



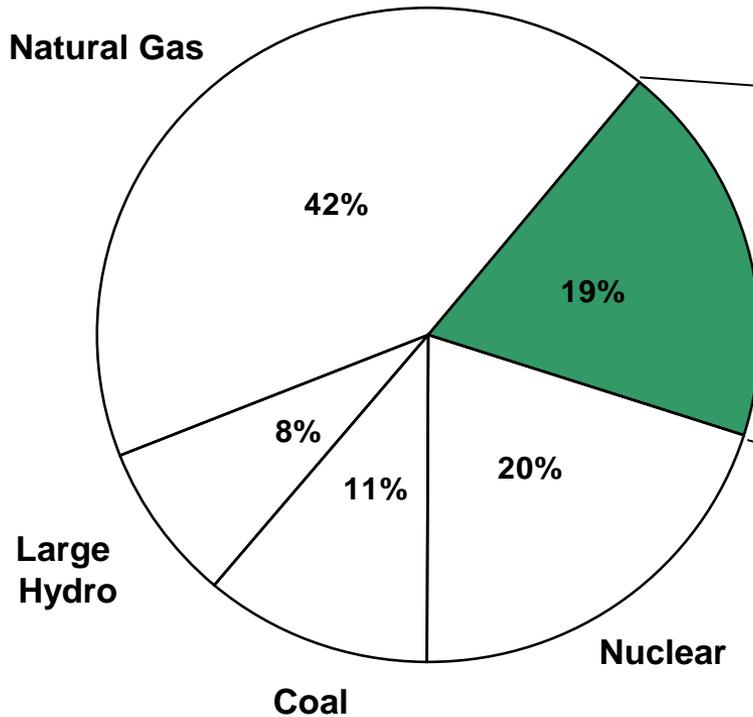
# **Southern California Edison Approach to Renewable Integration**

**June 7, 2011**

# SCE's 2010 Resource Mix

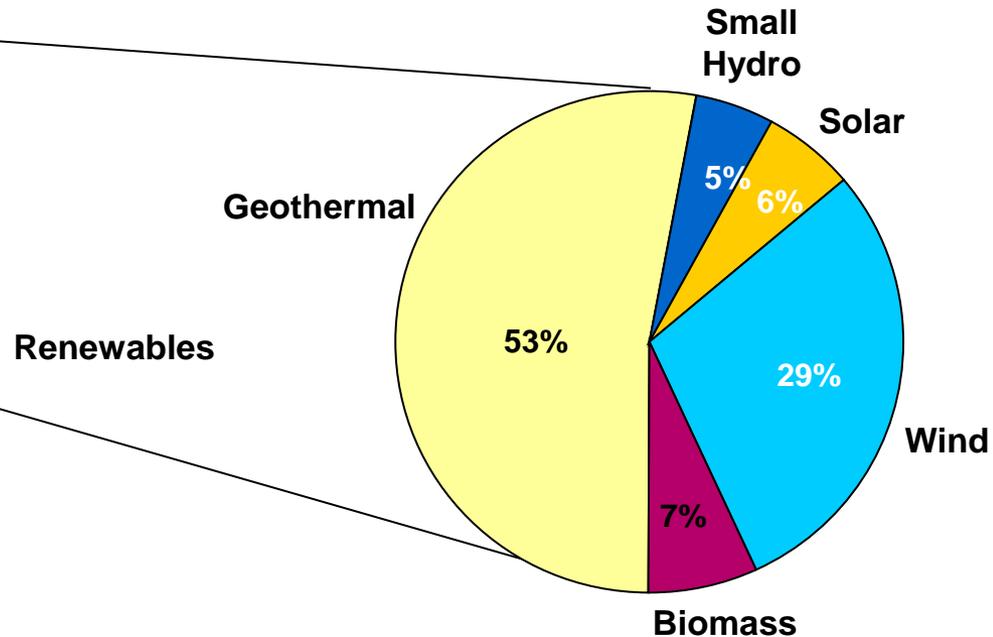
## All Resources

100% = 75 billion kWh/yr



## Renewable Resources

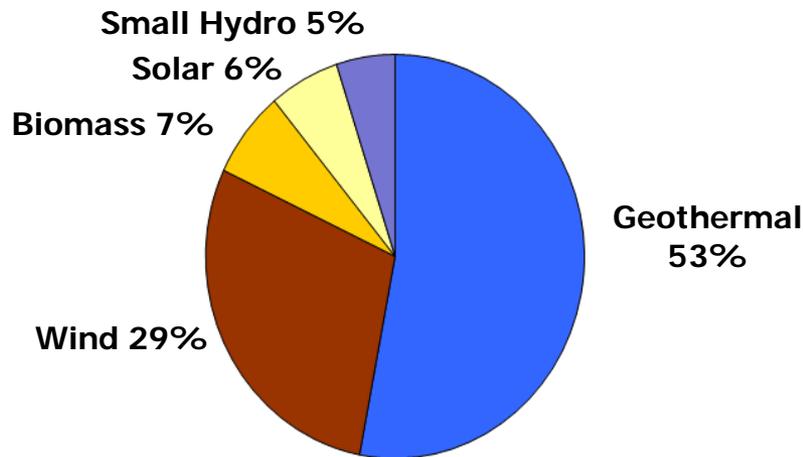
100% = 14.5 billion kWh/yr



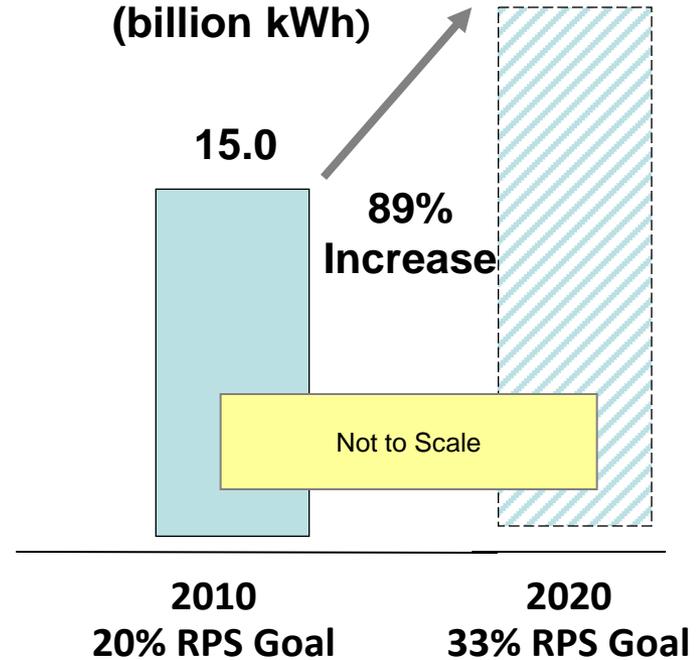
**California RPS goal: 20 percent of customers' energy needs from eligible renewable resources by 2010**

# SCE's 2010 Renewable Generation

**Actual 2010 Renewable Resources**  
**14.5 billion kWh**  
**19.4% of SCE's portfolio**



**Renewable Resources** 28.3  
 (billion kWh)



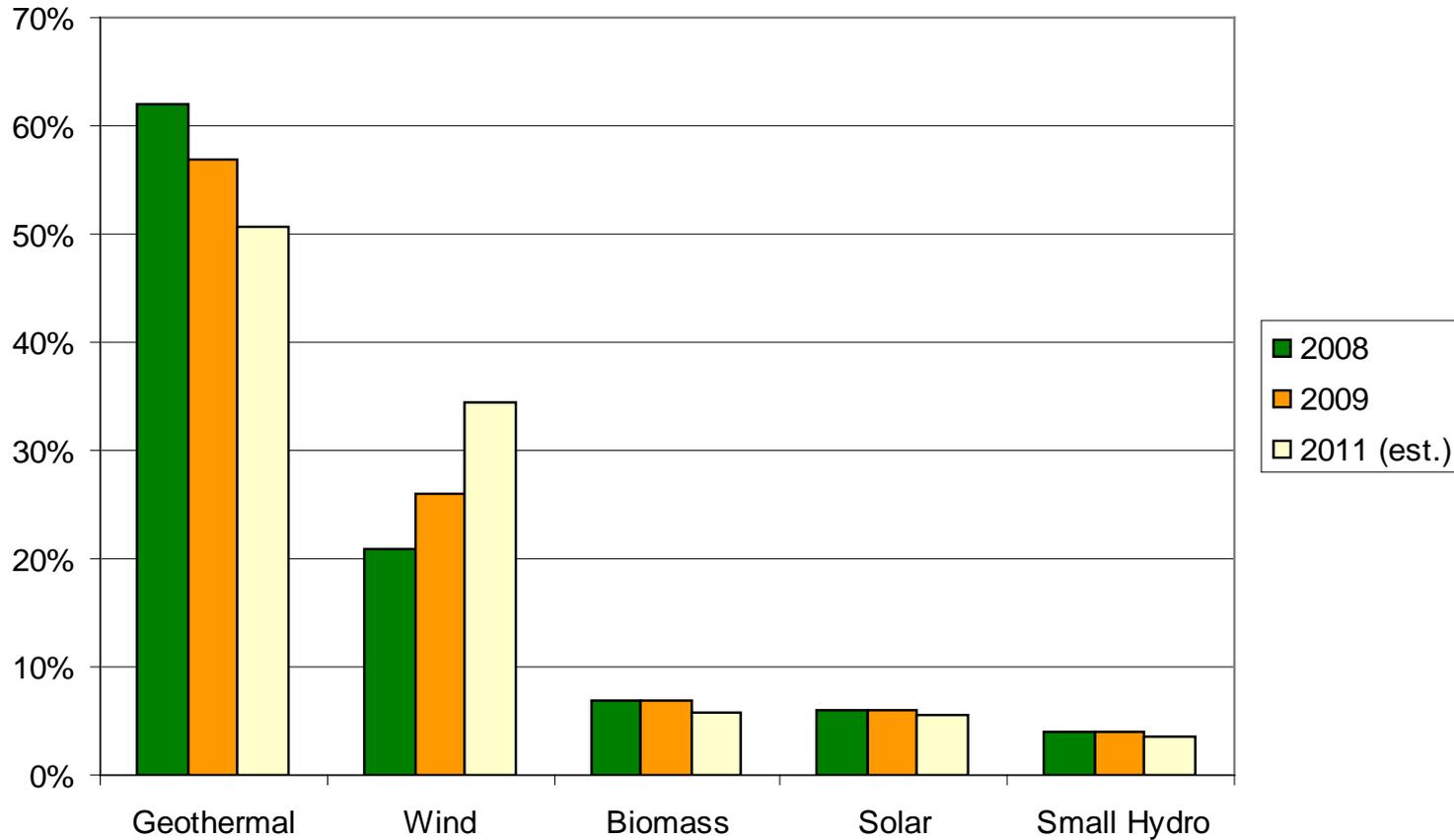
## SCE's 2010 Renewable Energy Goal

While energy deliveries may not have reached 20 percent in 2010 due to transmission and project development issues, contracts are in place to meet 20 percent of customers' energy requirements with renewable resources.

## SCE's Compliance with 2010 Renewable Energy Goal

SCE will demonstrate compliance using actual deliveries, banking and earmarking.

# SCE's Changing Renewable Resource Mix

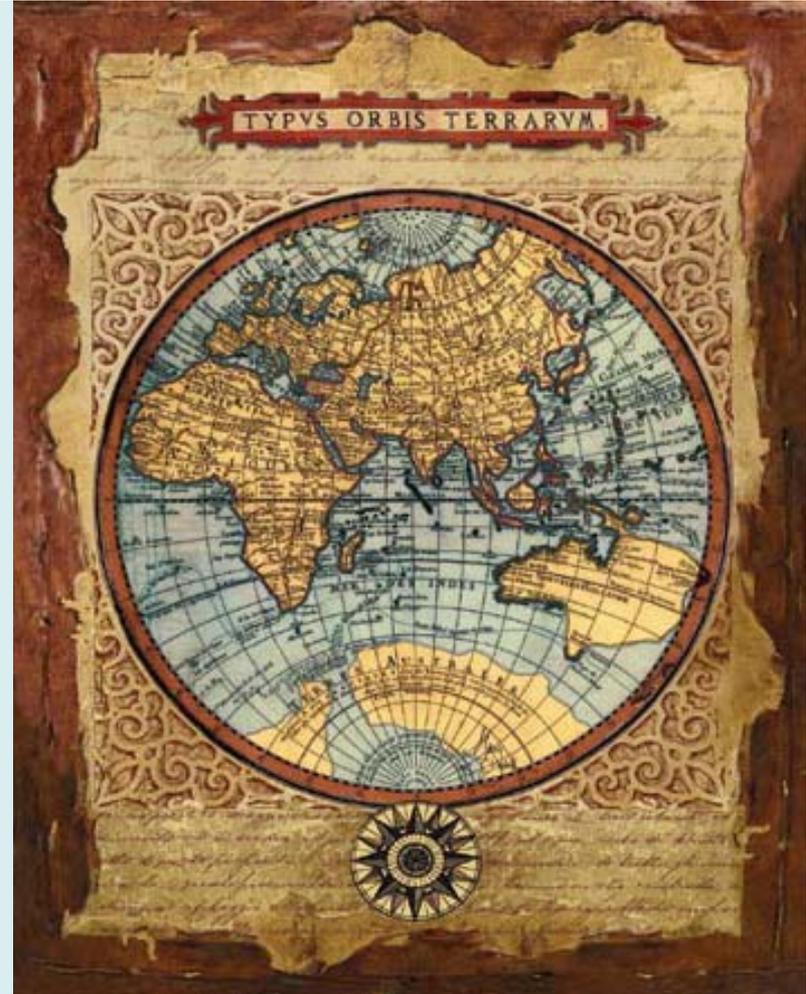


# Serving Load: “Ye Olde World”



Historically, utility operations focused on serving variable load reliably

- Serving load was the goal, all integrating services (e.g. Ancillary Services) focused on that end
- Load pays for everything
- We have been doing this for 100+ years & have a good idea of how to do this efficiently and reliably



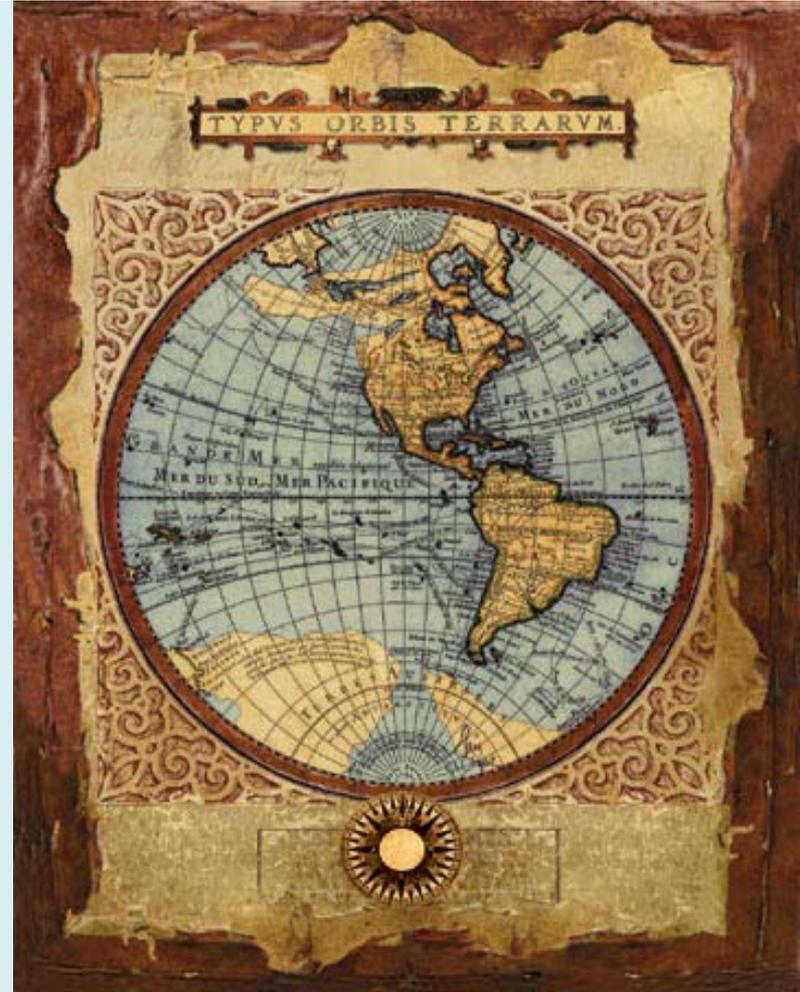
# Renewable Integration: The “New World”



Variable Energy Resources (VERs) is a paradigm shift requiring a break in 100+ years of traditional thinking.

How do you integrate VERS efficiently and reliably?

- What services are needed for integrating load. Load should bear costs.
- What services are needed for intergrating VERS? VERS should bear costs





# Renewables Integration Principles

- **Procurement:** CAISO/BA should Centrally procure integration services and resources.
- **Cost Allocation:** Allocate integration costs to all sources causing the operational challenges.(Allow Grandfathering for intermittent generators with existing off-take PPA's to mitigate seller impact but apply to all new intermittent generators)
- **Cost Allocation Metric:** Assess costs based on rate and magnitude of change in a source's output and the uncertainty or unpredictability associated with such fluctuations or other quantifiable metrics.
- **Technology Neutral:** No technology specific carve outs for cost allocation or market solutions. Charges should be based on contribution to the problem and revenues should be based on contribution to the solution. As an example, no surcharge for wind vs. solar and no extra payment for battery vs. flywheel.
- **Self-Provision:** Allow sources the option to Self-Provide Integration services.

# Market, Product Review & Potential Redesign

- **Redesign Timing:** While impacts to the CAISO grid may be years away, the time is now to assess and plan for intermittency issues.
- **Study, Study, Study:** Introduce market and product improvements only after thoroughly studying the effects of increased intermittent generation and clearly identifying specific needs and goals.
- **Market Efficiency:** When designing improvements, ensure that market efficiency is maintained without relying too much on manual interventions to the market solutions.



# Recent CAISO Renewable Developments

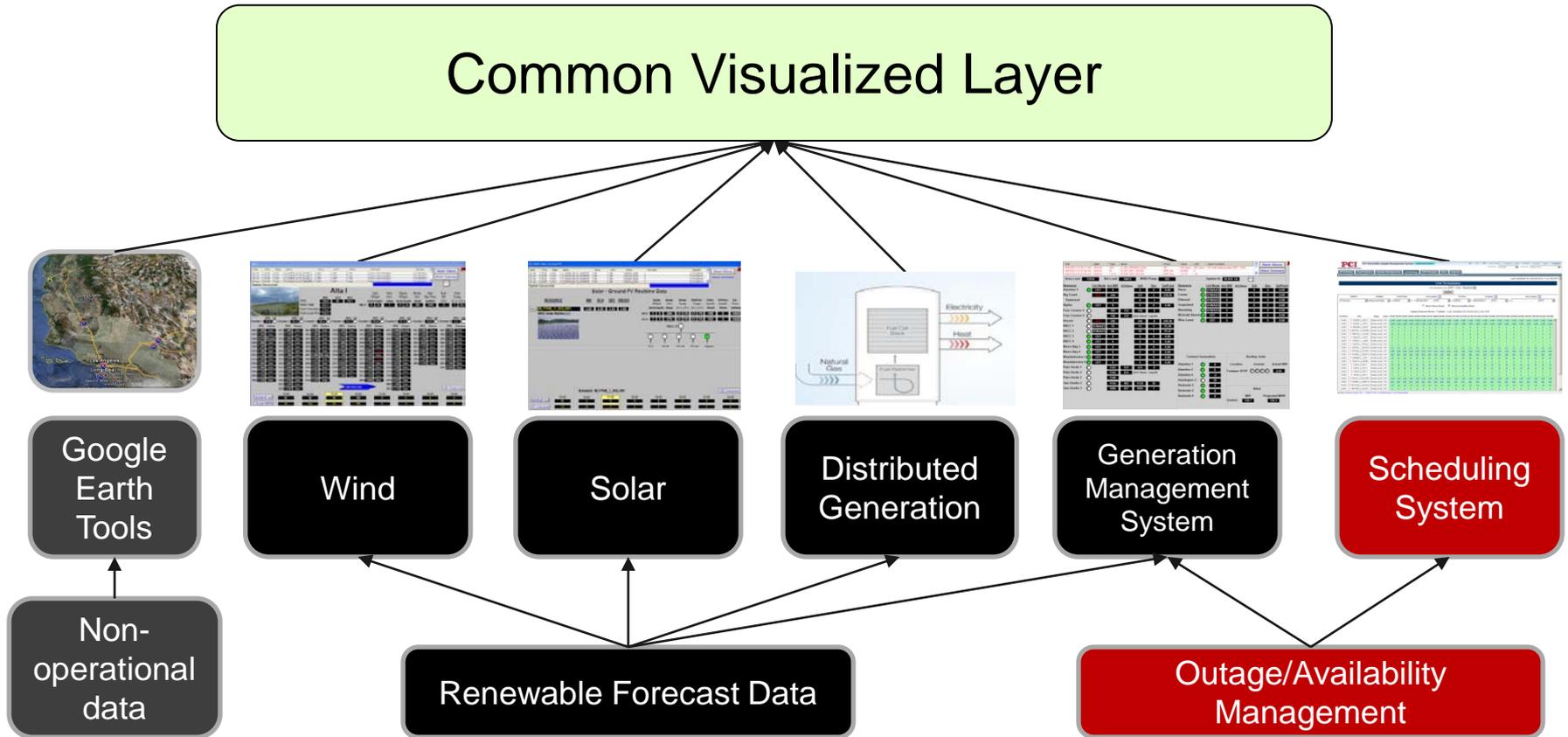
- April 12, 2011 California's Governor Brown signed SB X 1 2
  - Mandates a 33% Renewables Portfolio Standard
  - Recent CAISO studies translate this to between 11,000MW to 17,000MW of renewables in the CAISO
- CAISO preparing tariff language to allow batteries and flywheels to sell regulation
  - Studies indicate Regulation requirements expected to increase dramatically
- CAISO Renewable Integration: Market and Product Review (RIMPR) Phase 1:
  - Transitioning away from wholesale market subsidies for wind
    - Participating Intermittent Resource Program (PIPR) restricted or eliminated
  - Lowering the bid floor to provide greater incentives to reduce unscheduled generation
    - Current bid floor is -\$30/MWh, CAISO proposes -\$300/MWh

# Recent CAISO Renewable Developments

- CAISO RIMPR Phase 2 – developing a roadmap for comprehensive market changes.
- Items for consideration include:
  - New spot market products (Flexible ramping, minimum operating capacity)
  - Allocation of renewable integrating costs
  - Modification to intra-day market settlements
  - Long-term procurement (e.g. new generation build)
  - Pay-for performance regulation
  - Forward capacity markets
  - Forward reserves markets
- Redesign roadmap expected by the end of 2011
- Introduction of “Flexible Ramping”
  - Constraint to ensure CAISO has enough real-time operating flexibility to deal with uncertainty and forecast errors
    - Forecast errors expected to increase with additional intermittent resources

# Portfolio Situational Awareness

Southern California Edison's goal is to have wide-area situational awareness through a common visualization layer that integrates the results of multiple applications



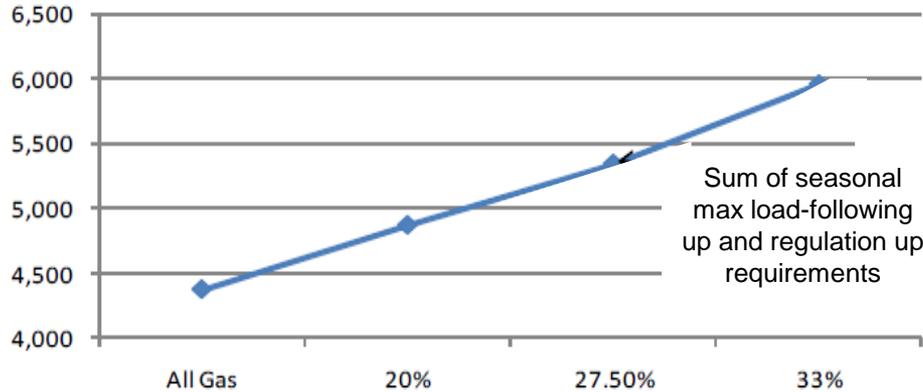


## Vision for Demand Response Resources

- SCE envisions DR as a means to aid the system through ancillary services
  - AS is likely the strategy to assist in integrating intermittent renewable resources.
- For DR to be sustainable, the solution needs to conform to the following:
  - The natural capabilities of demand response
    - Frequency of events
    - Duration of events
  - The natural use of demand response
    - Not integrated into markets
    - Integrated with wholesale markets
  - Demand response capacity
- Demand response can be a viable substitute in the supply spectrum
  - Use-limited resources have value
  - DR capacity manageable over the short run

# Renewable Resources Integration

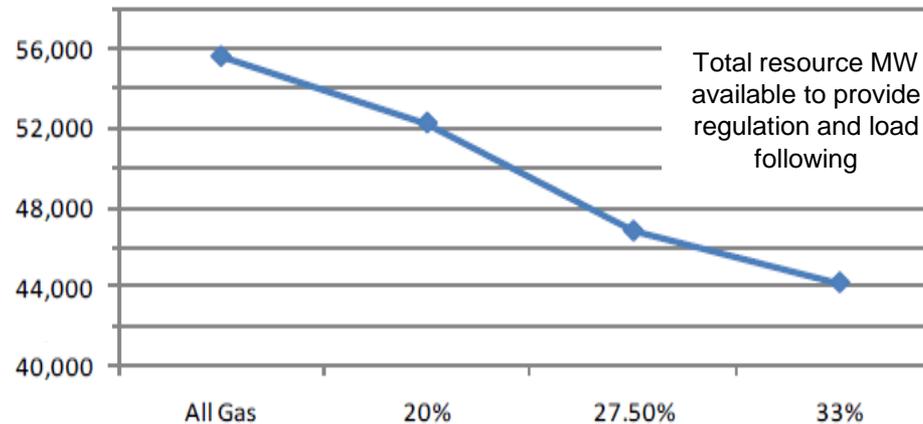
**Flexible Resource Requirements in 2020**



Sum of seasonal max load-following up and regulation up requirements

More renewable generation **increases need** for flexible resources

**Fleet Flexibility in 2020 MW, CA-wide**



Total resource MW available to provide regulation and load following

However, higher proportion of renewable resources **limits the overall fleet flexibility**

**Integration of renewable resources will be a driver of new conventional generation need**

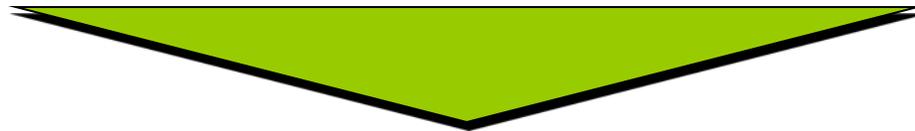
- Increasing renewable resources leads to increased operational need and less flexibility to meet need
- CPUC and CAISO must collaborate to ensure system has adequate resources to meet reliability standards

*Source: CPUC Workshop on Renewable Integration Model Methodologies (11/30/2010)*



## Decreased Generator Revenues in Wholesale Markets

- Increased production of wind and solar energy will lead to displacement of energy from thermal generation and will lower market clearing prices.
- Increased supply variability results in the existing thermal generators cycling more frequently and operating at lower capacity factors.



**The CAISO 20% Renewable Portfolio Standard study identifies a significant drop (15-40%) in energy market revenues for thermal resources, in all hours of the day in all seasons.**