



Regulatory Considerations for Your Storage Portfolio

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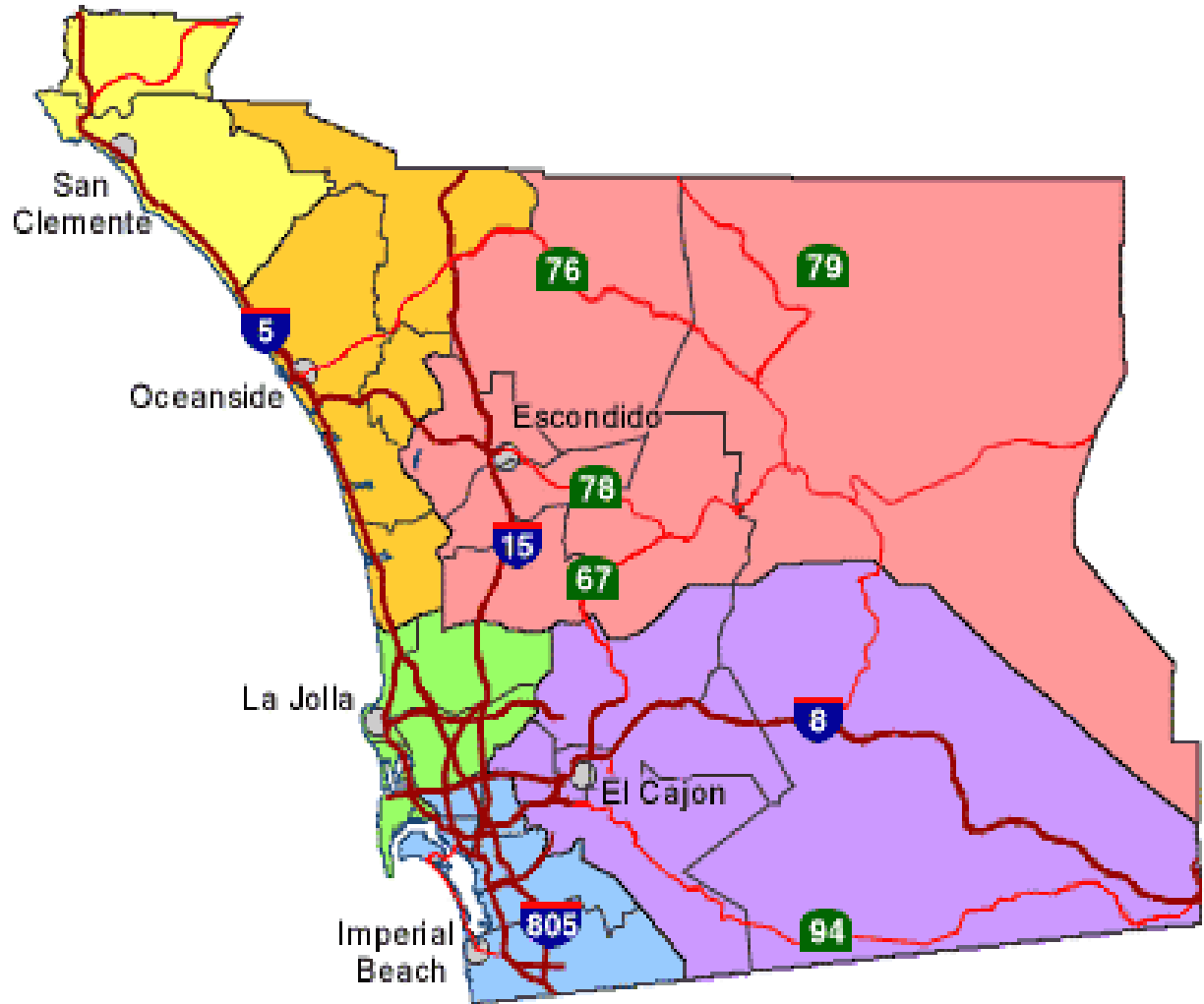
Electric Energy Storage
Phoenix, Arizona
January 12, 2011



SDG&E Service Territory



- San Diego Gas & Electric has customers in San Diego and Southern Orange counties in a service area that spans 4,100 square miles from Southern Orange County to the Mexican border.
- SDG&E has 1.4 million electric customers.
- SDG&E's customer mix is 89% residential and 11% commercial & industrial.



Regulatory Strategy



- View Storage as part of a larger Smart Grid Strategy
 - Storage is one part of a larger integrated strategy to modernize the grid.
- Outline key drivers of the investments in storage
 - What changes in the marketplace are leading to the need for storage
- Determine jurisdictional nature of investment
 - Need to know which regulators and what regulatory framework is applicable
- Make a business case for the storage applications
 - Articulate the value storage provide
 - The costs are clear and are quantified, benefits should be quantified

Case Study: SDG&E General Rate Case YTY2012 - Filed Dec. 2010



- Proposed Energy Storage in 2012 General Rate Case
 - Distribution Level
 - To address increasing penetration of PV on distribution system
 - Voltage regulation, frequency regulation, power intermittency, voltage flicker, deferment of capacity upgrades
 - Located on distribution circuits with high PV penetration
 - Planned installations of deployment over multiple years
 - Substation Level
 - To address centralized renewable variable generating sources
 - Voltage and Frequency regulation
 - Some off peak energy storage capability
- Requested 2012 Ratebase addition = \$54.9 million

Case Study: SDG&E General Rate Case YTY2012 - Filed Dec. 2010



Project will install electric energy storage in two forms:

- Distributed Community Energy Storage devices.
 - 50 Kw batteries installed in those circuits where the penetration of PV is 20%
 - 11 Circuits in 2011 and 14 Circuits in 2012
- Substation Energy Storage
 - Utility scale, size anticipated to be 1 MW or greater,
 - Installed to mitigate the effects of utility scale (up to 2 MW) PV projects that will be installed in various locations.
 - 4 MW to be installed in 2011 and another 4 MW to be installed in 2012

View Storage as Part of a Larger Smart Grid Strategy



SDG&E Smart Grid Program Request

- Renewable Growth
 - **Energy Storage (ES)**
 - Dynamic Line Ratings
 - Phasor Measurement Units
 - Capacitor SCADA
 - SCADA Expansion
- Electric Vehicle Growth
 - Plug-in Electric Vehicles
 - Smart Transformers
 - Public Access Charging Facilities
- Reliability
 - Wireless Faulted Circuit Indicators
 - Phase Identification
 - Condition Based Maintenance (CBM) Expansion
- Smart Grid Development
 - Integrated Test Facility

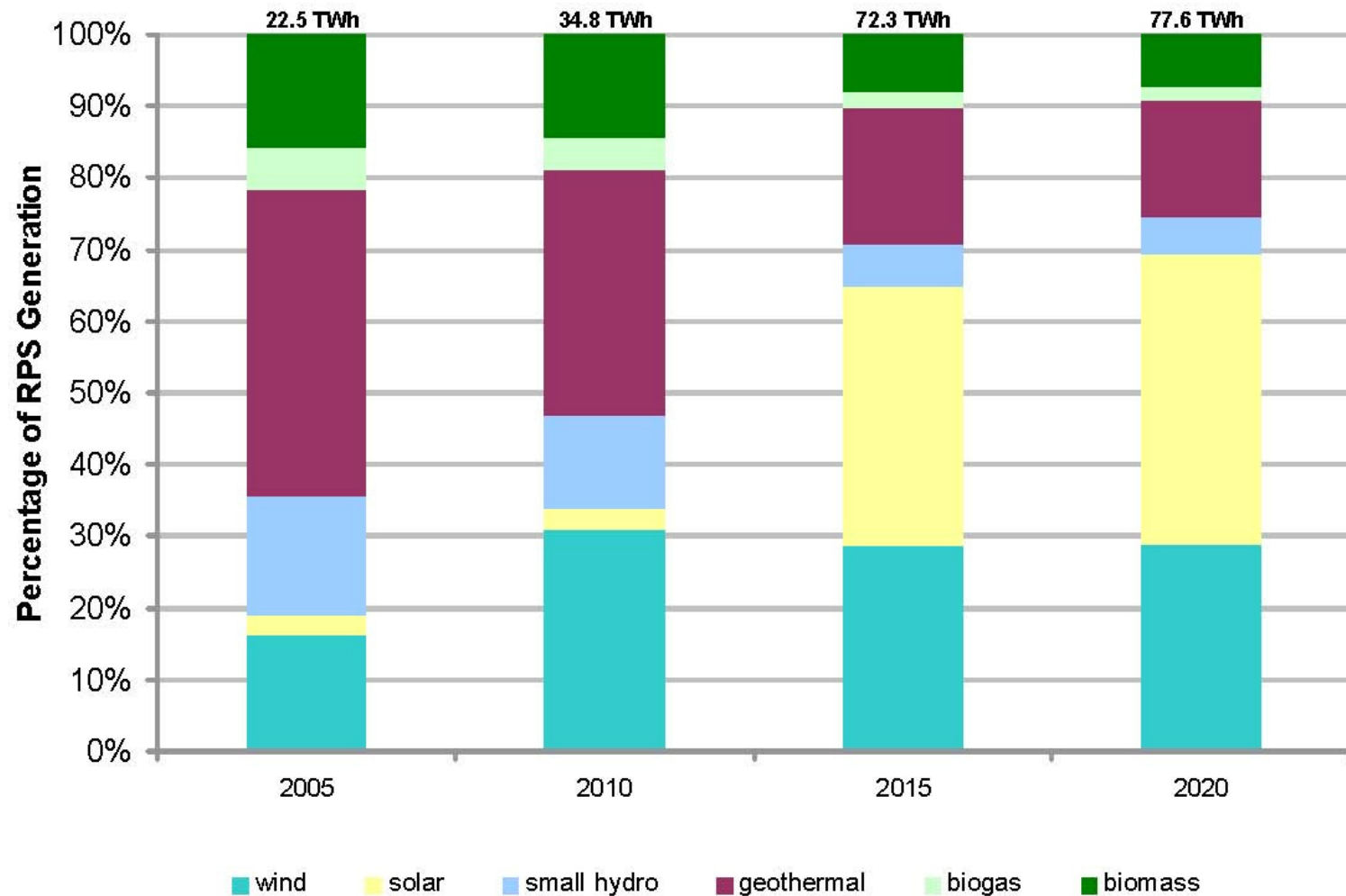
Storage is placed in context as one of several Smart Grid technologies being deployed to facilitate renewable energy growth and the integration of these renewable resources onto the Grid

Outline Key Drivers Of The Investments In Storage



- Renewable Energy Growth
- Renewable Energy Portfolio Change
- Variable Wind and Solar Generation
- Ramp Rates
- Growth of Distributed PV

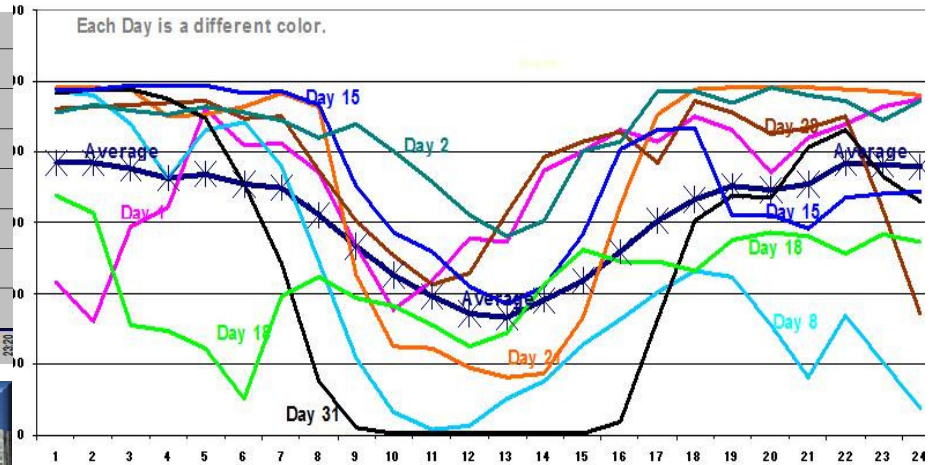
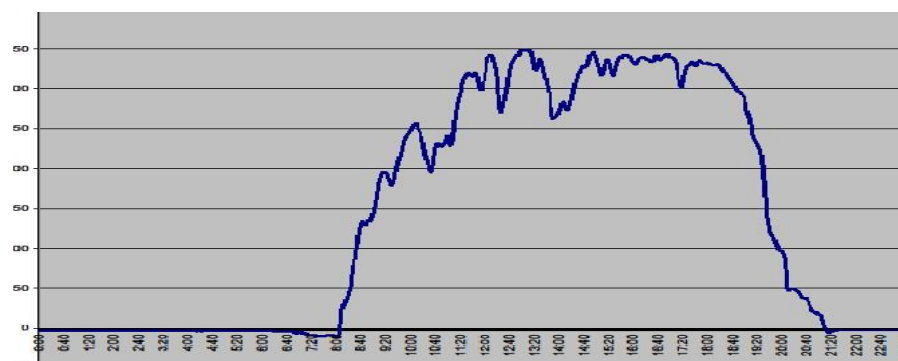
Drivers: Renewable Portfolio Change



Source: California Public Utilities Commission, 3rd Quarter 2009

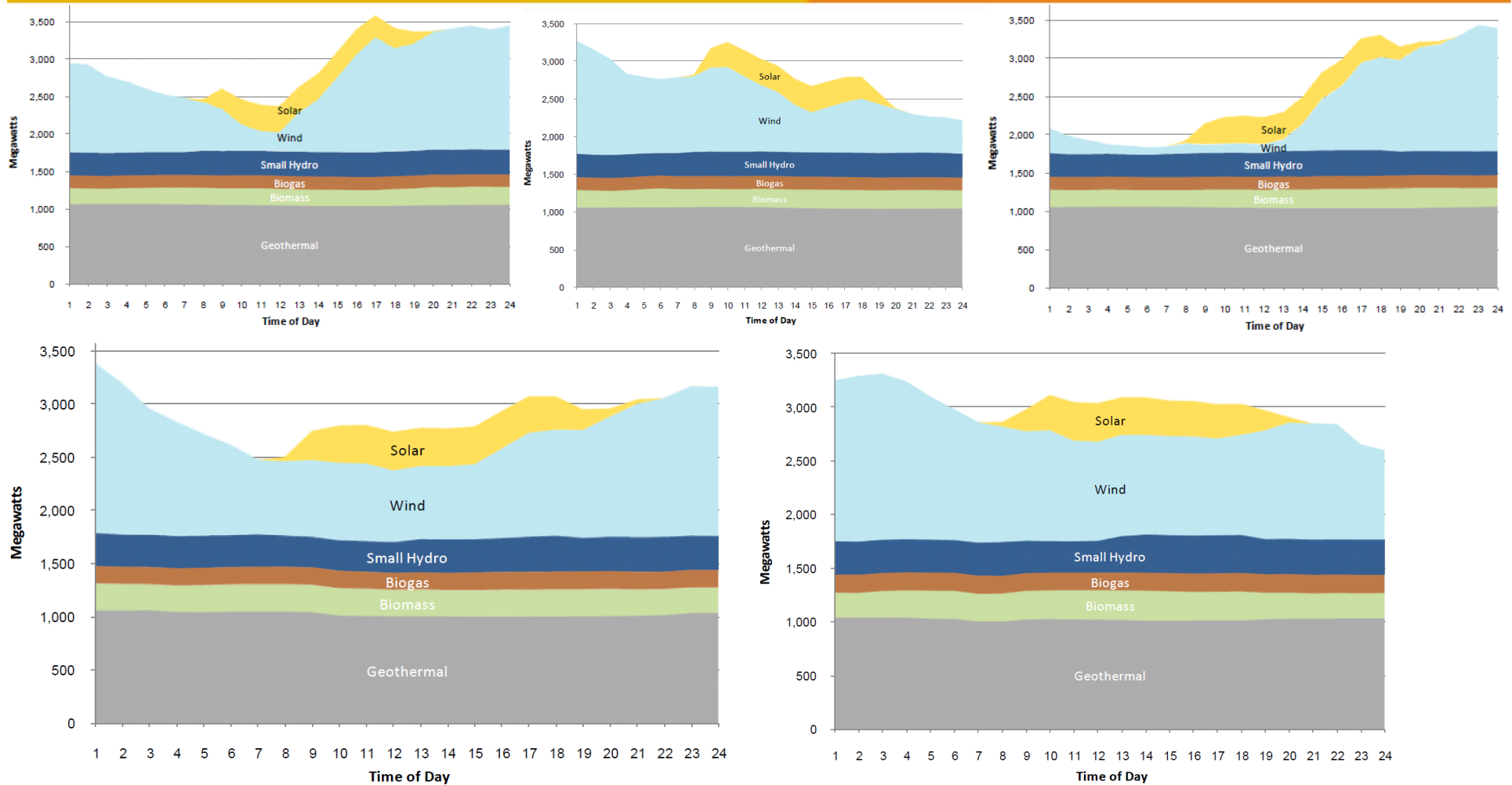
Drivers

Variable Solar and Wind Production



y^o utility

CA Centralized Renewable Production May 1 – May 5, 2010



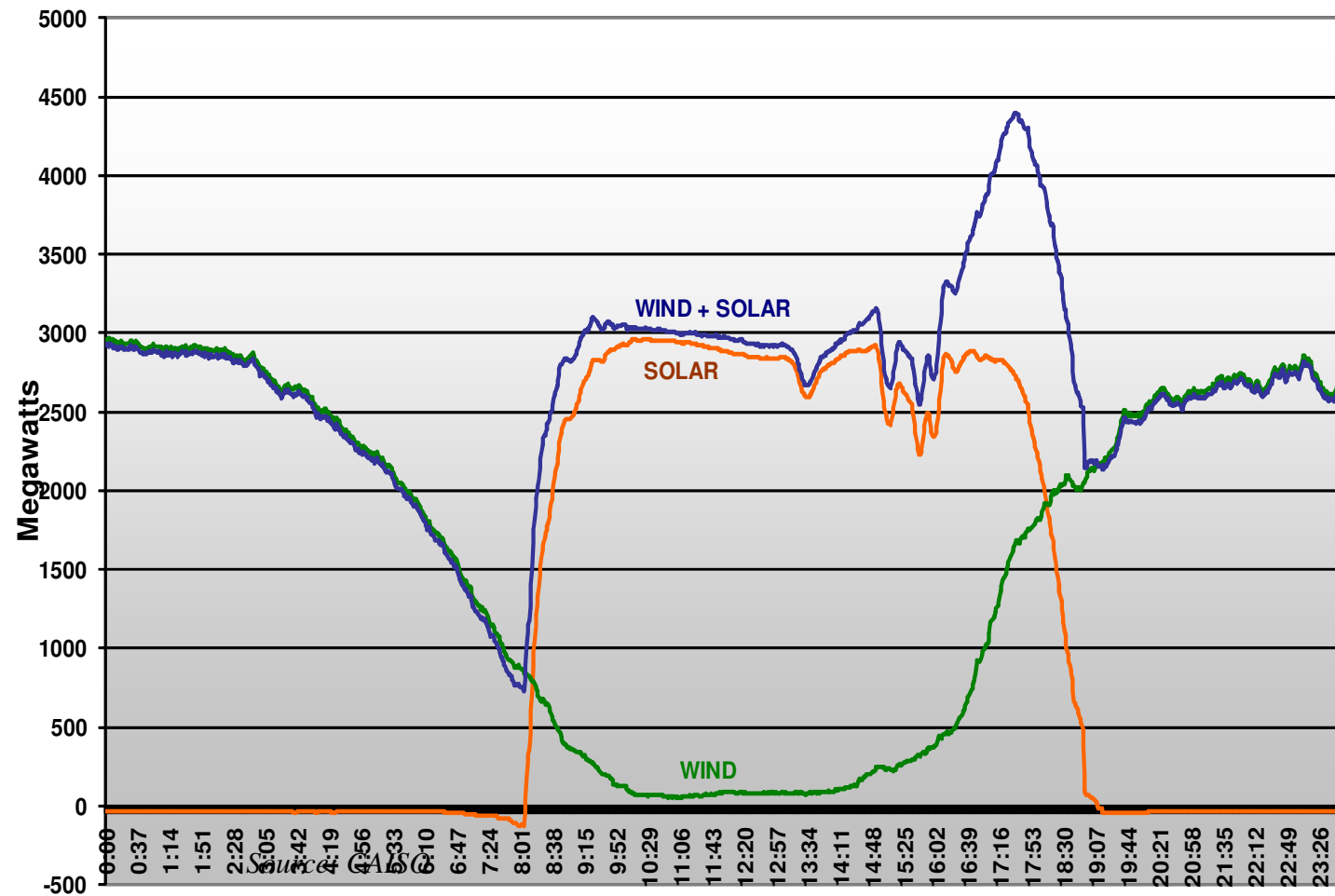
CA Centralized Renewable Production May 1 – May 5, 2010

Source: CAISO Renewables Watch Reports, May 2010

Drivers Ramp Rates



2013 - Wind + Solar
4000 MW Solar and 6000 MW WIND Nameplate Capacity

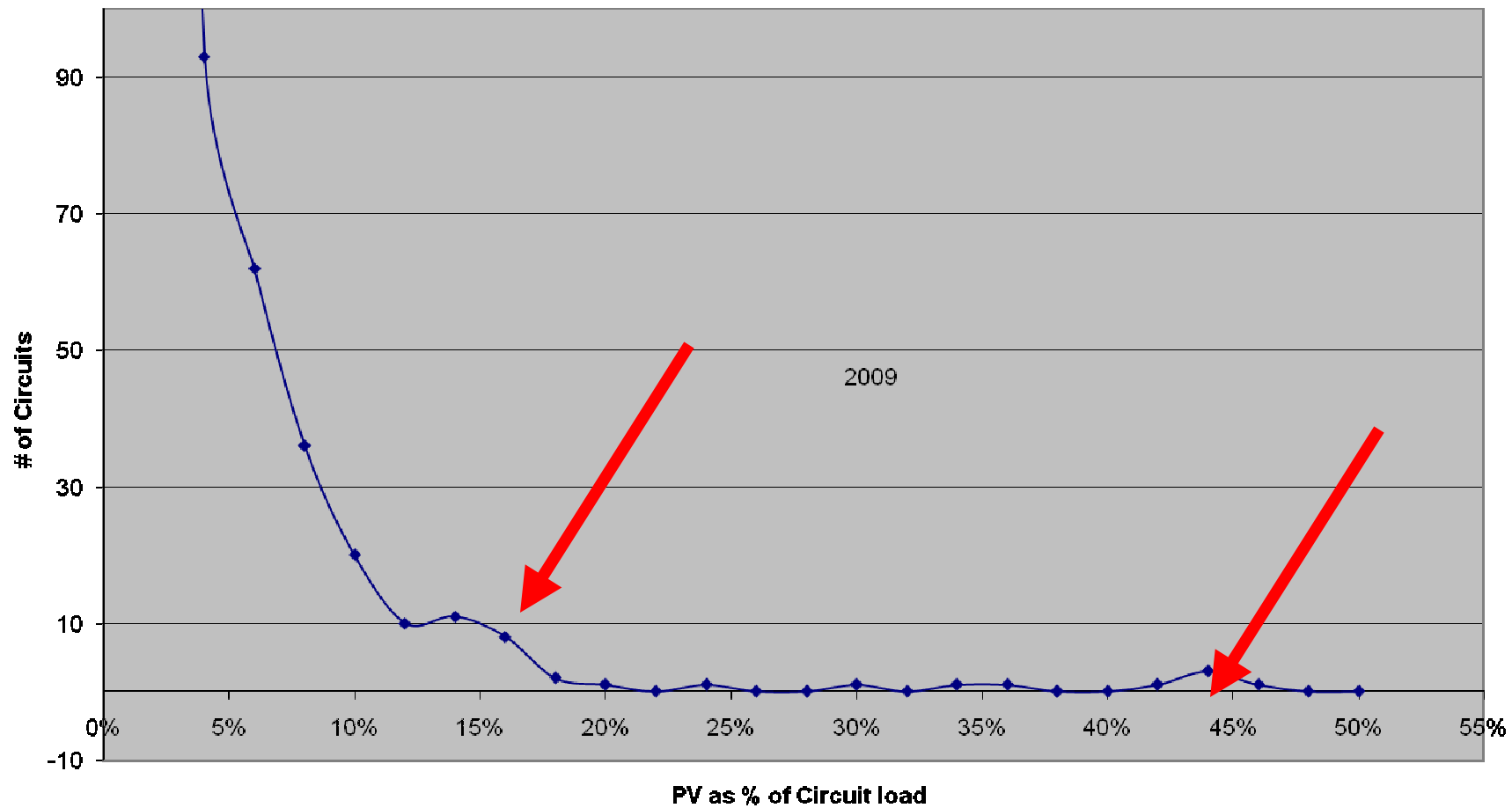


A  Semptra Energy utility

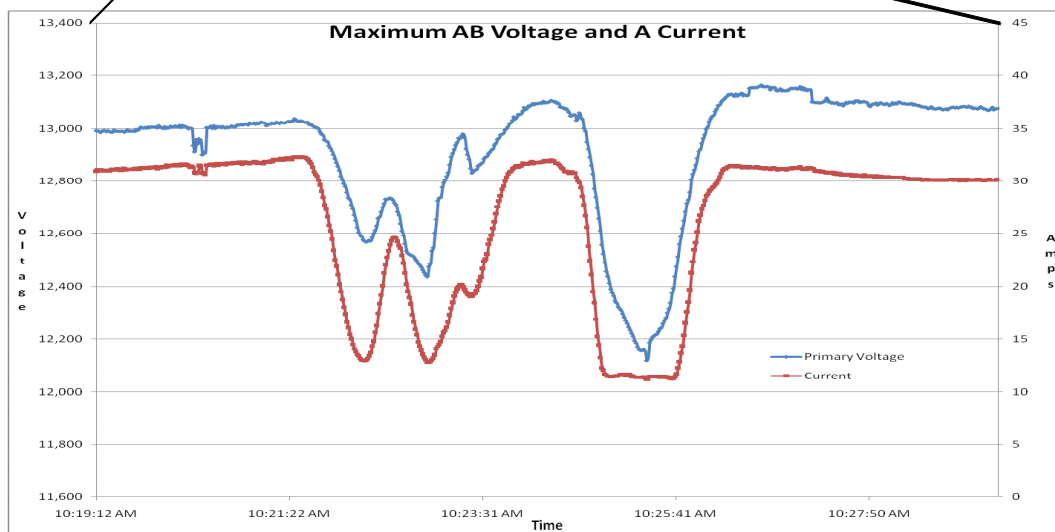
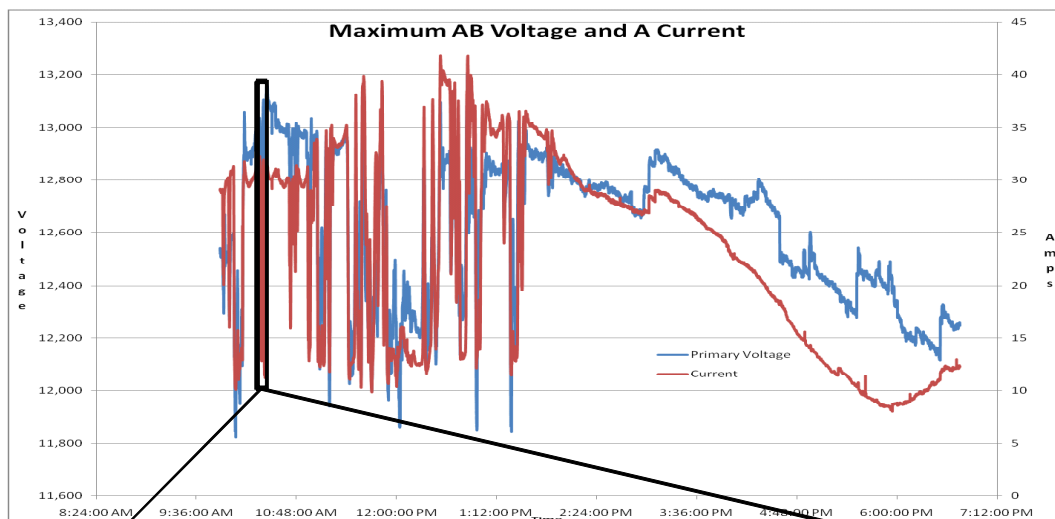
Drivers Distributed PV



PV Penetration 2009



Drivers Distributed PV



SDG&E instrumented a circuit with a high PV nameplate capacity at a time These Graphs show the impact of a 1 MW PV system on SDG&E's primary voltage for one day recorded with this instrumentation

Shows the impact of fog burning off on the output of the PV system and the commensurate changes in primary voltage during the day.

Magnified view, 10 minutes of one particular change in the PV system output data.

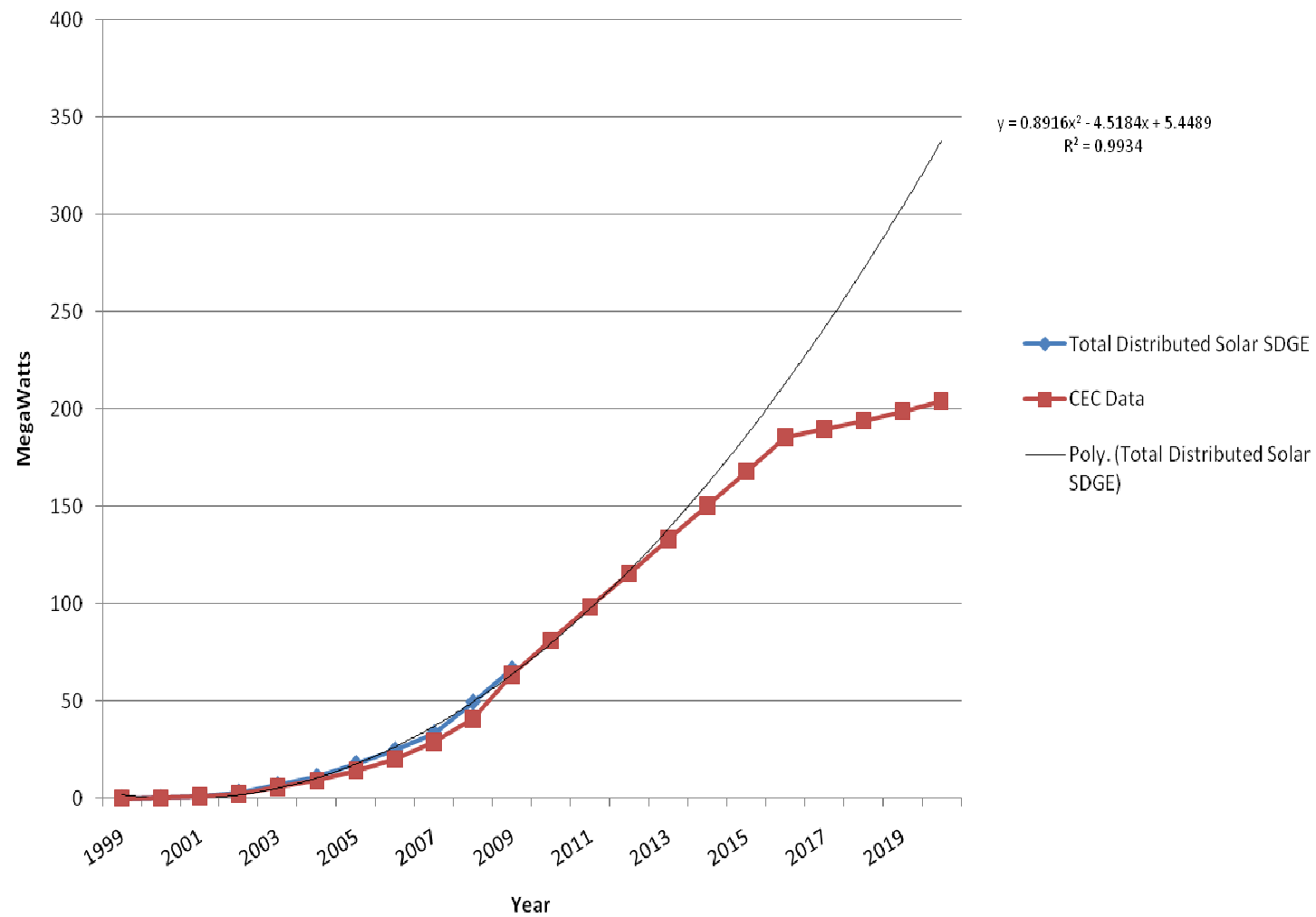
Operational issues noted from include: high primary voltage coincident with PV system output and an approximately 15% swing in primary voltage coincident with PV system output change.



Drivers PV Growth

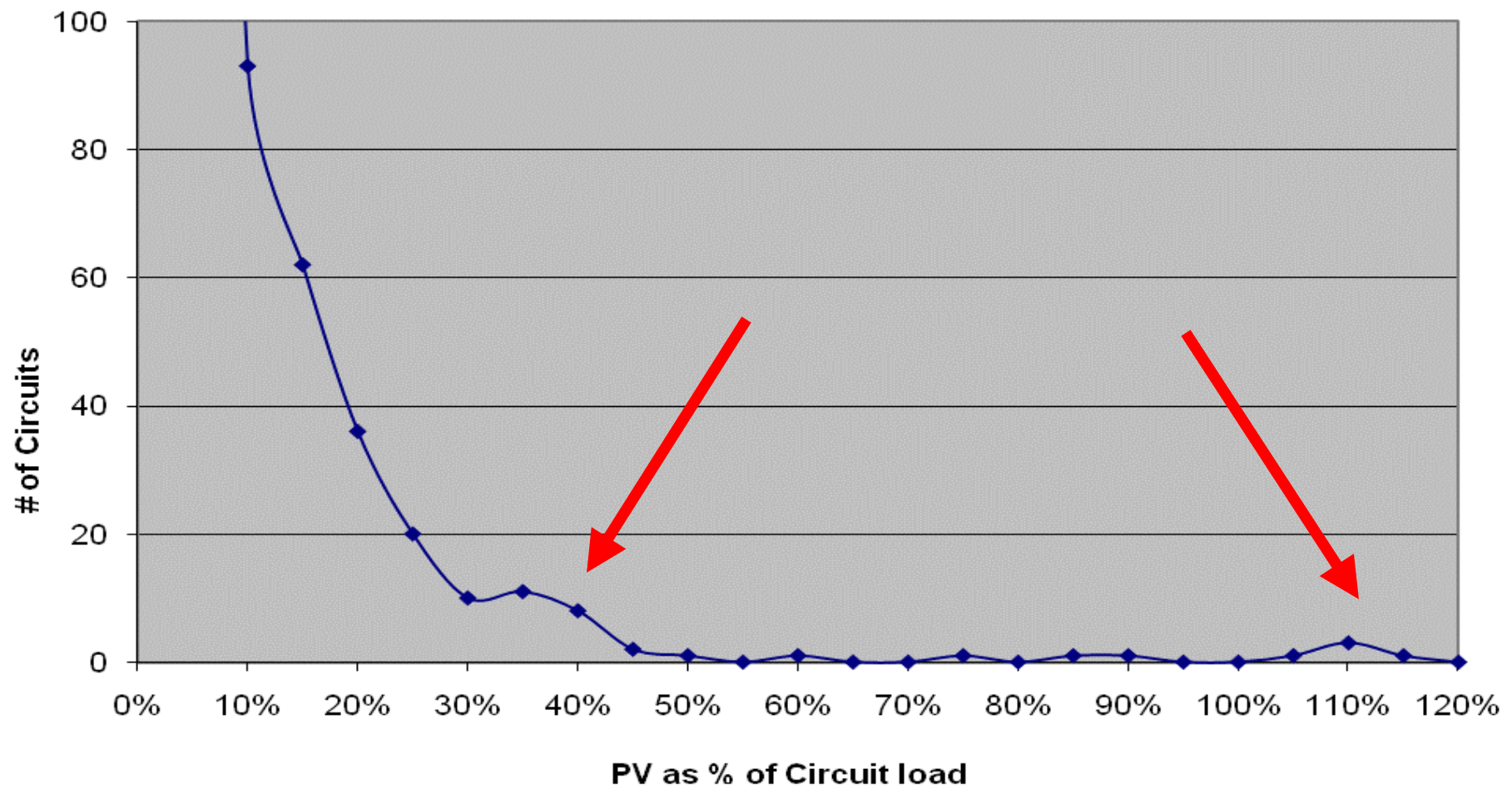


Total Distributed Solar Generation



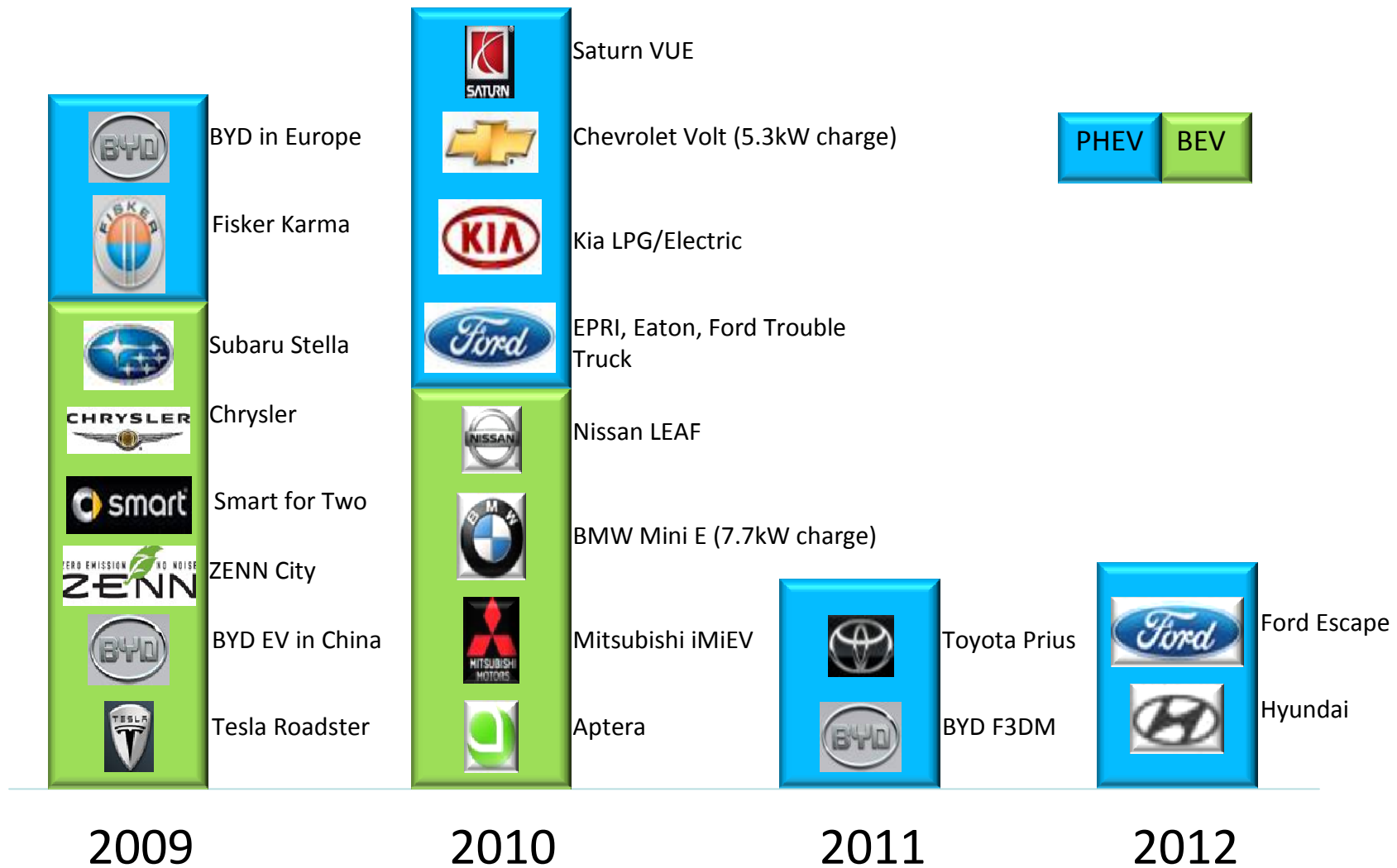


PV Penetration 2020



Drivers

Roll-out Schedule for PEVs



Determine Jurisdictional Nature Of Investment



- Investment is on the distribution system
 - State Regulated – California Public Utilities Commission
- Determined best procedural vehicle would be to include in the 2012 Test Year General Rate Case

Make A Business Case For The Storage Applications



Value Opportunities

- Grid operation to islanded system operation
 - Smoothing electrical transition
- Power quality
- Power leveling / regulation on grids with connected variable, renewal energy sources, such as Wind, PV, etc.
- Peak load shifting / shaving
 - As needed
 - Daily
- Energy storage for off-peak / on-peak energy arbitrage
- Energy regulation / ancillary services related to CAISO operations
- T&D capacity deferral

Questions?



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