_2 Allowances[*1]	N/A	$0.4	- $0.03	- $0.5
Total Statewide Electricity Expenditures*	**$36.8**	**$49.2**	**$50.6**	**$54.2**
Average Statewide Electricity Cost per kWh	**$0.132/kWh**	**$0.154/kWh**	**$0.158/kWh**	**$0.169/kWh**

*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	$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.

Achieving a 33% RPS Requires Policy Tradeoffs

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

Questions to Consider...

- Focus on commercialized technologies or long-term market transformation?
- Focus on developing in-state resources? Up to what cost?
- Delay 2020 target to develop primarily California resources?
- Focus on higher-cost solar PV to mitigate risk associated with central station generation that needs new transmission?
- Waive renewable energy delivery requirements for out-of-state resources to achieve 2020 target at lowest cost?

More information

CPUC RPS Website:

www.cpuc.ca.gov/renewables

33% RPS Implementation Report, model, and work papers:

www.cpuc.ca.gov/33perecent

Questions:

Sara Kamins
CPUC
Renewable Procurement and Resource Planning
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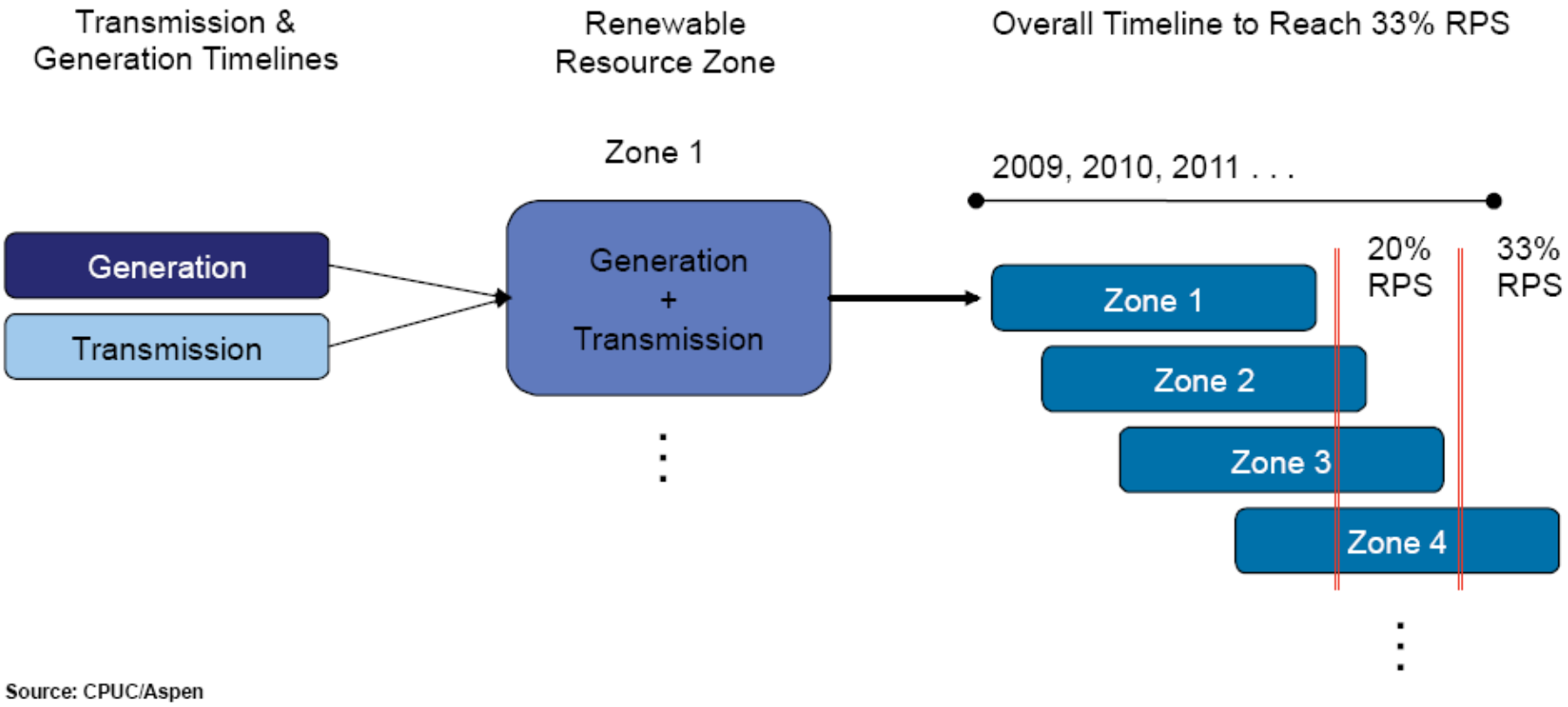
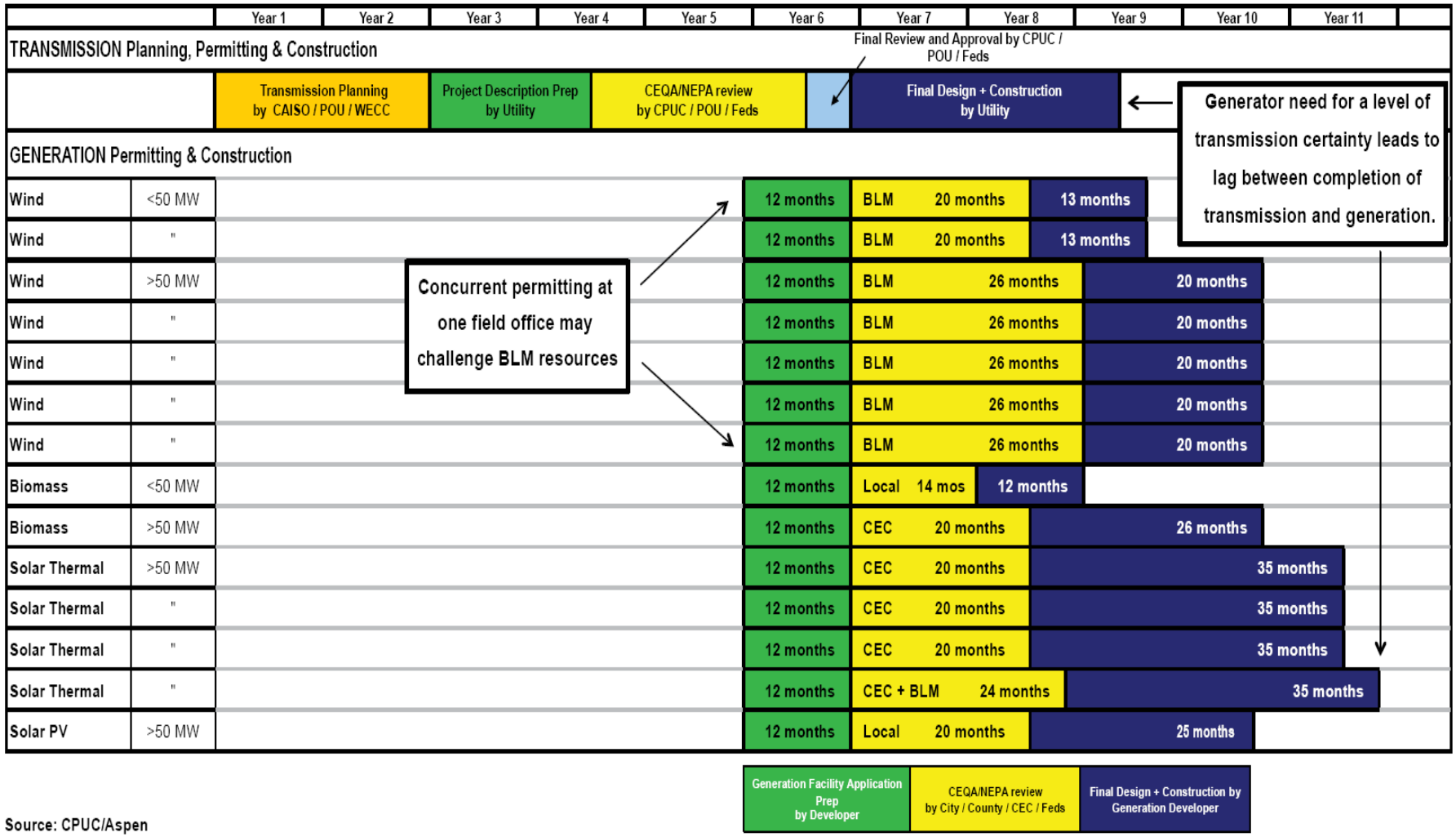
Developing Overall Timelines for the 33% RPS Reference Case



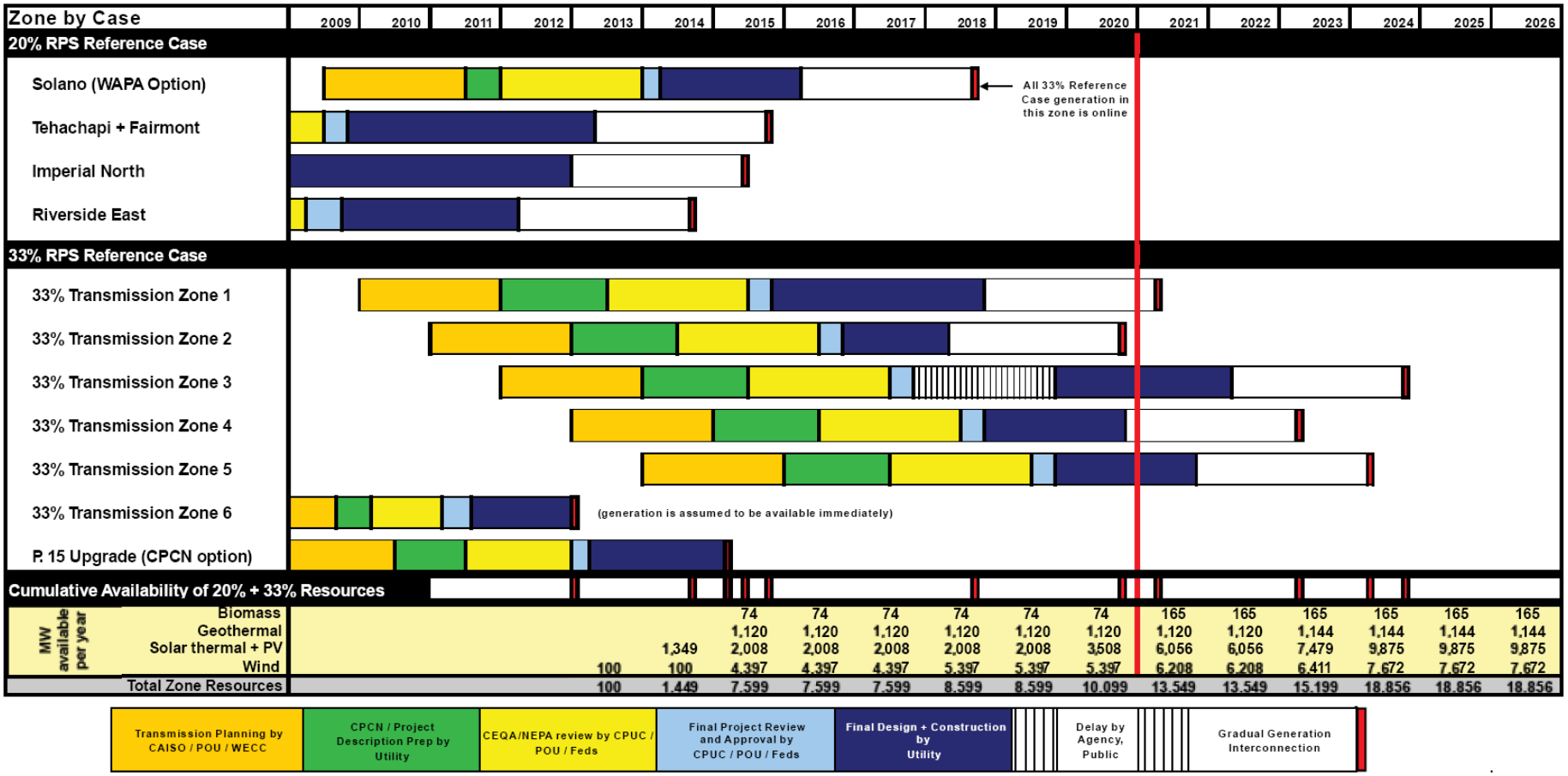
Source: CPUC/Aspen

Sample Zone Timeline: San Bernardino-Lucerne Zone



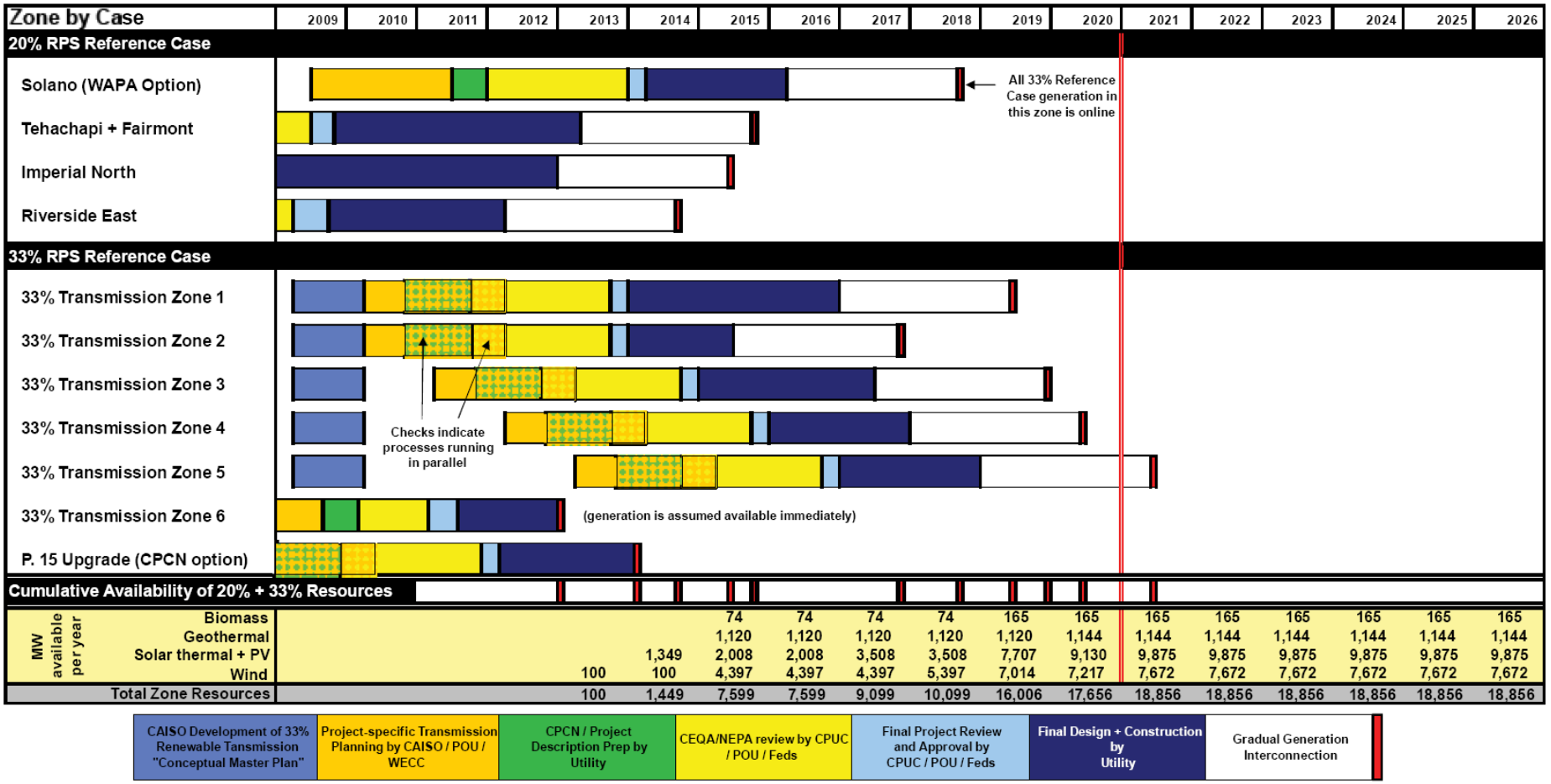
Source: CPUC/Aspen

Timeline 1:
Historical Experience w/o Process Reform



Result: 33% RPS achieved in 2024

Timeline 2A:
w/ Process Reform and No External Risks

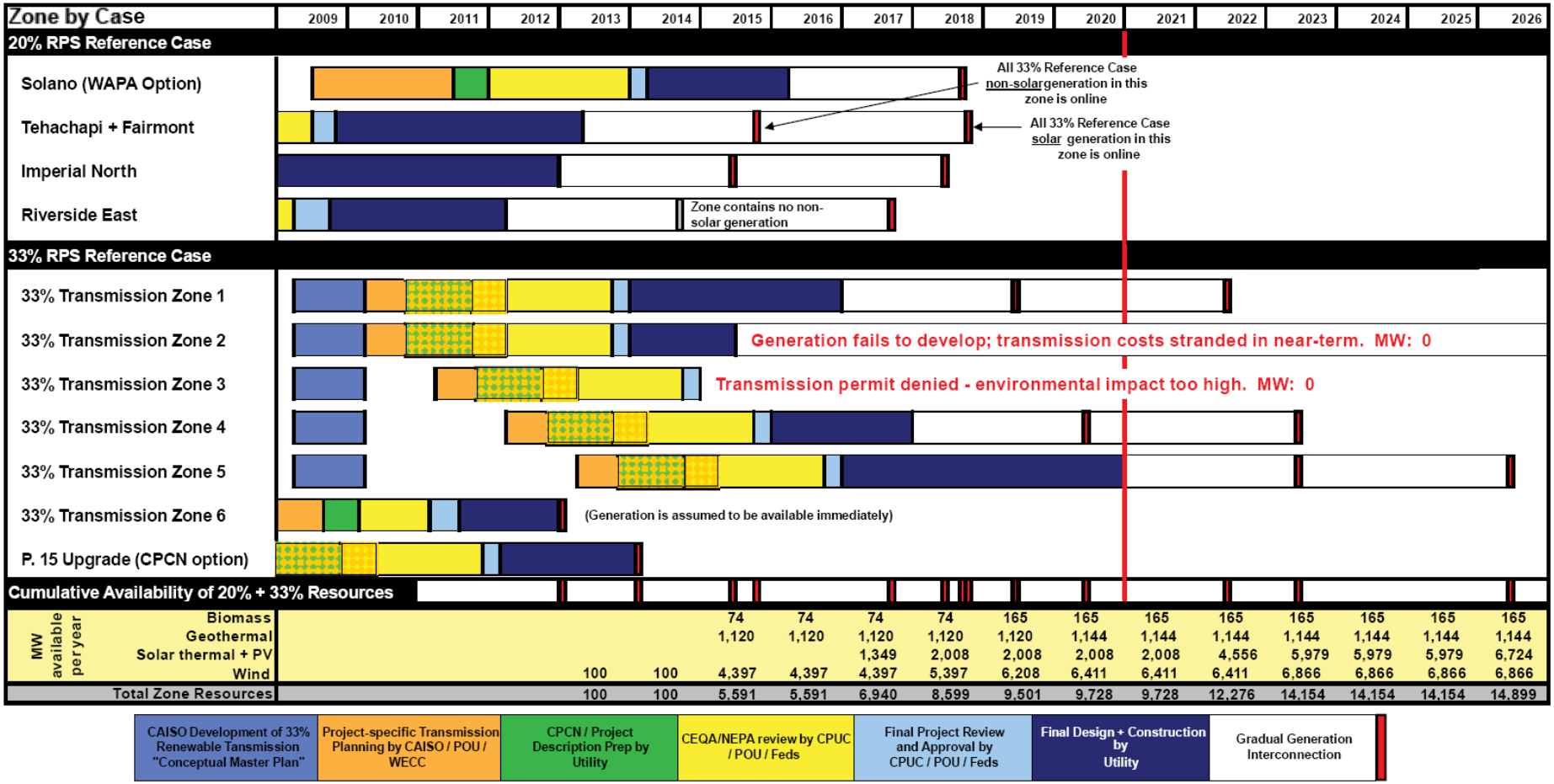


Result: 33% RPS achieved in 2021

Reforms Assumed in Timeline 2A

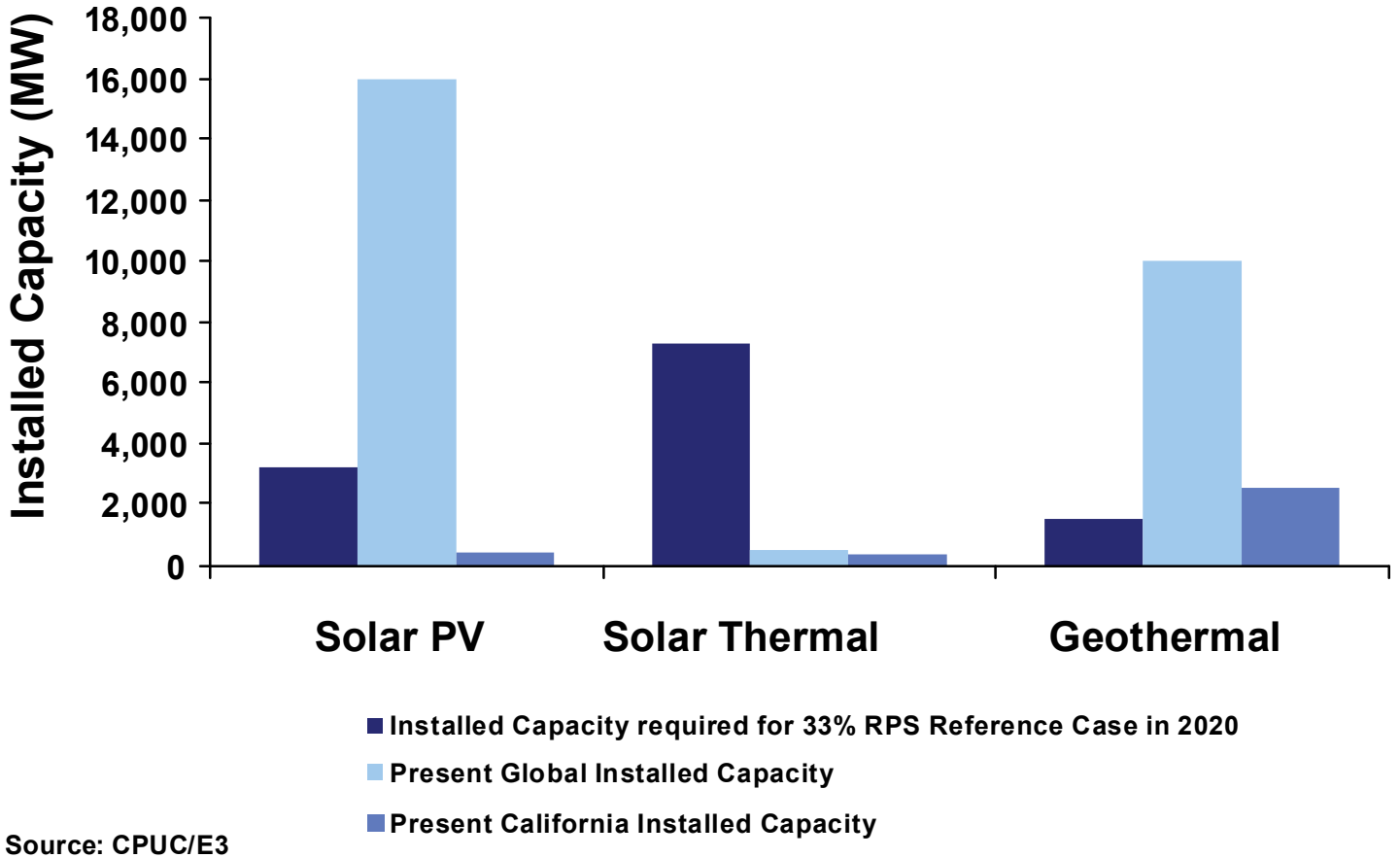
- Generation interconnection process reform at California Independent System Operator (ISO)
- Streamlined transmission permitting – environmental review and need determination – at CPUC
- Streamlined generation permitting
- Successful implementation of the Renewable Energy Transmission Initiative
- Planning for renewable resources in 2010 Transmission Planning process at California ISO – “Conceptual 33% RPS Master Plan” by Q1 2010
- Transmission corridor designation at California Energy Commission

Timeline 2B:
w/ Process Reform & External Risks



Result: 33% RPS is not achieved using current procurement strategy

Example of External Risk: Technology Risk



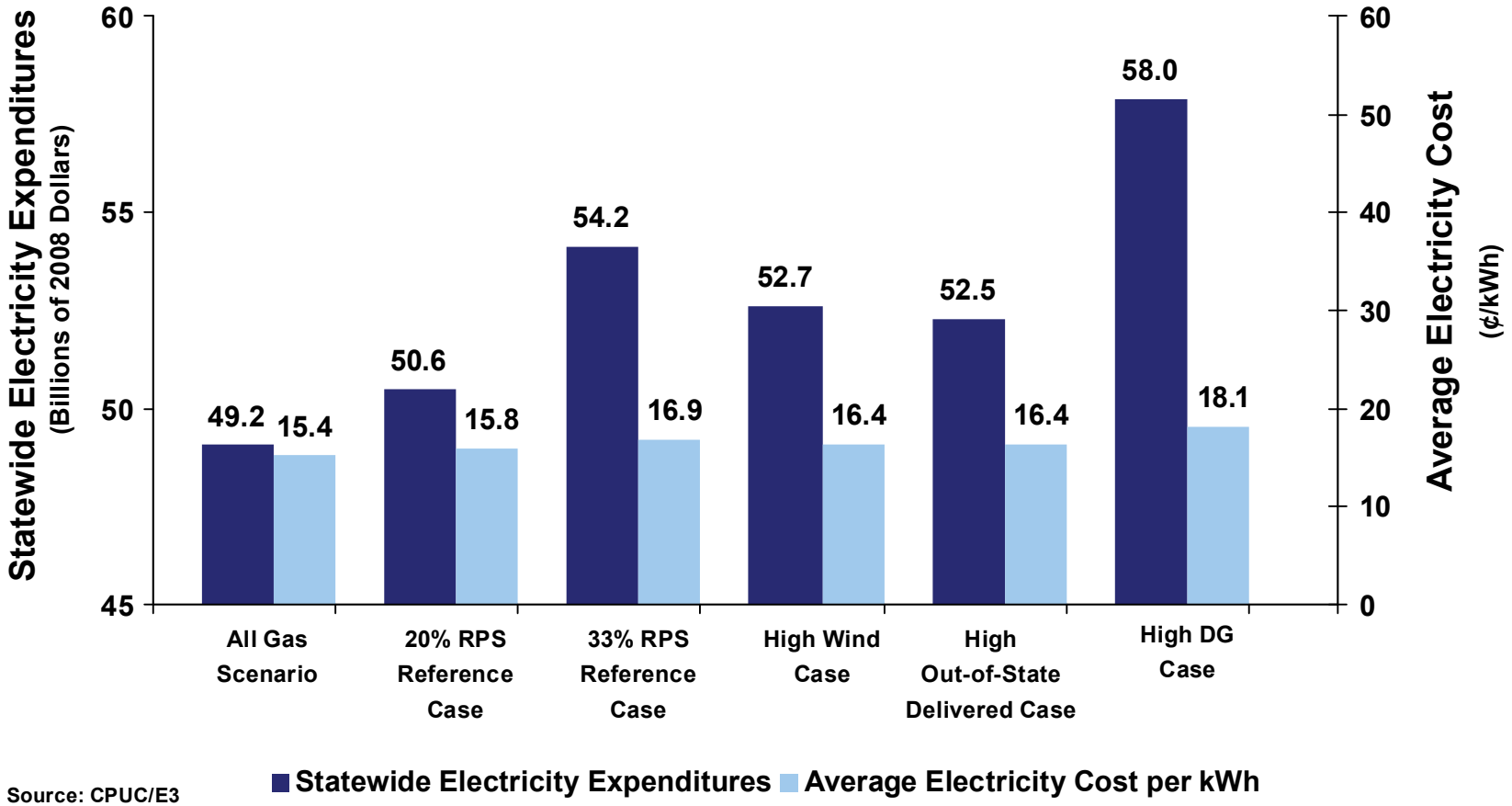
Source: CPUC/E3

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

33% RPS Sensitivity Analysis

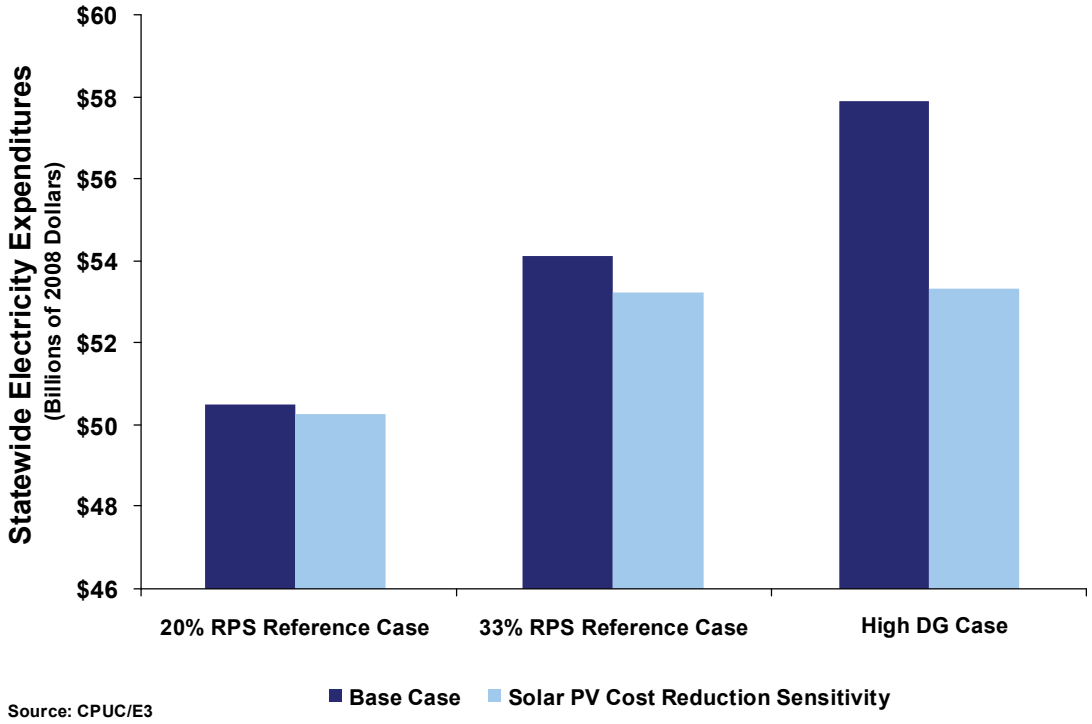
- Projecting the costs of different renewable and fossil-fired energy sources out to 2020 requires numerous assumptions about future conditions including:
  - Natural gas and CO_2 allowance prices
  - Load growth (low-load sensitivity based on CPUC/Energy Commission Aggressive Policy Case)
  - Technology costs (solar PV cost reductions)
- Many of these variables are highly uncertain, and some significantly influence the model's results

33% RPS Reference Case Most Expensive Case That Needs Transmission



Source: CPUC/E3

Solar PV Cost Sensitivity



Source: CPUC/E3

- 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

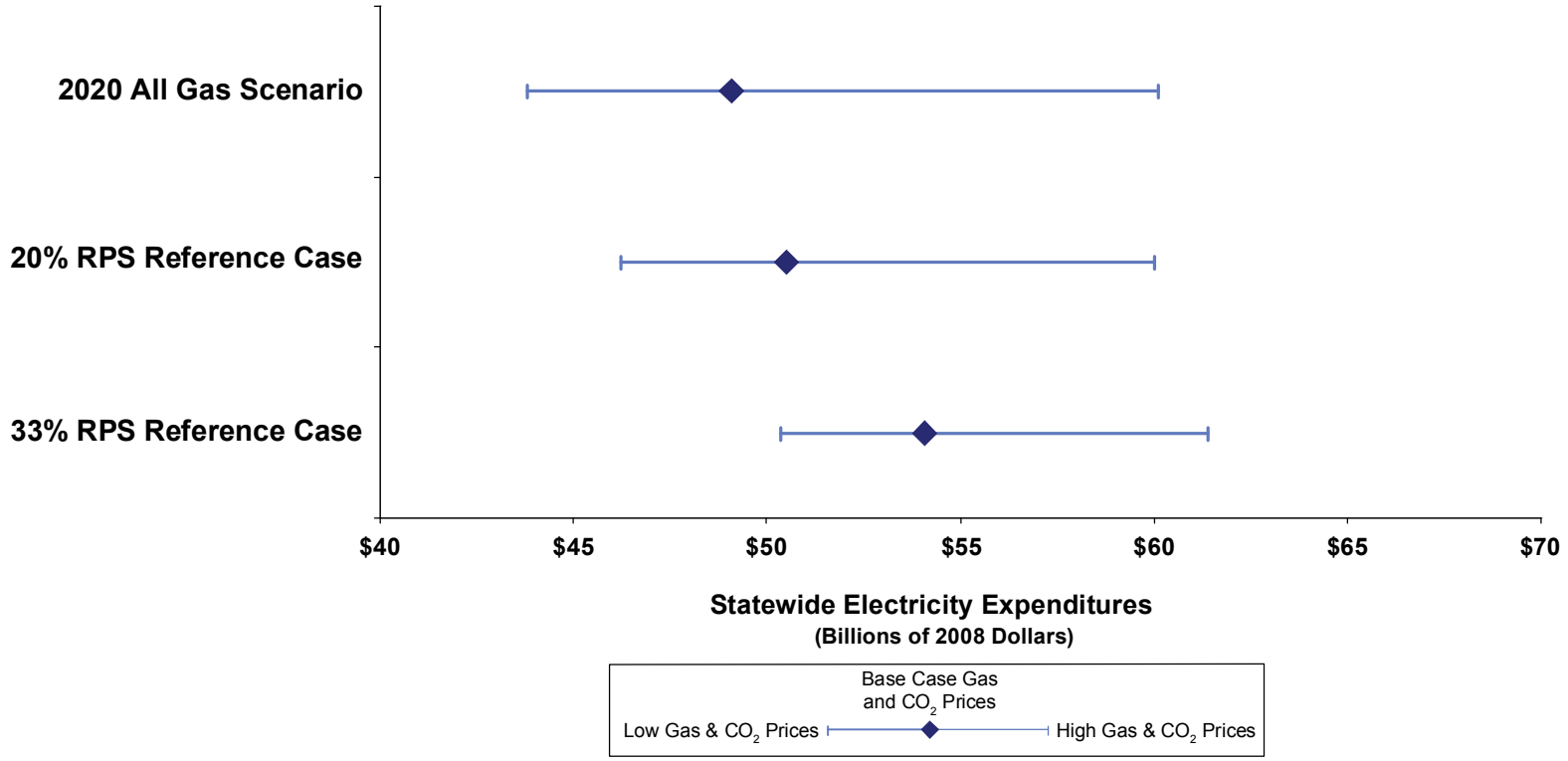
Low-Load Sensitivity

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.

Natural Gas and CO_2 Price Sensitivity



- 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