



# Harvard Electricity Policy Group

## Transmission Rights, Transmission Wrongs, and Renewable Resources Conflicts Over Access, Pricing, and Jurisdiction

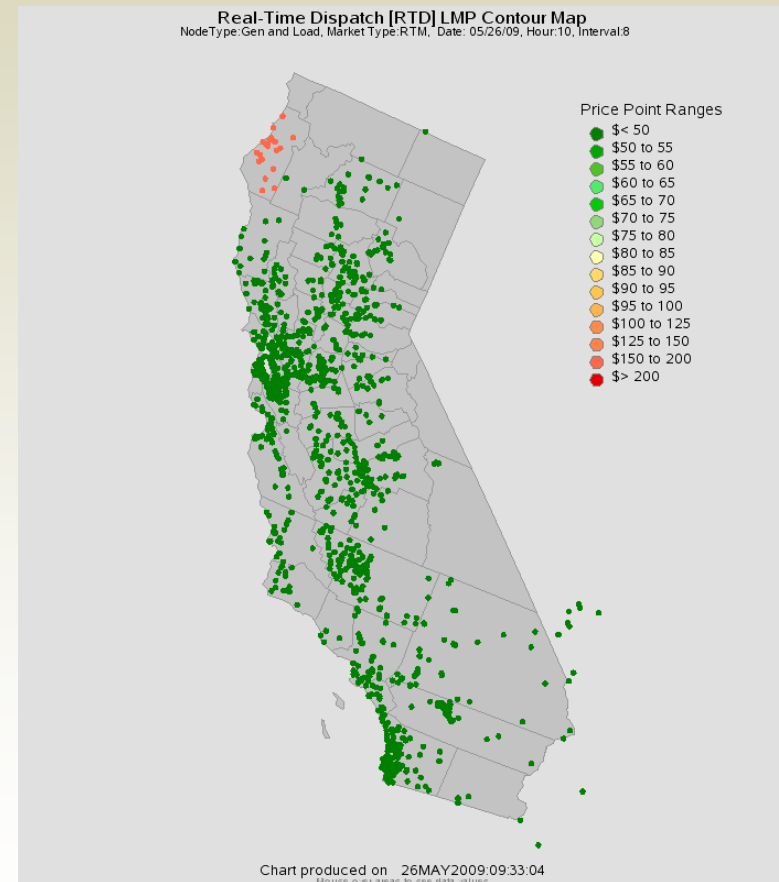
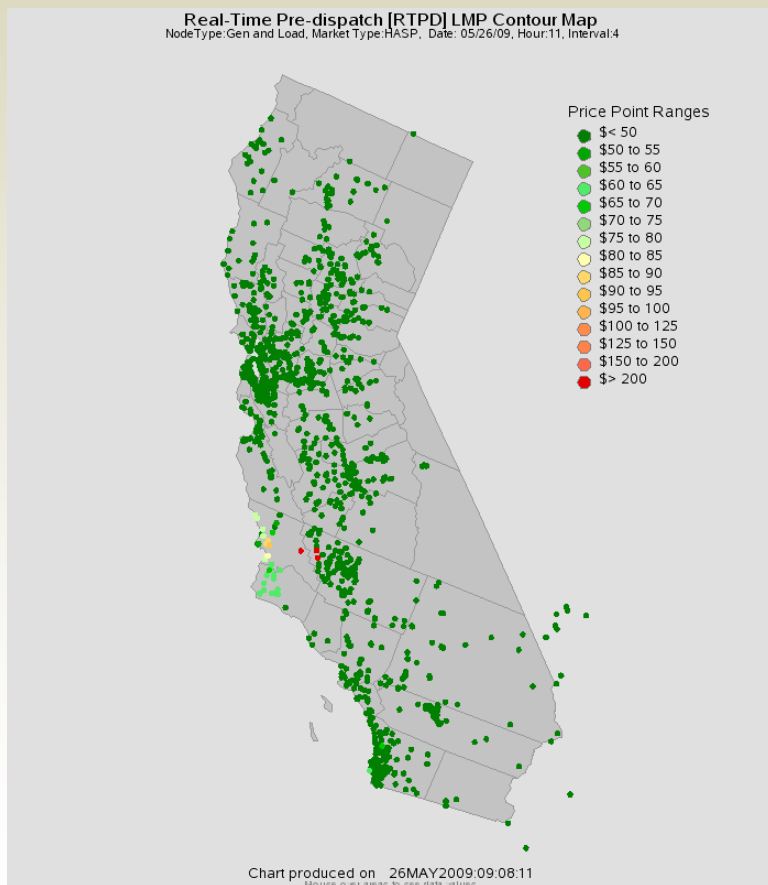
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May 28, 2009

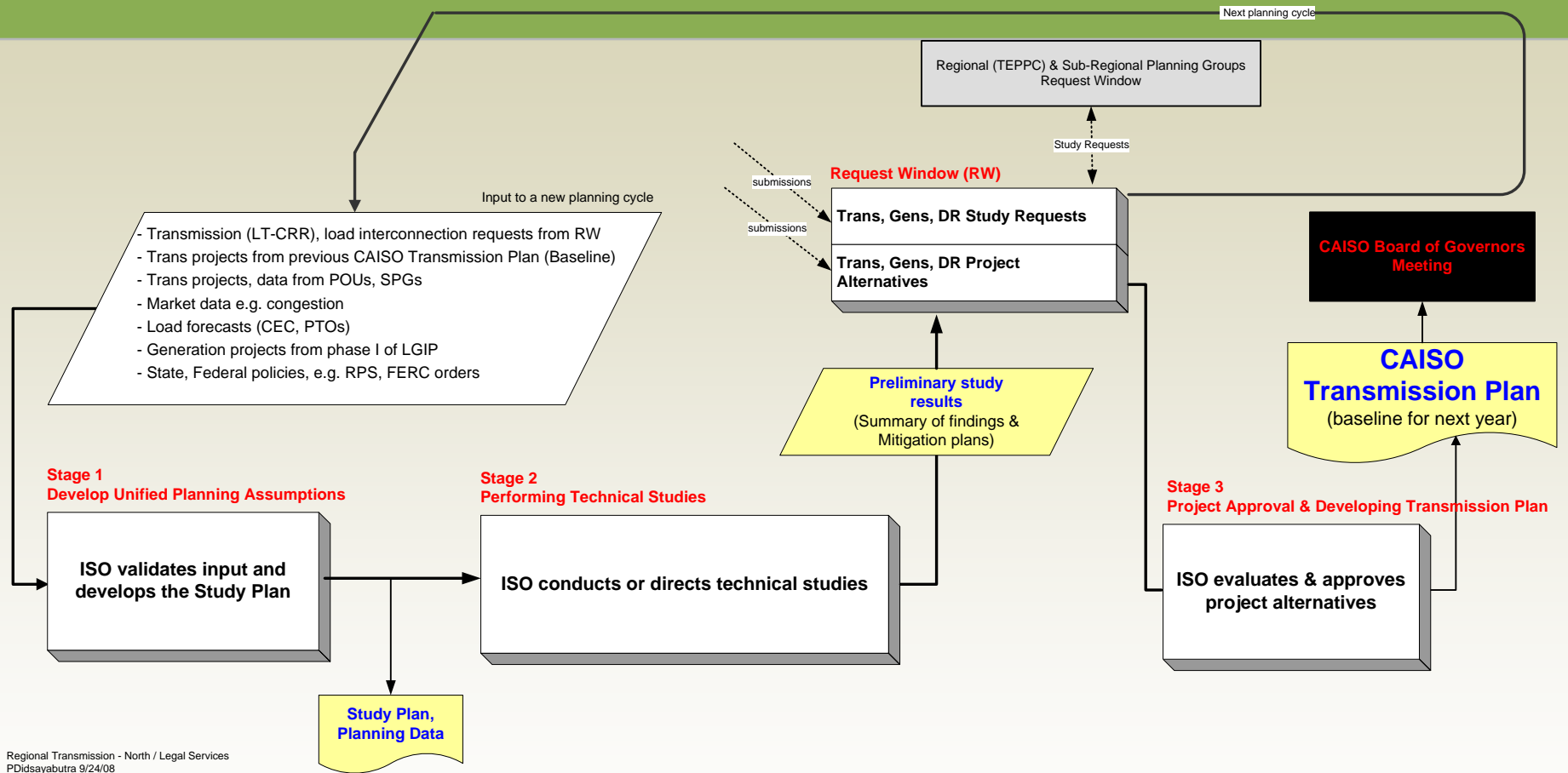
# Putting Nodal Pricing To Work

- Nodal signal assists operators to take actions that are synergistic with system operator needs (also reduces use of ancillary services)
- Nodal prices signal the need for new generation or demand response at the right locations
- Nodal price differences between points on the grid signal the need for transmission upgrades to relieve the congestion
- The appearance of insufficient transmission infrastructure is a symptom of a lack of pricing – generation, transmission and demand-side can all compete to relieve system “bottlenecks”
- Policymakers have clear information to support decisions – or do they?
- Should policy makers take special steps to reduce barriers to the development of renewable generation?

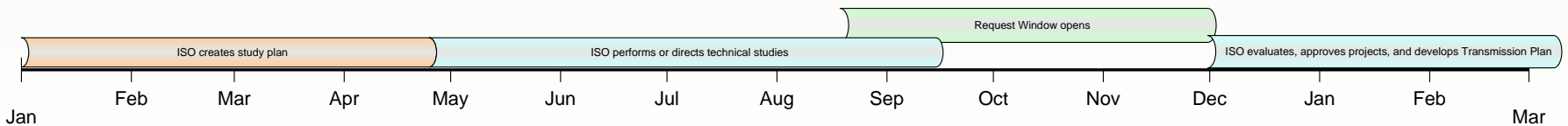
# Watching Nodal Pricing Work



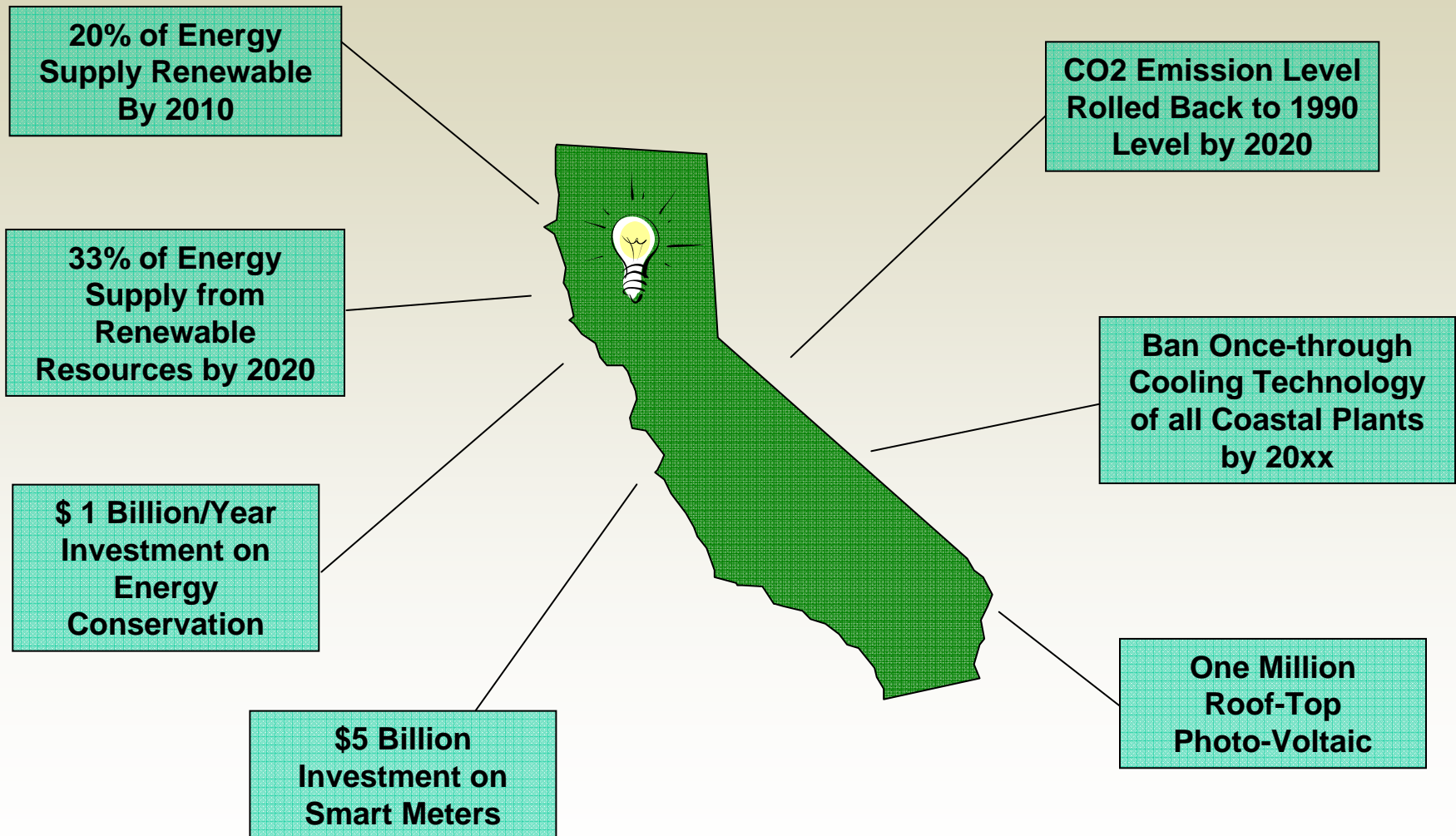
# The ISO Transmission Plan



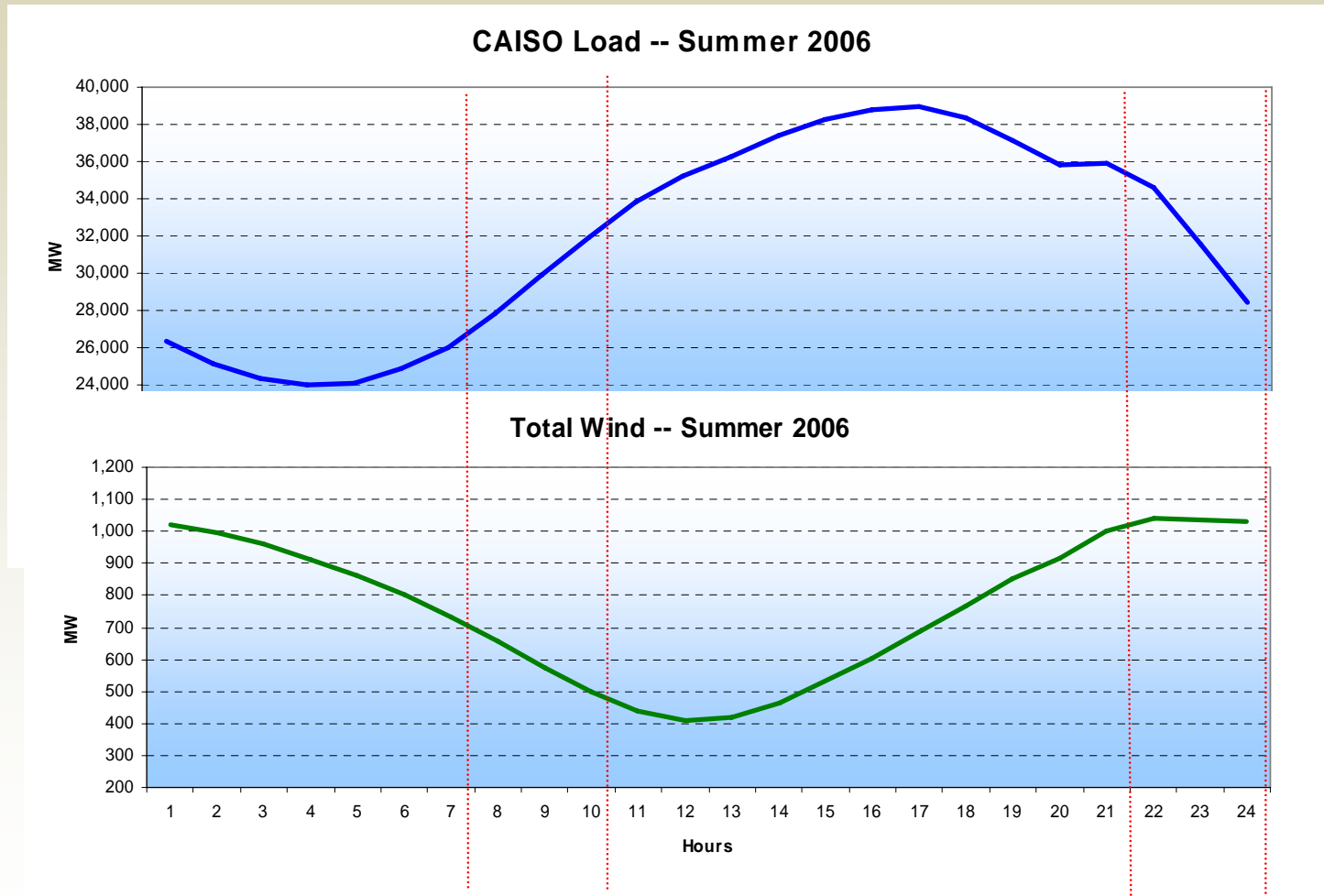
Regional Transmission - North / Legal Services  
PDidsayabutra 9/24/08



# Accommodating Climate Change Initiatives

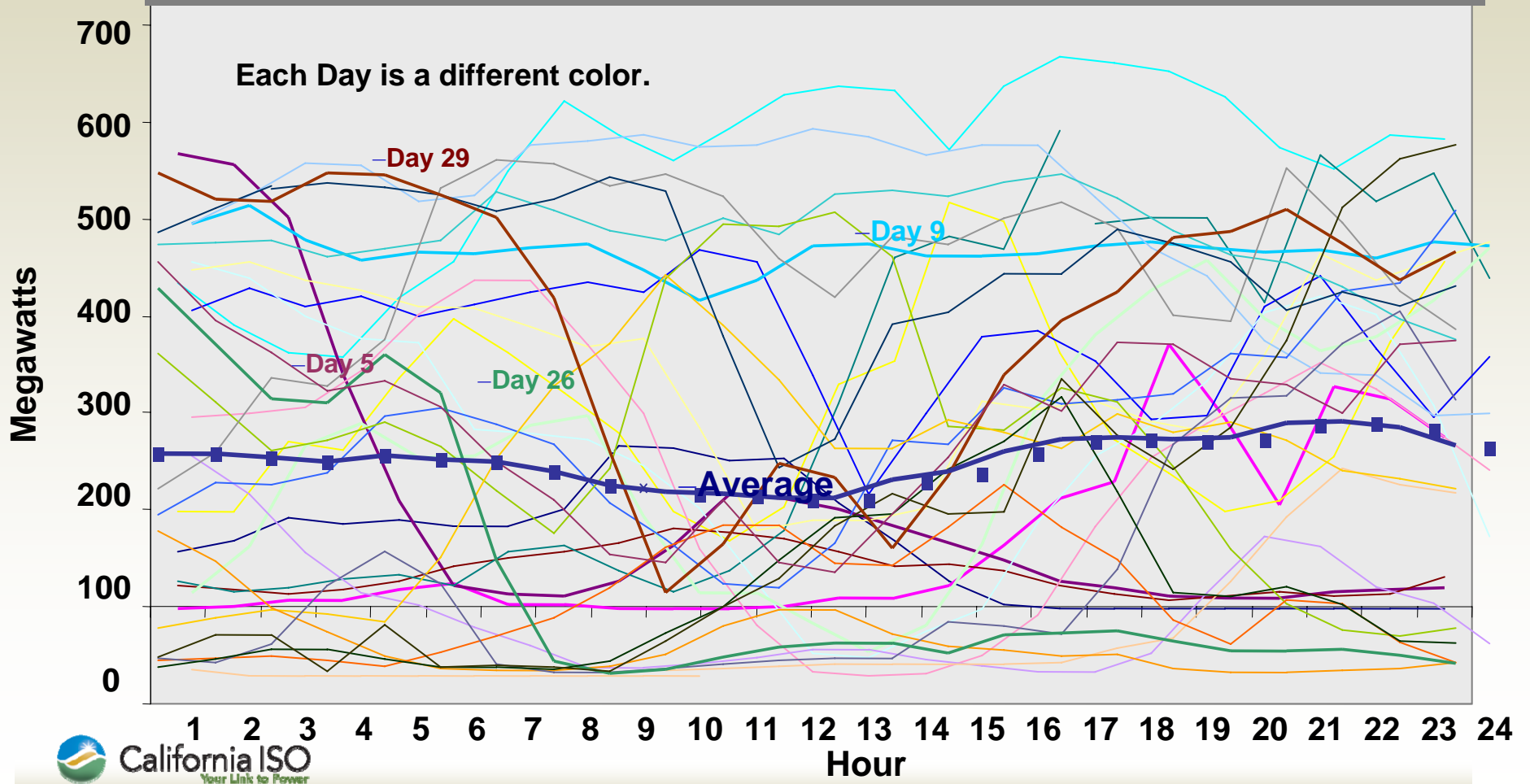


Wind generation tends to be inversely correlated to daily load curve, creating ramping impacts.



# Tehachapi area wind generation varies widely from day to day and hour to hour.

The average for April 2005 is smooth, but the day-to-day variability is great, showing the importance of improved forecasting tools and telemetry to the operating floor.



# Renewable Transmission Energy Initiative (RETI)

- California's Renewable Portfolio Standard (RPS) requires that a percentage of electric energy sold at retail by California's load serving entities (LSEs) be derived from qualified renewable energy resources. The percentage required by current law is 20% by 2010, but ..RETI's goal is to identify transmission facilities likely to be required to meet a 33% RPS requirement by the year 2020.
- "RETI will assess all Competitive Renewable Energy Zones (CREZs) and neighboring areas that can provide significant electricity to California by the year 2020. RETI will also identify those CREZs that can be developed in the most cost effective and environmentally benign manner and will then use existing transmission planning processes to prepare transmission plans of service for those CREZs identified for development"

# The five requirements for conditional approval of a project as a LCRIF

- ISO staff must determine that the facility is “needed”;
- The primary purpose of the facility must be to connect two or more generators located in an *energy resource area*, and at least one generator must be owned by an entity that is not an affiliate of the owner of another generator in the same *energy resource area*;
- The facility will be a high voltage facility;
- At the time of the in-service date, the facility will not be a network facility and otherwise would not be eligible for inclusion in the transmission owner’s transmission revenue requirement; and
- The facility meets the reliability requirements applicable to the ISO controlled grid as well as ISO planning standards.

# Results of ISO November 2007 Integration of Renewable Resources Study

- **Load Following is necessary to maintain stable operations**
  - Load following Capacity requirements will increase



700 - 800 MW



500 - 900 MW

- **Regulation is required to maintain frequency and maintain interchange schedules**

- Regulation capacity requirements can double certain hours



170 - 250 MW



100 - 500 MW

# “To 20 Percent and Beyond”!!!

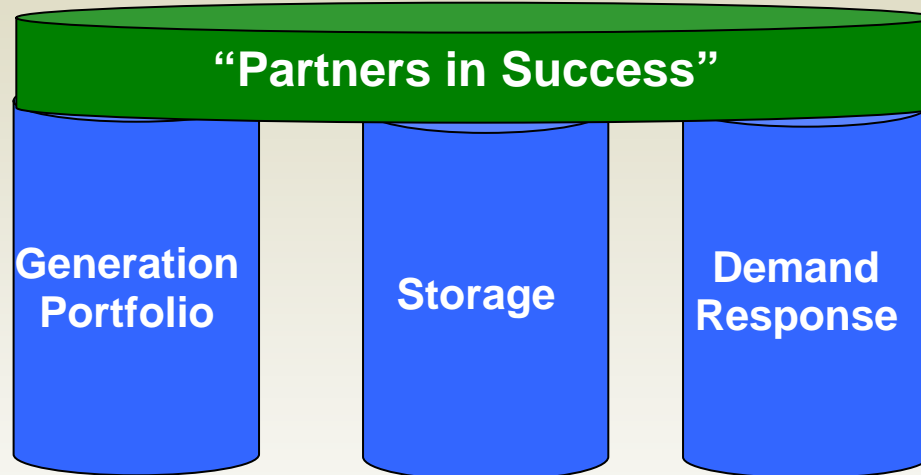


Wind Generation



Solar Generation

## Resources Required for Renewables Integration



Hydro Generation

Quick Start Units  
Fast Ramping  
Wider Operating Range (lower  $P_{min}$ )  
Regulation capability

Shift Energy from off-peak to on-peak  
Mitigate Over Generation  
Voltage Support

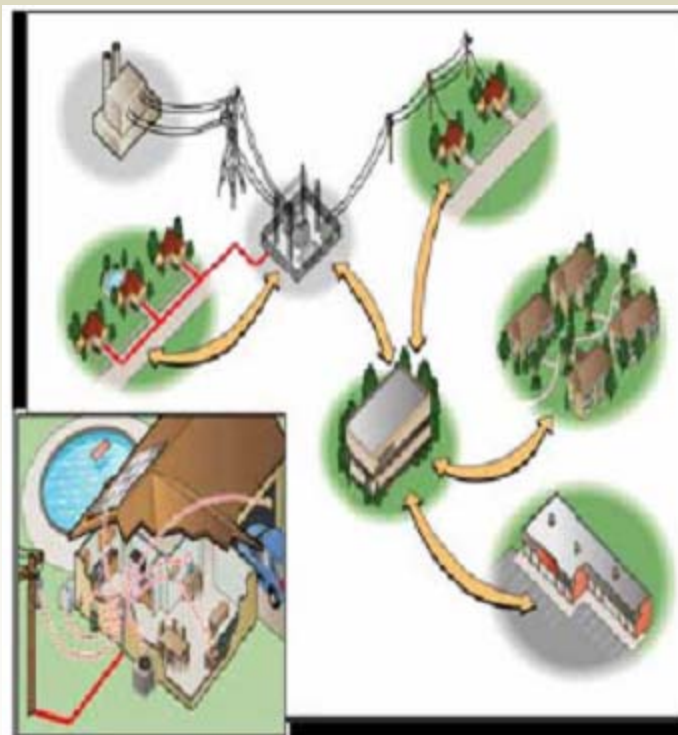
Regulation capability

Price sensitive load  
Responsive to ISO dispatches  
Frequency Responsive  
Responsive to Wind Generation Production

# What the Smart Grid Is

Makes use of communications, computing and power electronics to create a system that is:

- Self-healing and adaptive
- Interactive with consumers and markets
- Optimized to make best use of resources and equipment
- Predictive rather than reactive, to prevent emergencies
- Distributed across geographical and organizational boundaries
- Integrated, merging monitoring, control, protection, maintenance, EMS, DMS, marketing and IT
- More secure from attack



# Reducing Barriers to Entry?

- LCRI is a cost allocation mechanism developed to reduce barriers to the development of generation in remote locations with fuel sources that are infeasible to relocate, such as wind or solar projects.
- California faces proposed feed-in tariffs of up to 20 MW of outside-the-customer-meter generation to promote wind technology
  - Fixed prices, above-market, take-or-pay?
  - How many price-responsive C&I customers can offset one of these?
  - How to fit within existing Renewable Portfolio Standards?
- Demand response not yet credited for environmental benefits
- Storage devices prompt another look at characteristics of ancillary service requirements
  - Have the A/S requirements changed?
  - Do we hold the line until innovation catches up to the needs?

# Preserving the Characteristics of a Workably Competitive Electricity Market

- Will price signals drive investment?
- Can an ISO remain technology and fuel neutral?
- Will Policymakers protect competition, not competitors?
- Will we foster innovation across the entire portfolio – demand, supply, delivery through competition or base the future on special programs?