California's Renewable Portfolio Standard

Northwest Power and Conservation Council
California Power Markets Symposium

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William A. Monsen
MRW & Associates, LLC
Oakland, California
wam@mrwassoc.com

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Overview of Presentation

- Introduction
- Current RPS policy in California
- Which resources are being procured and at what cost?
- Challenges with renewable integration
- Potential “bumps in the road”

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California's RPS Program

- Current program covers all California entities
  - Investor-Owned Utilities
  - Publicly-Owned Utilities
  - Retail Electric Service Providers, and
  - Community-Choice Aggregators
- Sets 2020 target for 33% of energy to be from eligible renewable energy resources
  - Large hydro and rooftop solar under the California Solar Initiative (CSI) program are excluded from RPS eligibility
- Many alternatives for obtaining renewables
  - Large projects procured through Requests for Offers and bilateral negotiations
    - Not IOU self-builds
  - CPUC programs for mid-size and small projects
    - ReMAT, successor to Feed-In Tariff (0-3 MW)
    - Renewable Auction Mechanism (3-20 MW)

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History of RPS in California

- Established in 2002 by Senate Bill 1078
  - 20% renewables by 2017; only applied to Investor-Owned Utilities
- Accelerated in 2006 by Senate Bill 107
  - 20% renewables by 2010
- Current target set in April 2011 by SB1X-2
  - 33% renewables by 2020 with interim target of 25% by 2016
  - Included Publicly-Owned Utilities
  - Defined three categories of eligible renewables for procurement going forward

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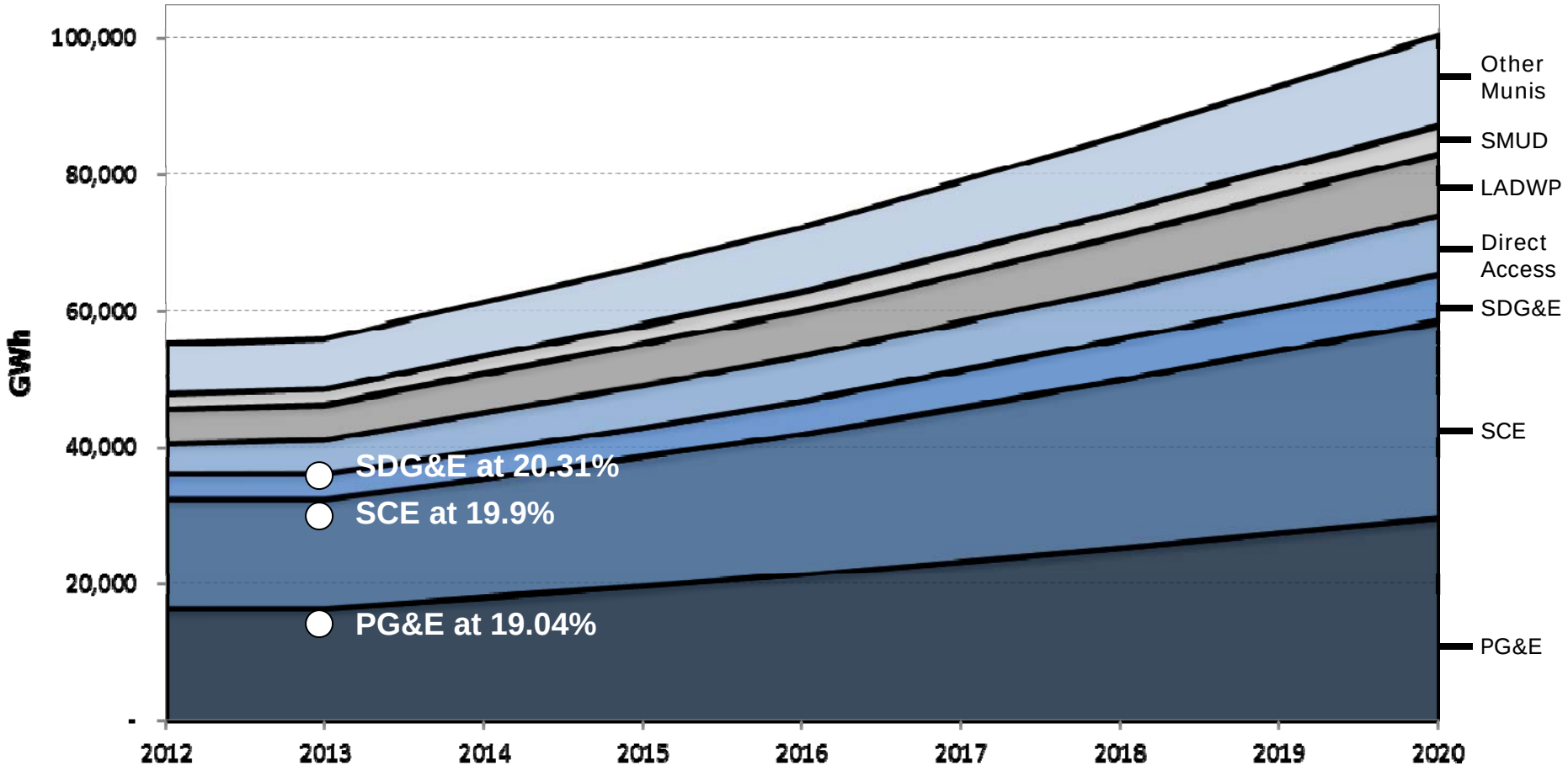
Renewable Energy Needed to Meet RPS Target in 2020



Source: SB 1X-2 and CEC Demand Forecast

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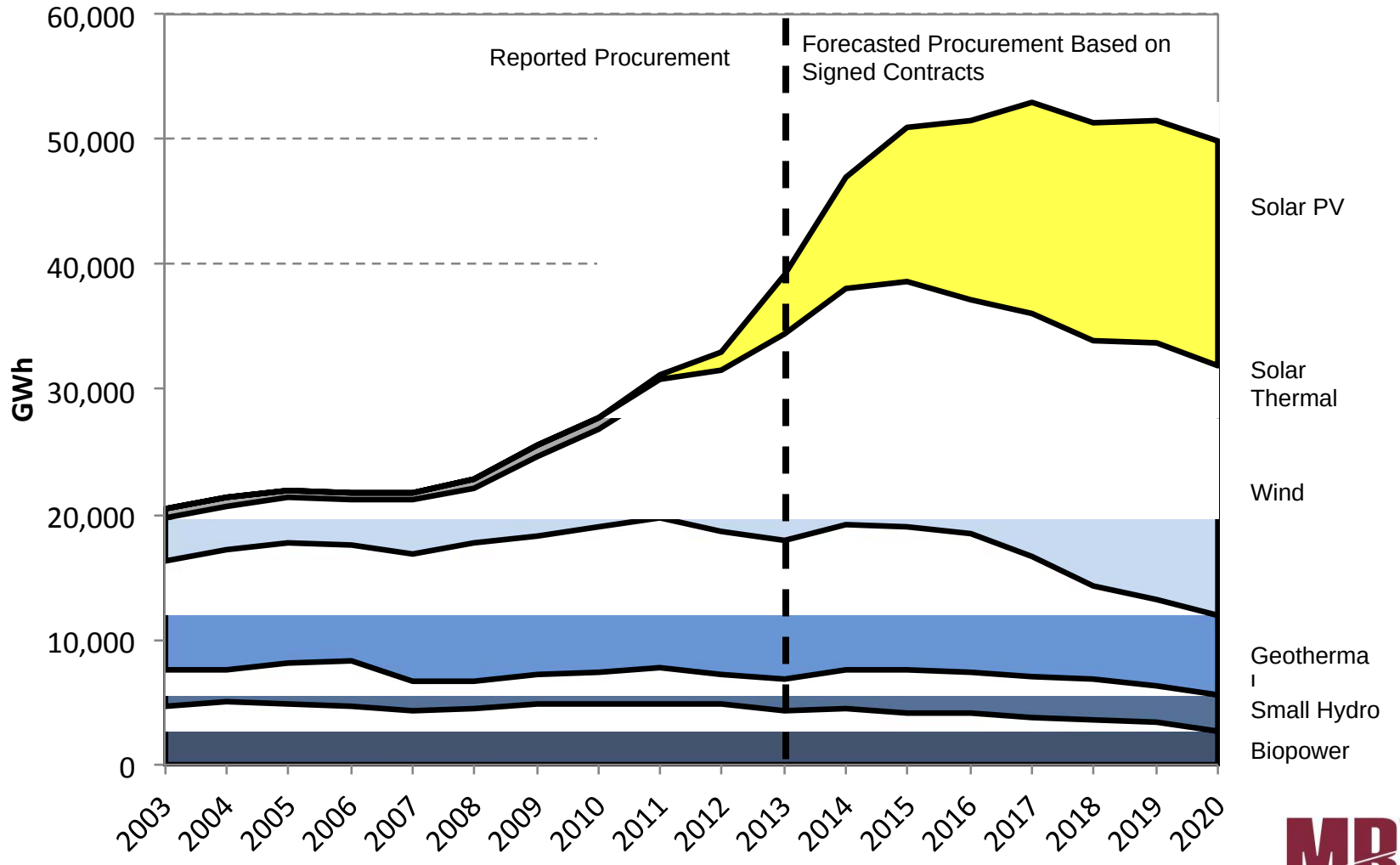
IOU Renewable Resource Mix



Source: CPUC Report to Legislature, March 2013; IOUs' RPS Procurement Reports, August 2013

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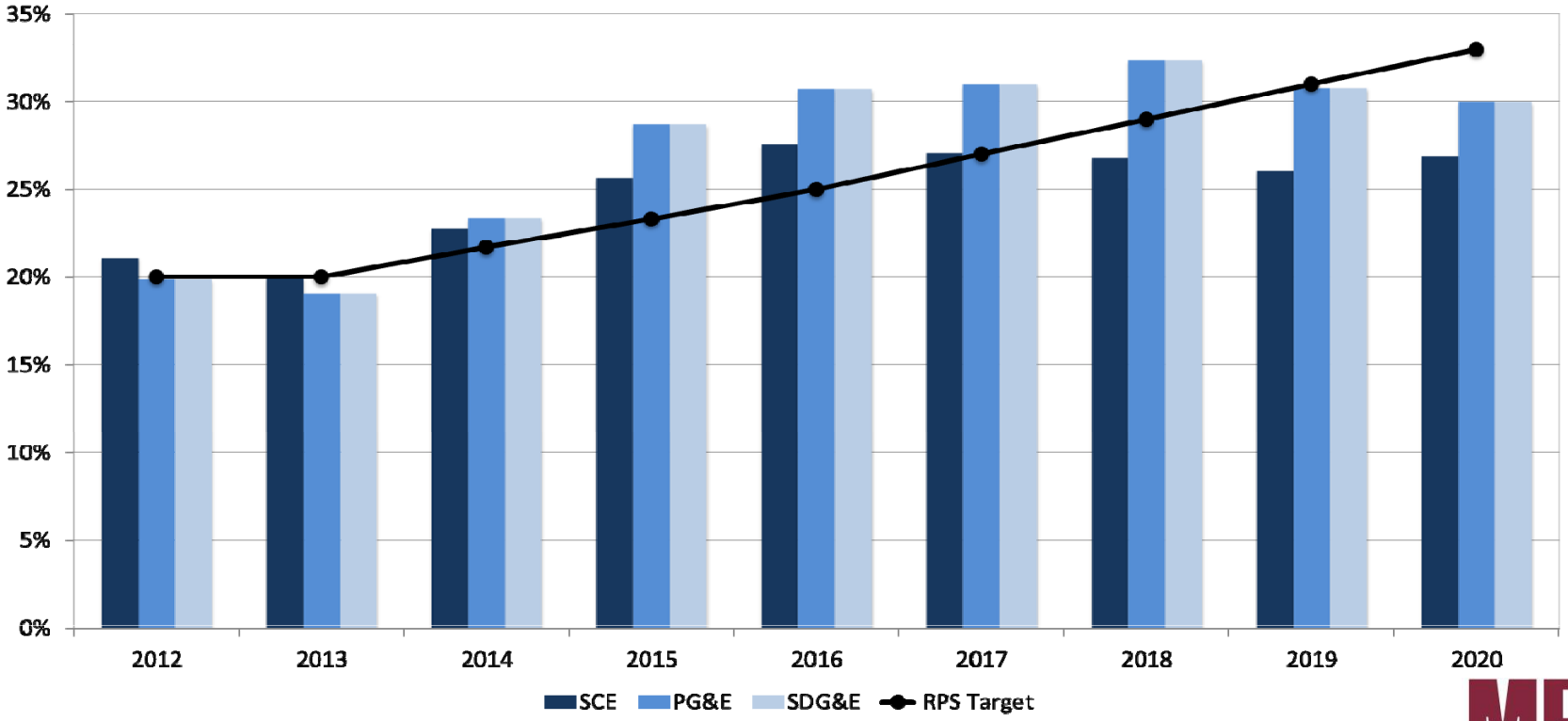
California – IOU Procurement Progress

- California IOUs have signed contracts to meet much of their RPS requirements through 2020
- The IOUs are selling excess renewable generation in the near-term
- Project failure and contract expirations may present sales opportunities for new projects in the mid- to long-term



Source: August 2013 RPS Compliance Reports

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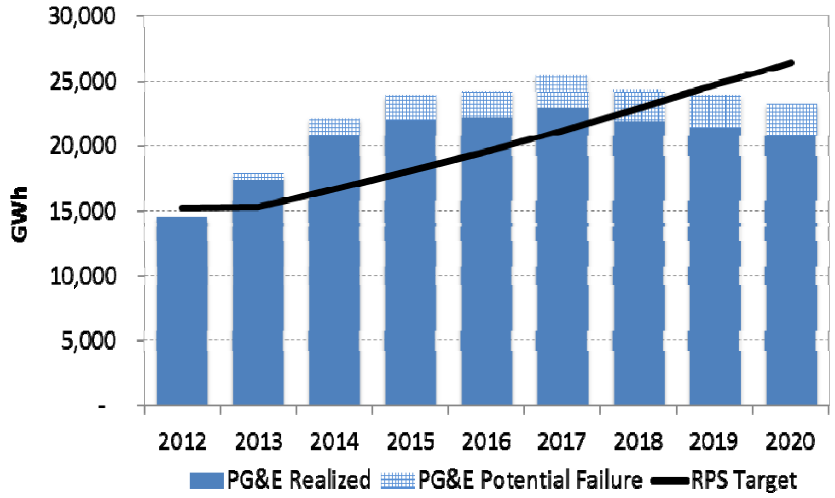
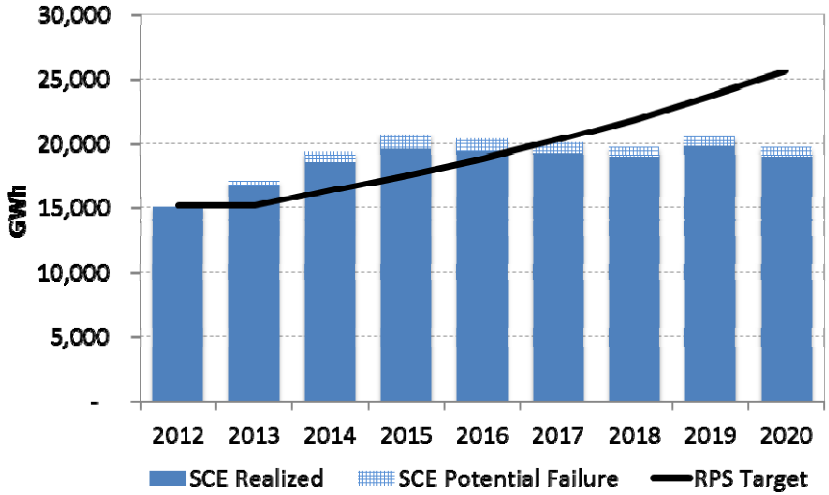
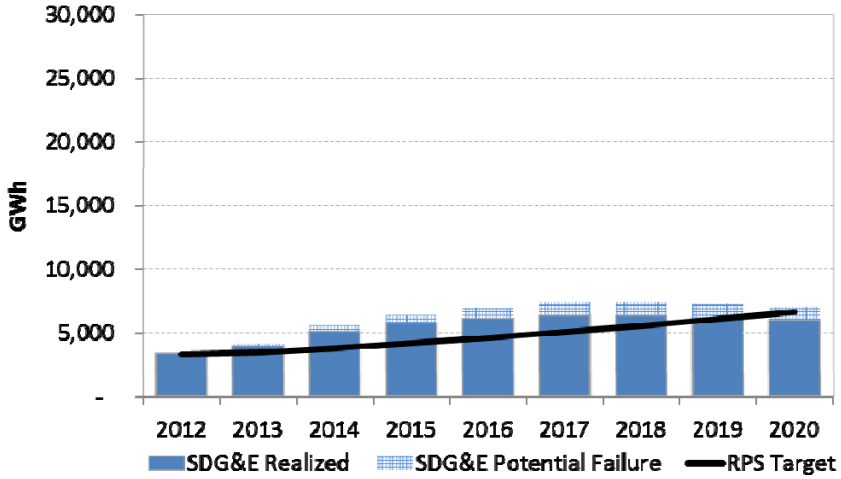
California – History of IOU Contract Failure







- While CA IOUs appear over-procured in the short term there has been significant project failure in the past
- Past failure rates have been as much as 35-40%. This could create opportunities for new projects to obtain Power Purchase Agreements
- Charts show failure rates of up to 40% for new projects coming online after 2012

Source: August 2013 RPS Compliance Reports

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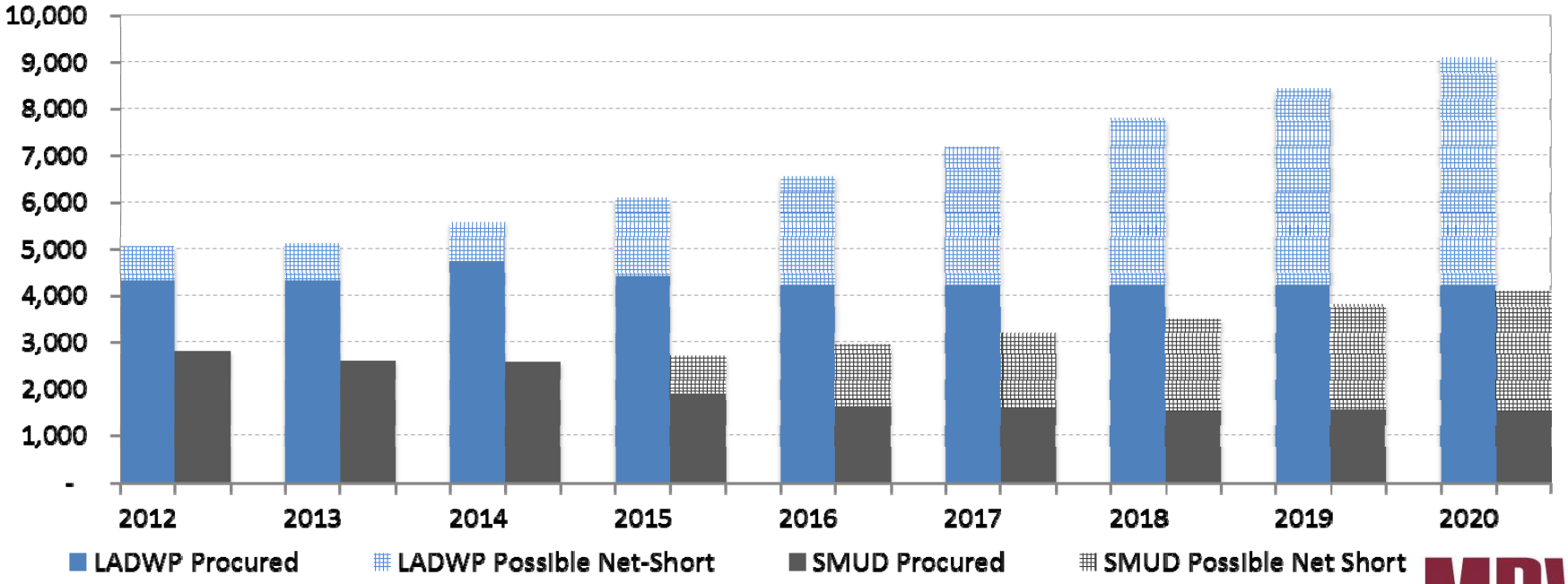
Procurement Status for Large Publicly-Owned Utilities

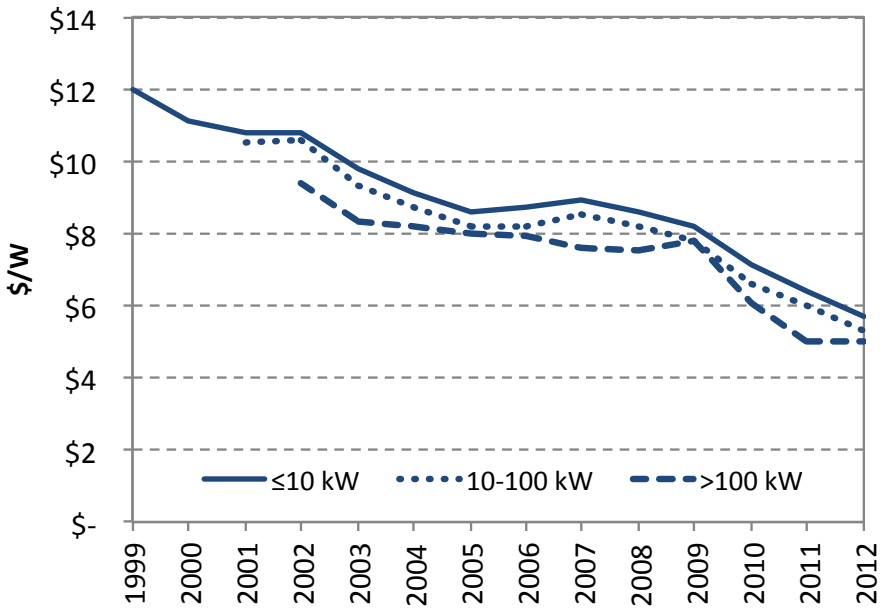
- Los Angeles Department of Water and Power (LADWP)
  - Currently meets 18% of energy requirements with renewables, has an additional 10% of current energy requirements under construction or planned.
  - Last renewable RFP was in 2010
- Sacramento Municipal Utility District (SMUD)
  - Early actor in renewables procurement, achieved 20% by 2010, however many contracts are short-term.
    - Will need additional capacity as contracts expire and RPS target increases



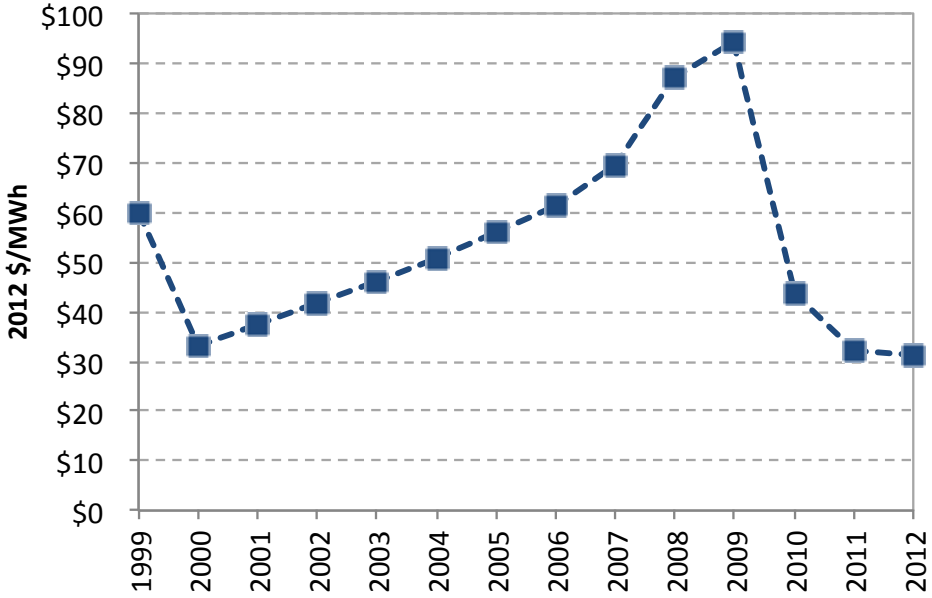
Evolution of Solar and Wind Prices

- Recent research shows decreasing solar prices and possible inflection point for wind prices

California Residential and Commercial Solar PV System Median Installed Price per Unit Capacity



Generation-Weighted Average Levelized Wind PPA Prices in the Western U.S.



Source: Lawrence Berkeley National Laboratory (LBNL), Tracking the Sun VI, July 2013; LBNL, 2012 Wind Technologies Report, August 2013

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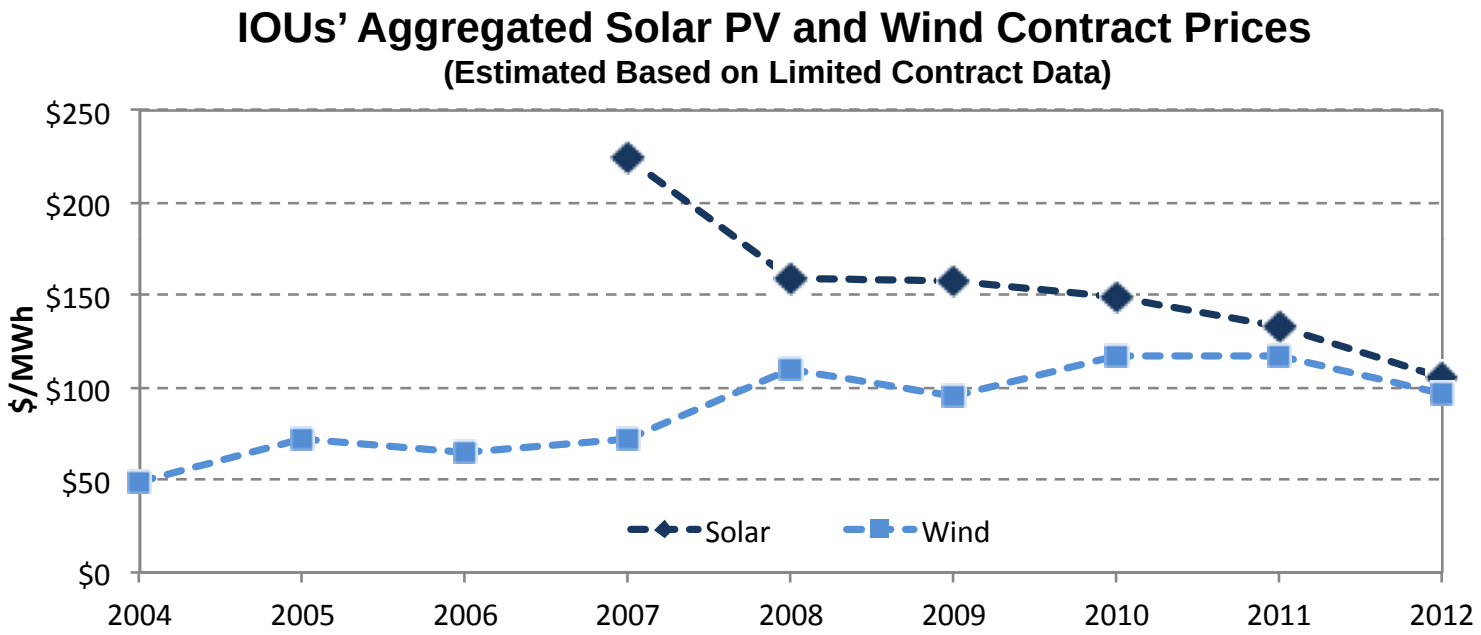
Evolution of Solar and Wind Prices



- Recent IOU information shows decreasing PV prices and relatively flat wind prices
- In July 2013 the City of Palo Alto entered into three 30-year PPAs for up to 182,500 MWh of solar annually for $69/MWh

Source: Padilla Report, 2012; IOUs' RPS Compliance Reports, August 2013

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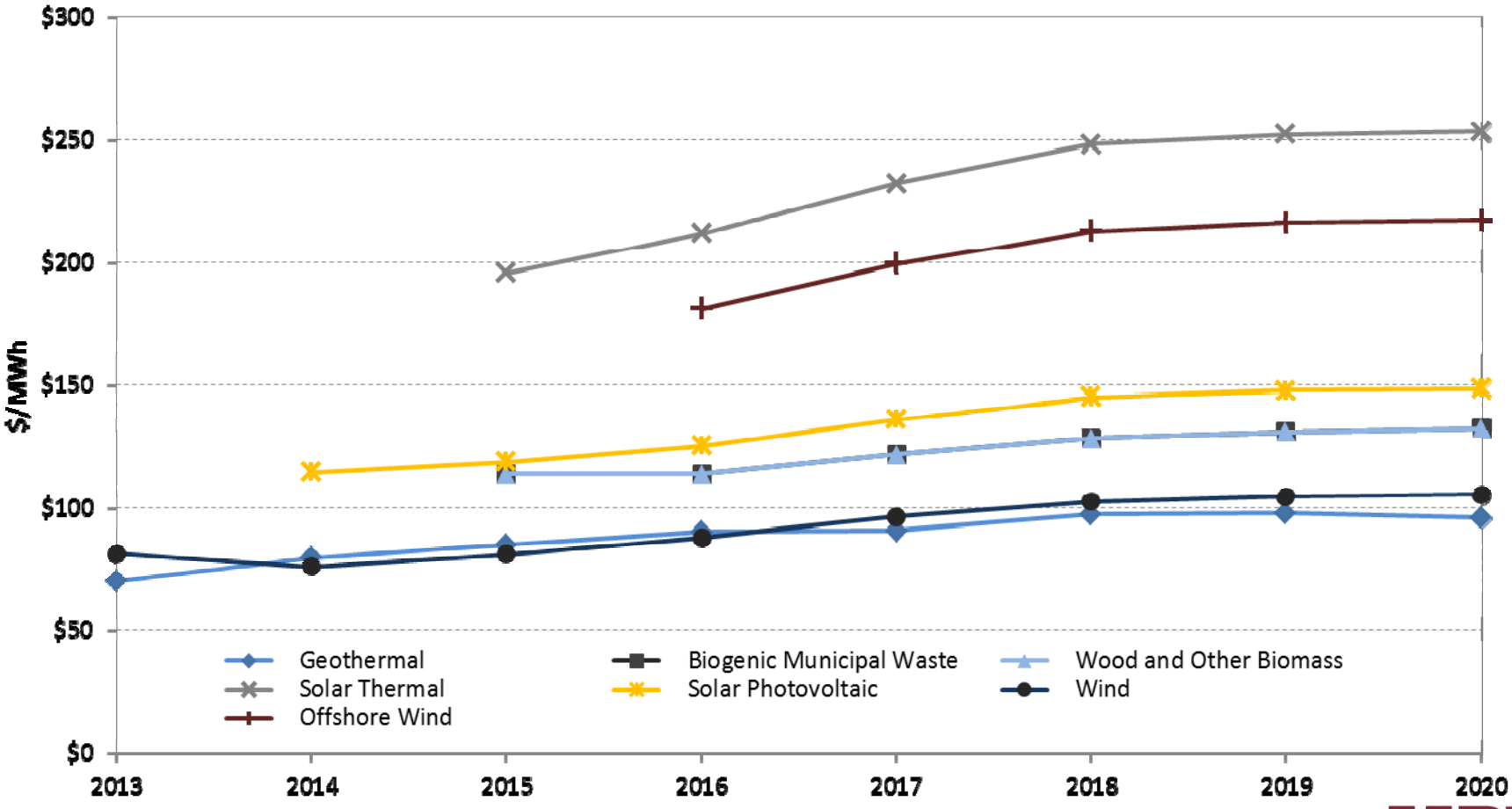
Future Wholesale Renewables Costs - EIA



Source: EIA Forecast, 2013

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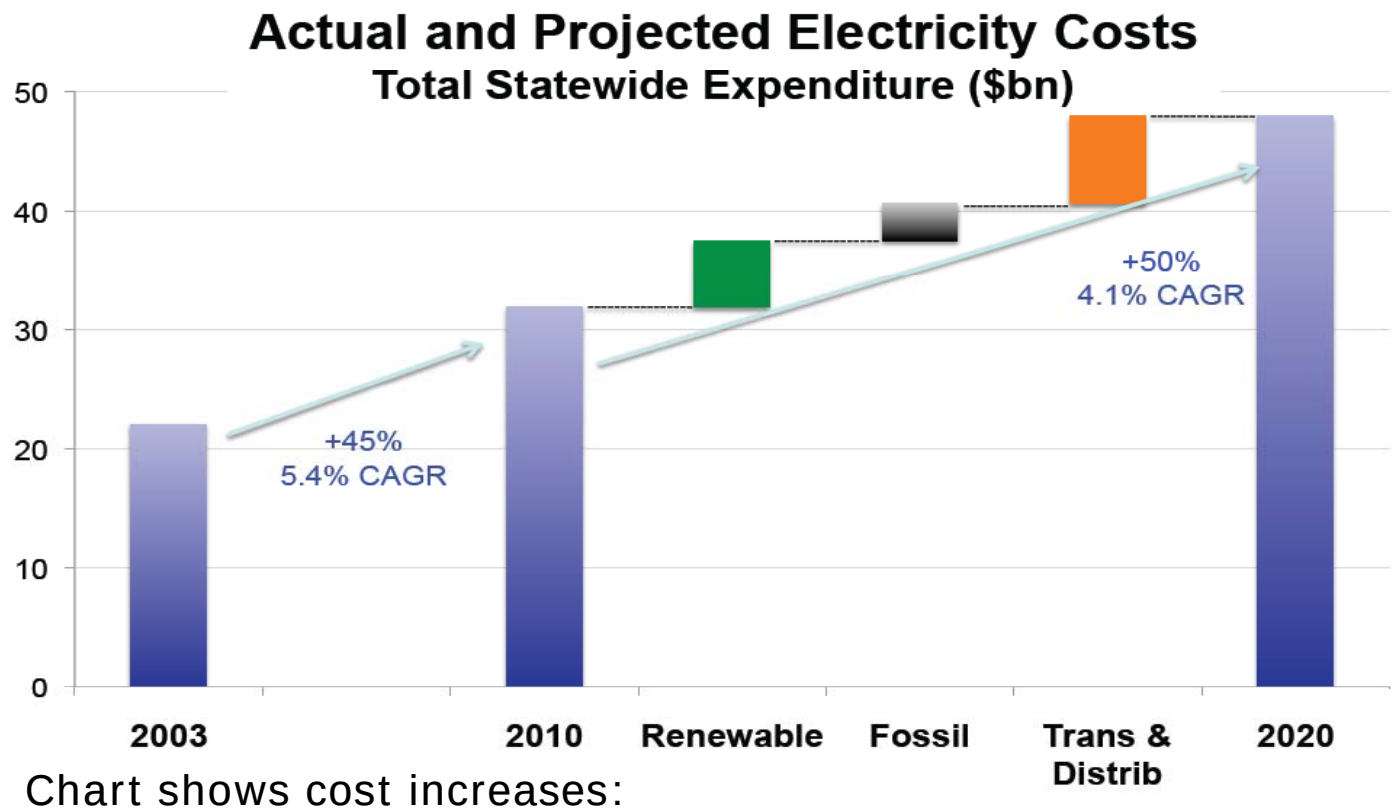
Rate Impact of RPS Program



- Chart shows cost increases:
  - Renewables - $7 Billion
  - Fossil Fuel Resources - $3 Billion
  - Transmission and Distribution - $8 Billion
- Renewables are expected to put upward pressure on rates, but they are only part of the picture

Source: Commissioner Ferron, CPUC, May 2012

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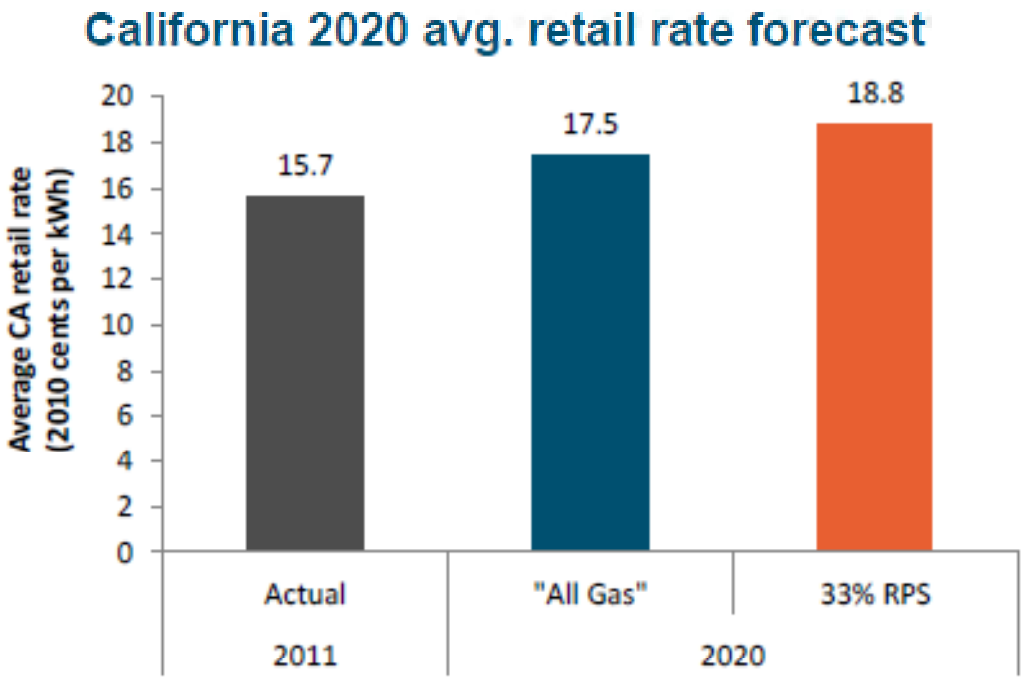
Rate Impact of RPS Program – E3 Model



- 8% rate increase due to meeting 33% RPS by 2020
  - Based on 33% RPS scenario vs. "all-gas" scenario in 2020
  - 20% total rate increase from 2011 to 2020 (~2% per year) due to:
    - Increasing transmission and distribution costs
    - Increasing fuel and generation costs (not only due to renewables)

Source: E3 Law Seminars International presentation, November 2012, and E3 2010-2011 LTPP filings, CPUC "trajectory case."

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Renewable Cost Containment

- 2002-2007: Supplemental Energy Payments (SEPs)
  - CEC funds available to generators to cover costs above the Market Price Referent
- 2007-2009: Above Market Funds (AMF)
  - Electric corporation now responsible for cost recovery of above-market transactions
  - Utility AMFs exhausted by the end of 2009
- 2009-Present
  - IOUs must demonstrate reasonableness of PPAs to CPUC
- New Method in Development
  - Slated for implementation in 2014
  - Recent CPUC staff proposal: Procurement Expenditure Limitation
  - Controversial proposal uses ratio of IOU RPS procurement expenditure to total IOU revenue requirement to determine appropriateness of renewable costs

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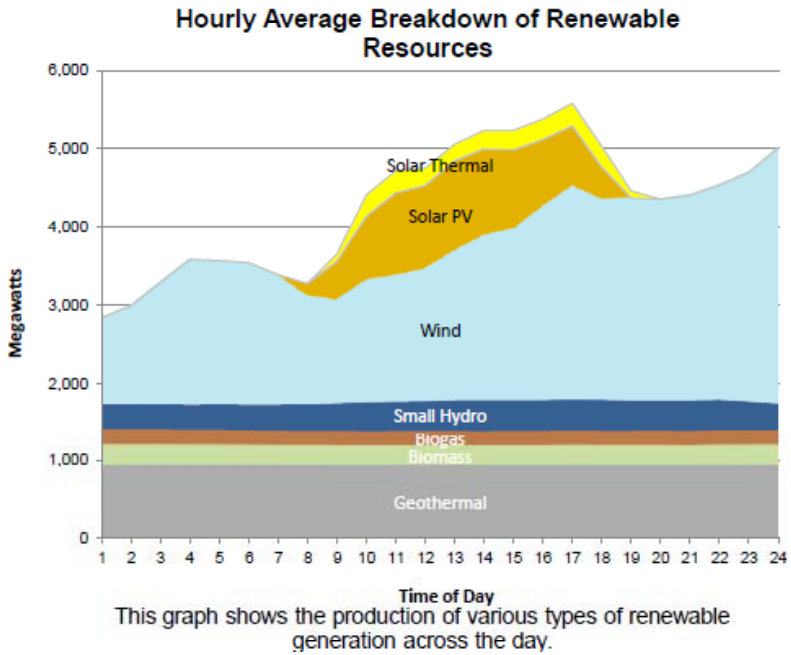
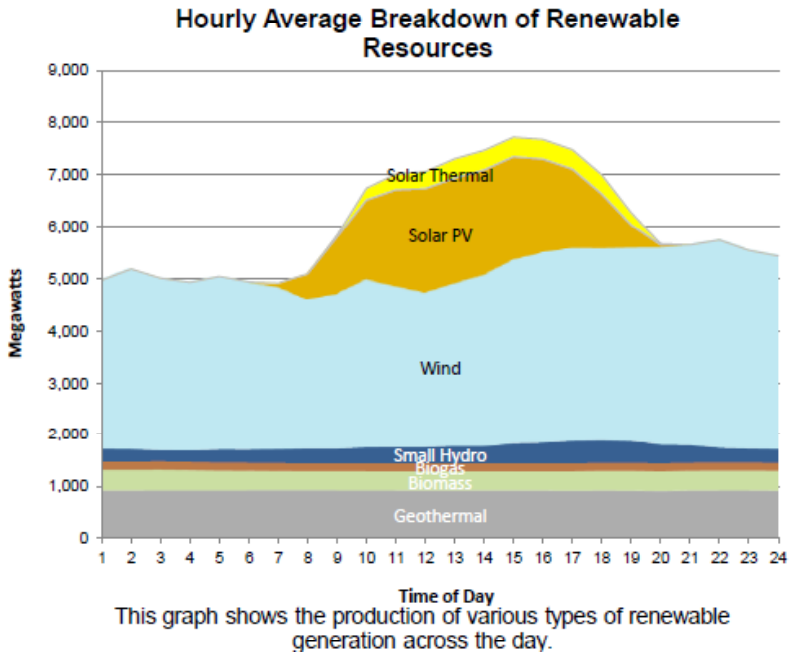
Challenge of Integrating Increasing Levels of Renewable Generation

April 1, 2013



This graph shows the production of various types of renewable generation across the day.

August 1, 2013



This graph shows the production of various types of renewable generation across the day.

- Solar and wind production volatile from day-to-day
- Relative uncertainty regarding future need for integration resources
- Disagreement among key players whether additional integration resources are needed

Source: CAISO Daily Renewables Watch for April 1, 2013 and August 1, 2013

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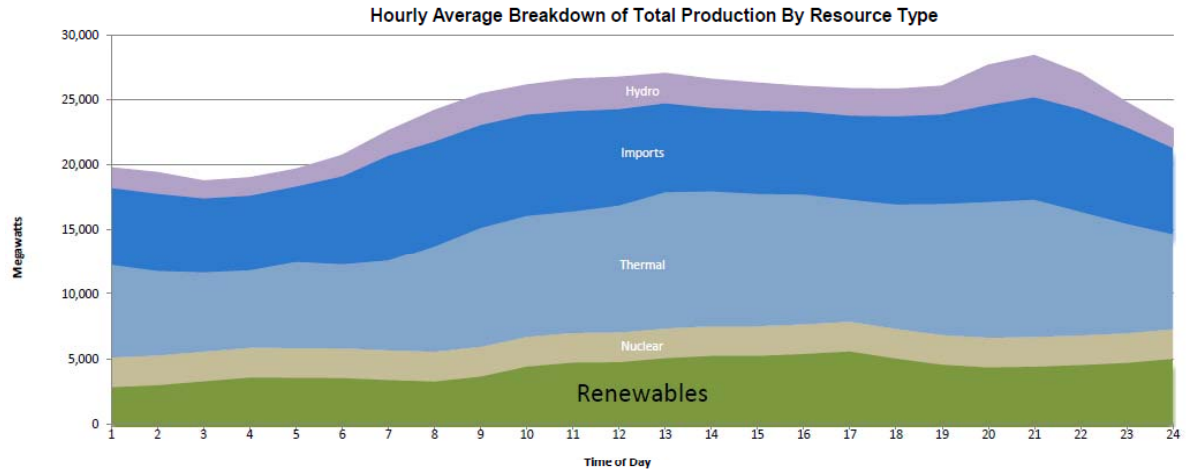
Challenge of Integrating Increasing Levels of Renewable Generation

April 1, 2013



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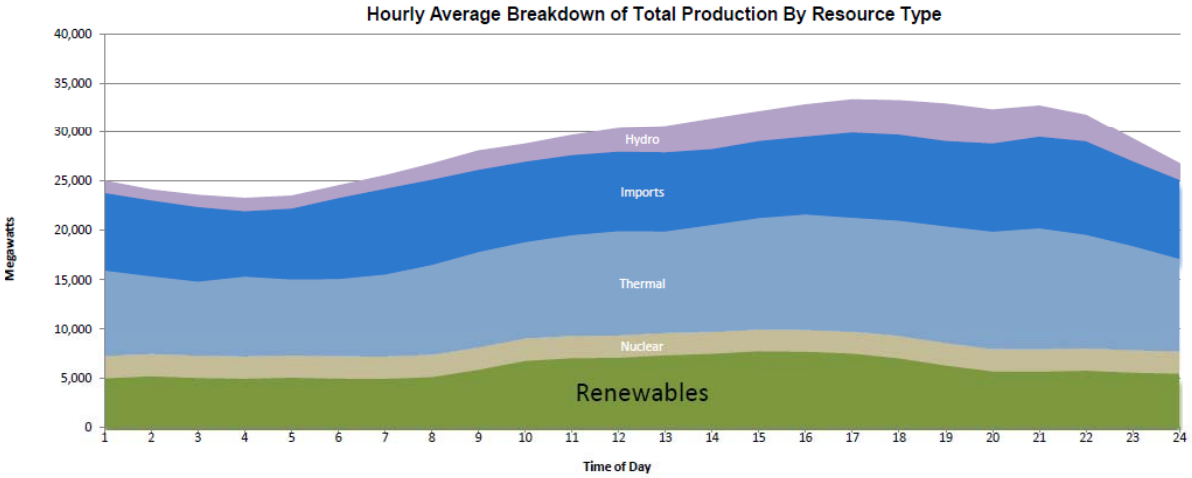

- While wind and solar production varies significantly day-to-day, overall production of renewables remains rather steady
- Evolving challenge as renewable percentage continues to increase

Source: CAISO Daily Renewables Watch for April 1, 2013 and August 1, 2013

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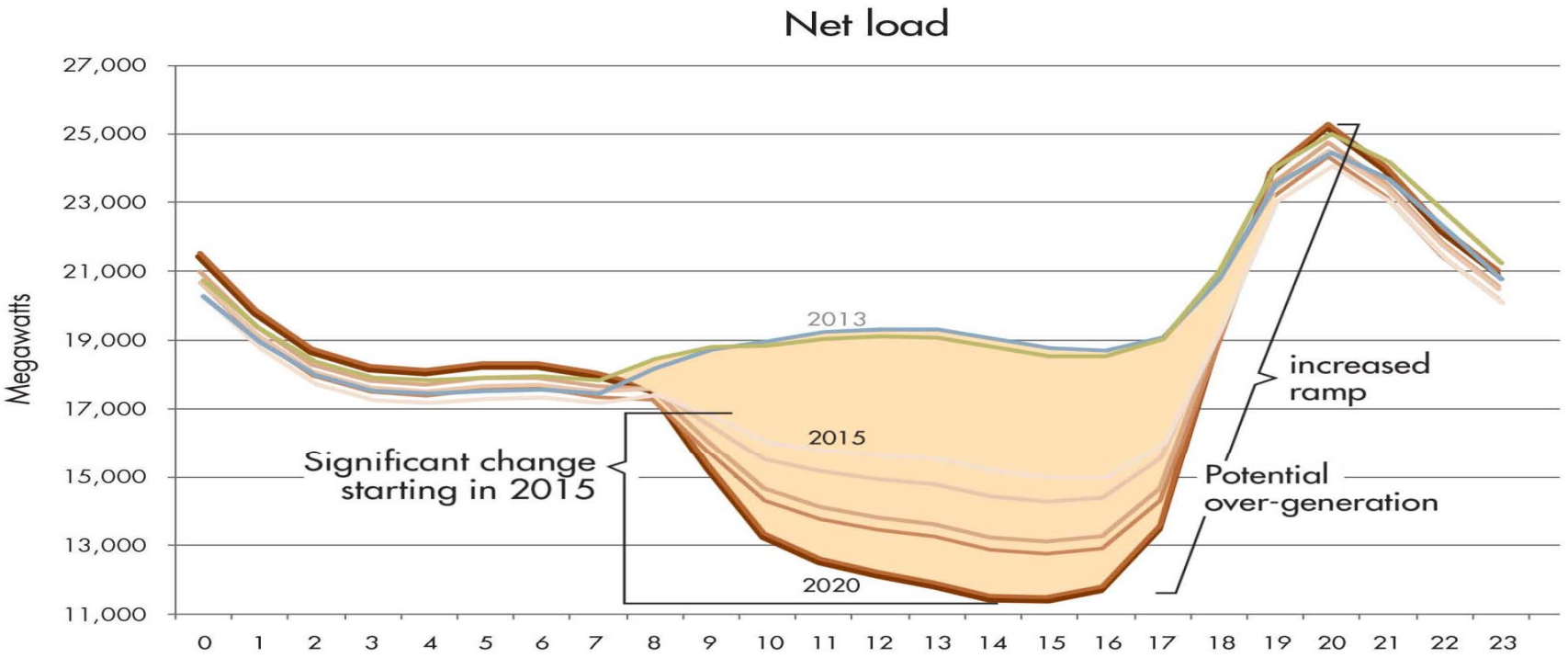
The “Duck Curve”



- Shows California load net of solar and wind resources on a typical March day
- Significant increases in solar and wind may shift system peak, resulting in steep evening ramp and need for flexible resources

Source: CAISO, 2013

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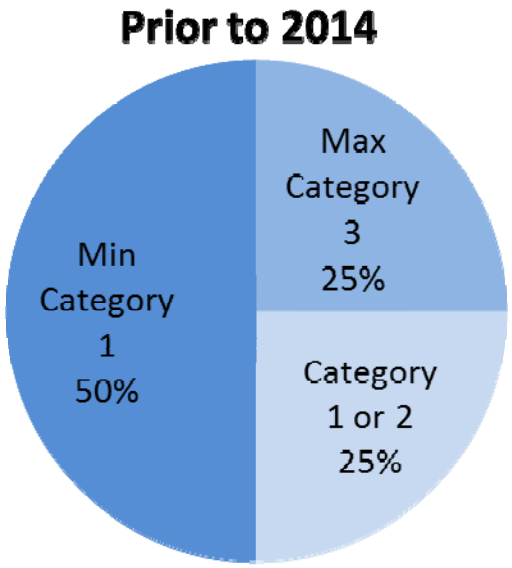
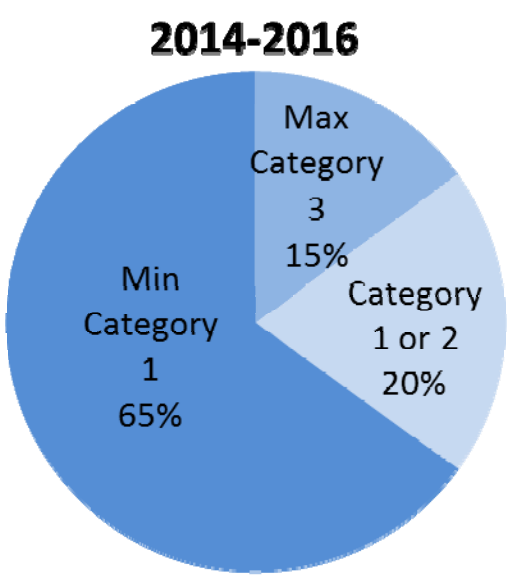
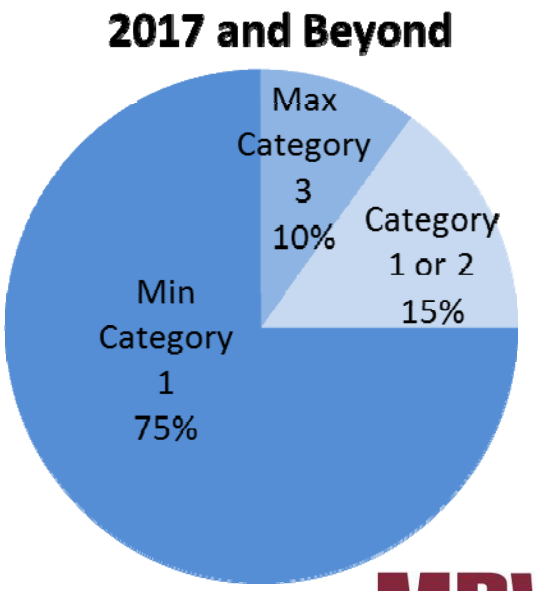
Challenges for Out of State Renewable Providers

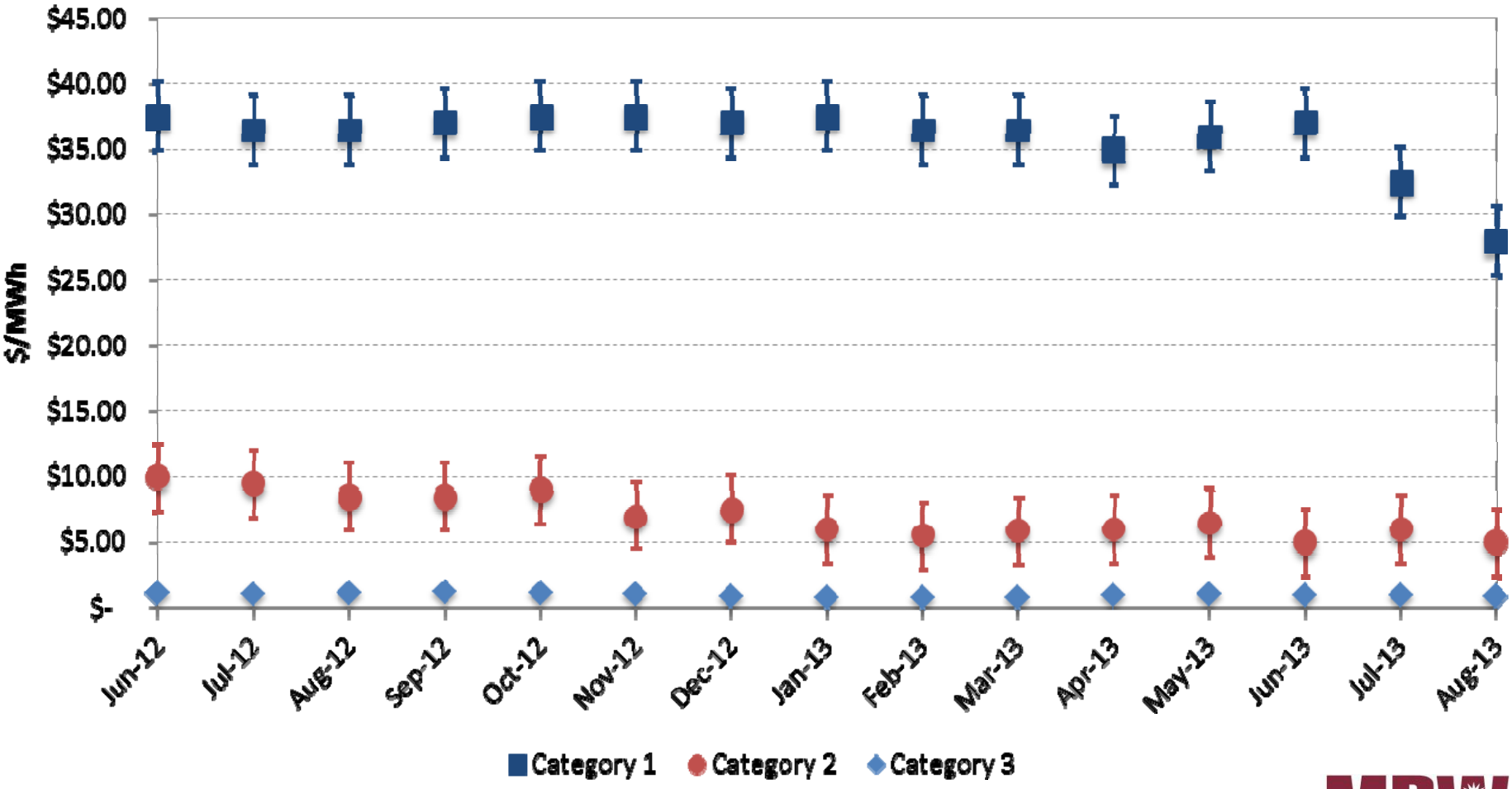
- Categories for RPS Compliance
  - Category 1: Direct connection, scheduling without substitution, or dynamic transfer to a California balancing authority
  - Category 2:Firmed and shaped resources delivered into a California balancing authority
  - Category 3: Other resources and unbundled RECs







Market Price for Renewable Attributes by Category



Note: Prices shown are for renewable attributes only; they do not include energy
Source: Platt's Megawatt Daily

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Challenges for Out of State Renewable Providers

- Virtually all contracts since the new RPS requirements went into effect are Category 1 resources
- Very few out-of-state power purchases are expected to qualify as Category 1
  - Mesquite (AZ) contract with PG&E
  - Copper Mountain Solar II (NV) contract with PG&E
  - Silver State Solar South (NV) contract with SCE
- PG&E and SCE have not yet contracted any additional Category 2 or 3 resources
- SDG&E has purchased a small amount of Category 3 resources (RECs)
  - Details are not publicly available

Source: August 2013 RPS Compliance reports

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Potential Bumps in the Road

- Commerce Clause: U.S. Constitution, Article 1, Section 8
  - Bars states from erecting unfair barriers to interstate commerce
  - Renewable Categories in SB1X-2 sparked controversy
    - Do limits specified by SB 2(1X) regarding different categories of electricity discriminate based on state lines? If so, can any discrimination be justified by reasons other than economic protectionism?
    - In January 2012 Cowlitz County Public Utility District in Washington requested that the CPUC rehear its decision establishing the RPS categories, claimed most out-of-state generators will not qualify for Category 1 treatment and therefore the RPS rules discriminate against out-of-state generators in violation of the commerce clause
    - Several parties supported this filing but the CPUC has not yet issued a formal ruling
  - Renewable categories likely to cause ongoing legal uncertainty

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Potential Bumps in the Road: Many Large Solar Projects in Trouble

Project Name	Project Type	Capacity (MW)	Expected Date Online	Reason for Project Termination	Date PPA/Project Terminated
Calico Solar Project	Solar thermal	664	2017	PPA canceled	June 24, 2013
Hidden Hills	Solar thermal power tower	500	Third quarter 2015	Scheduling and transmission issues	April 3, 2013 (on hold indefinitely)
Rio Mesa 2	Solar thermal power tower, without storage	200	December 31, 2015	PPA cancelled	January 18, 2013
Rio Mesa 1	Solar thermal power tower, without storage	200	September 30, 2015	CPUC denied cost recovery	September 13, 2012
Siberia 1	Solar thermal power tower, with storage	200	December 31, 2016	CPUC denied cost recovery	September 13, 2012
Siberia 2	Solar thermal Power tower, with storage	200	December 31, 2016	CPUC denied cost recovery	September 13, 2012
Imperial Valley Solar 2	Solar dish Stirling system	750	2013	PPA cancelled	August 17, 2011
San Joaquin Solar Units 1 & 2	Solar thermal/biomass hybrid	107	First quarter 2011	Project economics and biomass supply	June 17, 2010
Blythe Solar Power Project	Solar PV; previously solar thermal	485 (reduced from 1000)	June 2018	PPA not renegotiated since project design modified to PV	Prior to June 2012

Total Capacity: 3,306 MW

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Questions?

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