

Cutting Edge Trends in Energy

CCPUC Conference: 100 Years of PUC Regulation

Ritz-Carlton Highlands, Lake Tahoe

October 4, 2010

Robert B. Weisenmiller
Commissioner
California Energy Commission

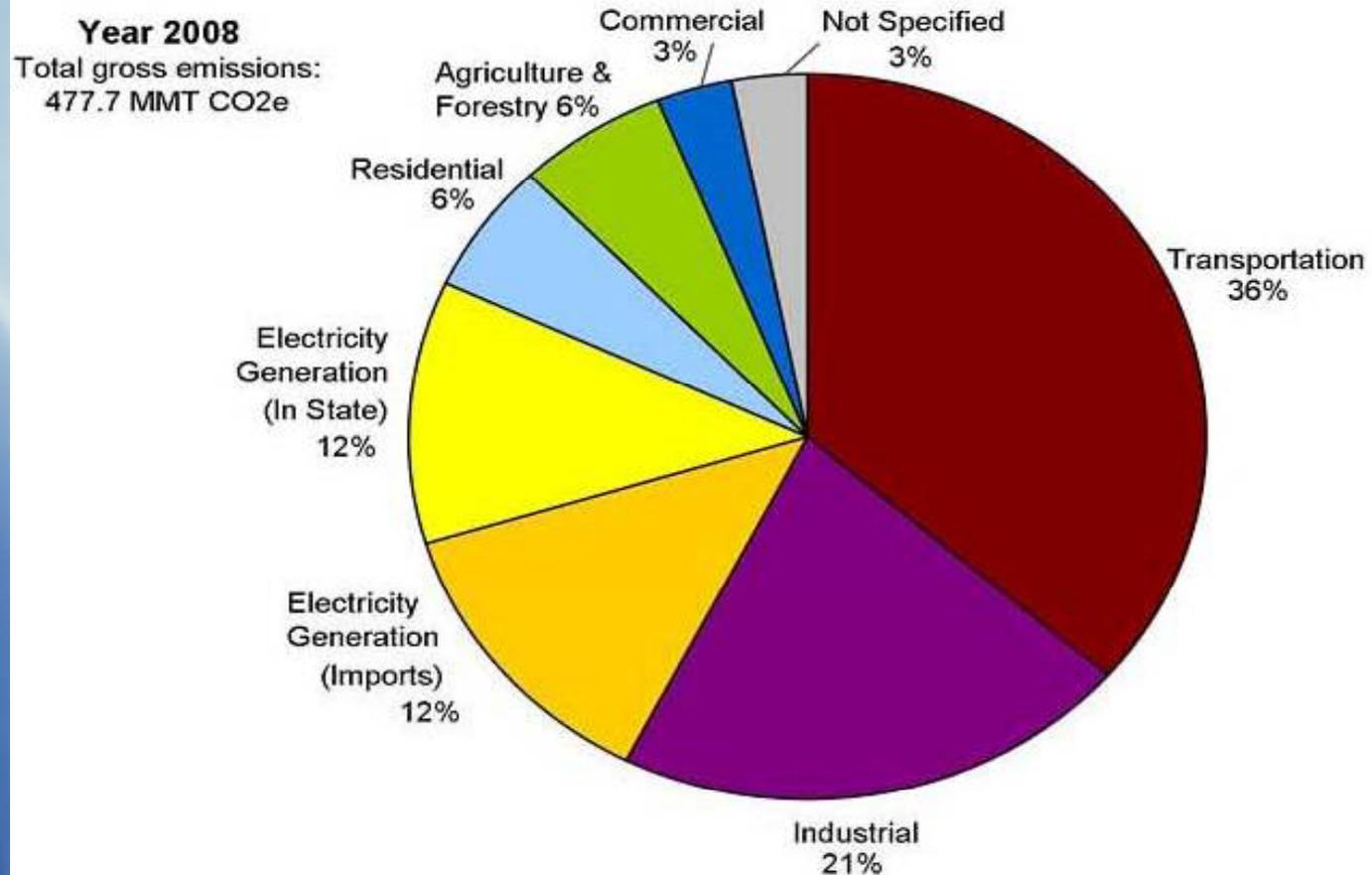


Game Changers

- ❖ Energy Policy
 - Greenhouse Gas Emissions
- ❖ Energy Technologies and Research & Development
 - Smart Grid
 - Energy Storage



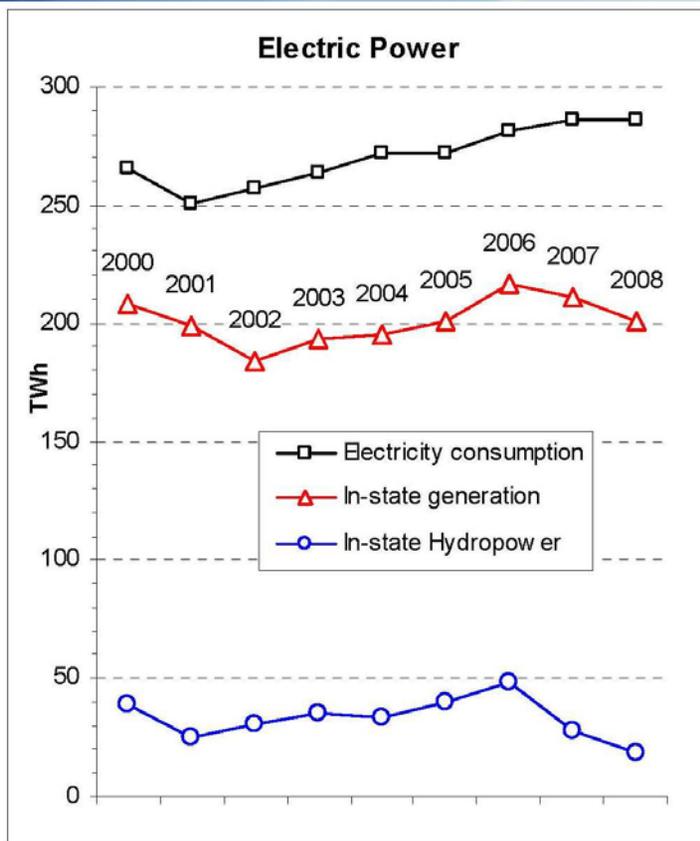
California Greenhouse Gas (GHG) Emissions



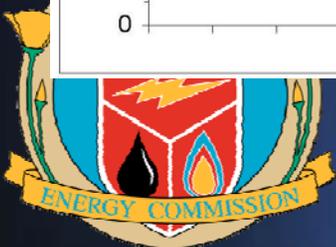
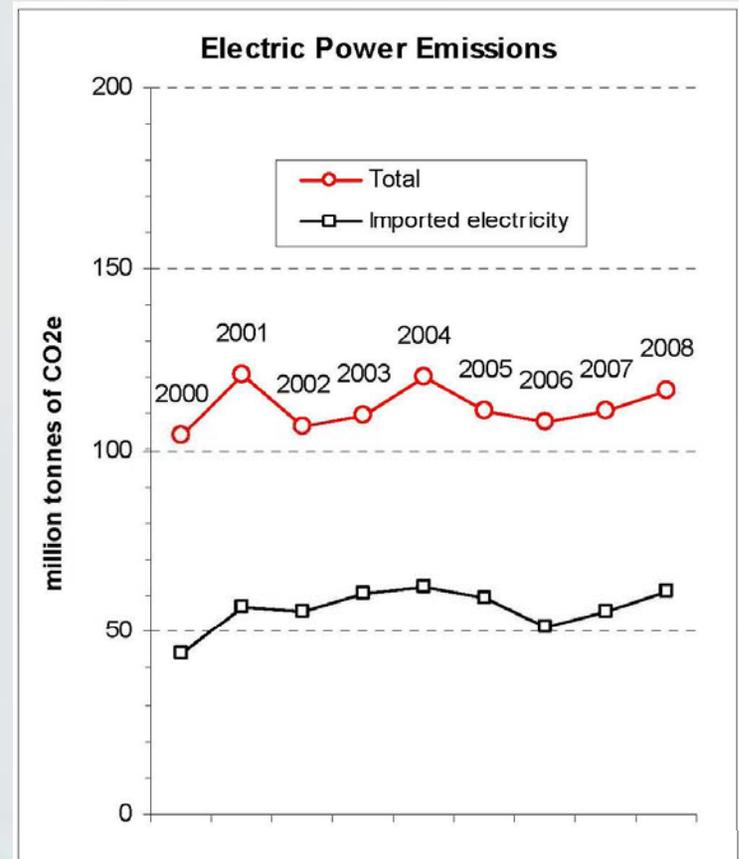
Source: <http://www.arb.ca.gov/cc/inventory/data/graph/graph.htm>



GHG Emissions Trends in Electricity Sector

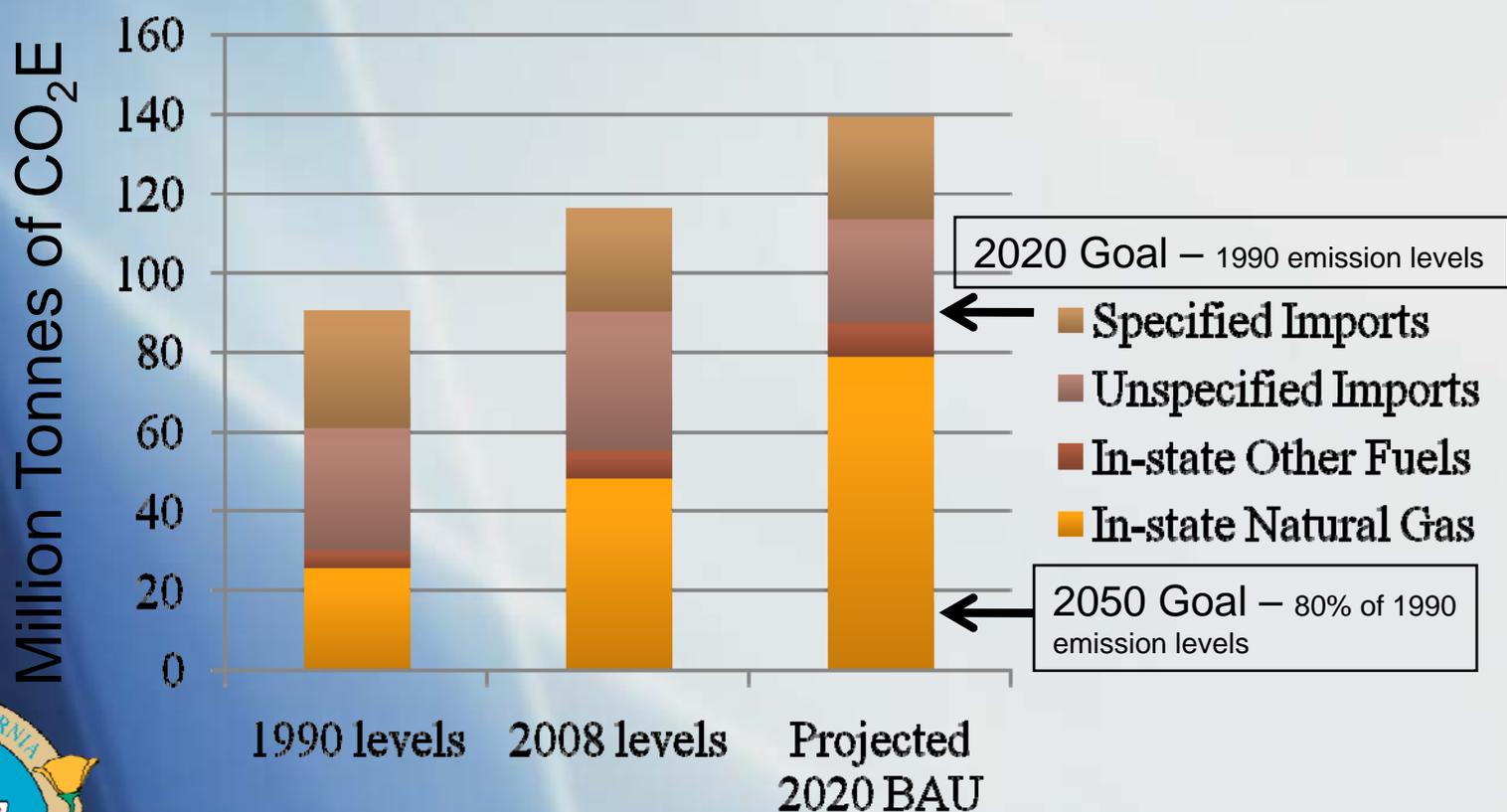


Although imported electricity only makes up about a fifth of the state load it accounts for about half of the electricity GHG emissions.



Source: http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_trends_00-08_2010-05-12.pdf

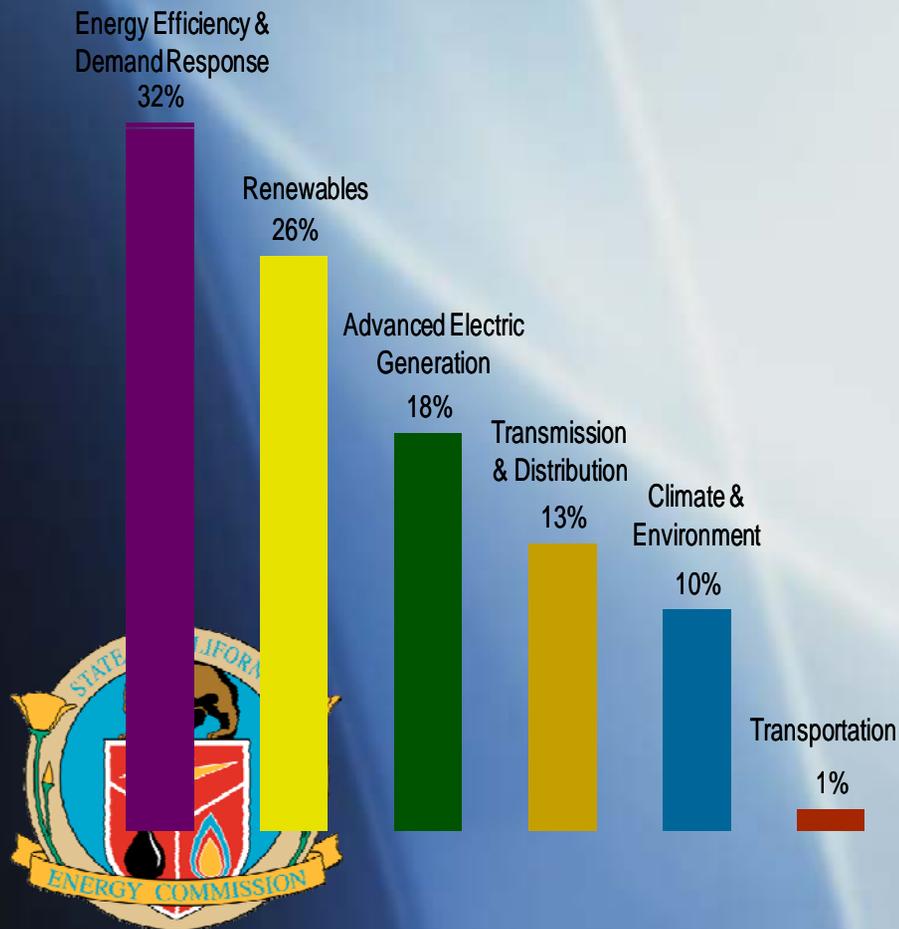
Where do we need to go?



Source of 1990 data is <http://www.arb.ca.gov/cc/inventory/archive/archive.htm>; 2008 data is http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_00-08_2010-05-12.pdf; and 2020 data is <http://www.arb.ca.gov/cc/inventory/data/forecast.htm>

Why PIER? – Follow Energy Policy

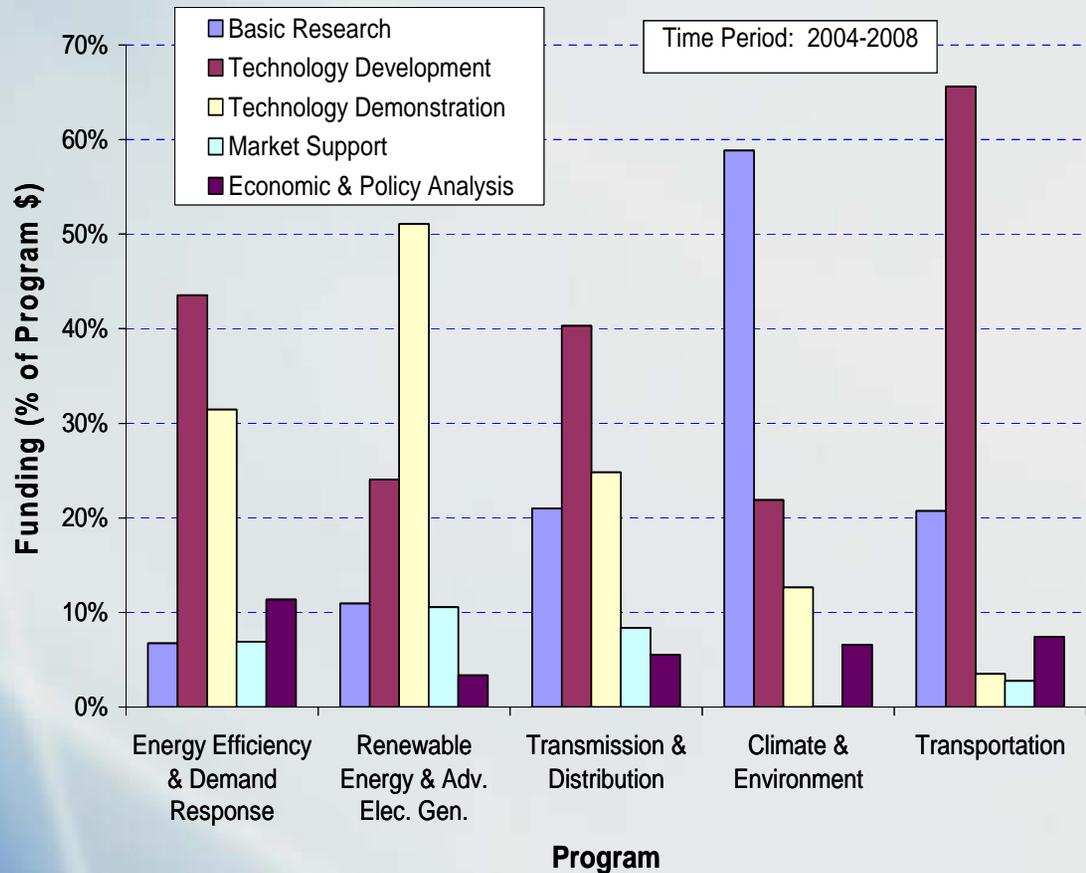
“Loading Order” by Program (\$587.7 million from 1997 – 2008)



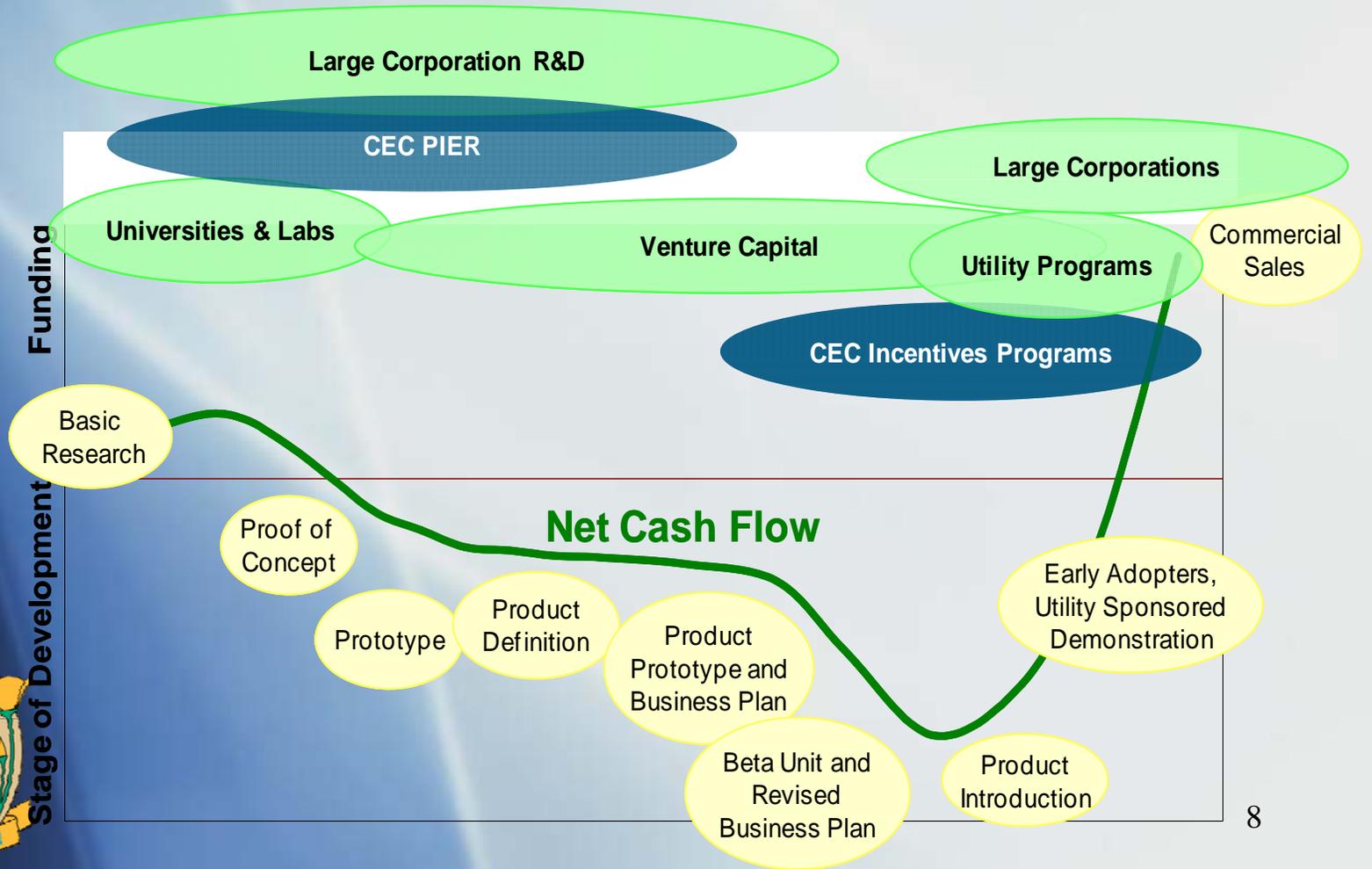
- ❖ Meeting Energy Needs with Efficiency and Demand Response
 - Using Efficiency to Reduce GHG Emission Levels
 - Potential Savings from Demand Response
- ❖ Using Renewable Resources to Meet Energy Needs
 - Deliverability and Transmission Upgrades
 - Dispatchability and Reliability
 - Barriers to Renewable Energy Market Development
- ❖ Clean Fossil Energy Generation
 - Distributed Resources
- ❖ Transmission & Distribution
 - Smart Grid
 - Demand Response to Meet Electric System Peaks

PIER Background and Funding by Stage

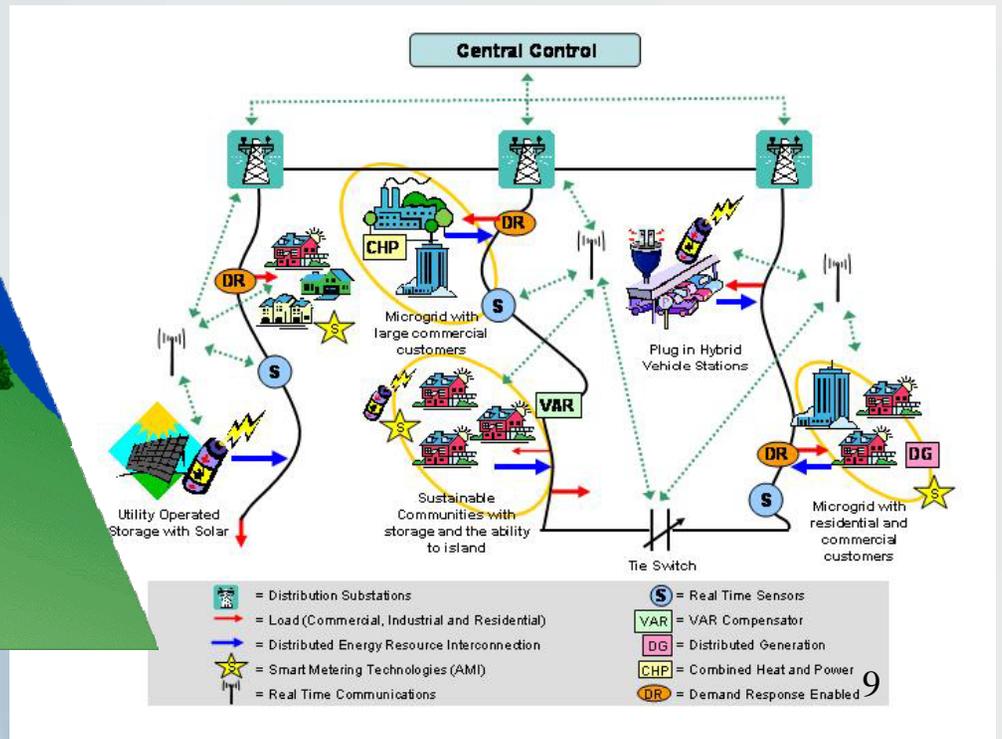
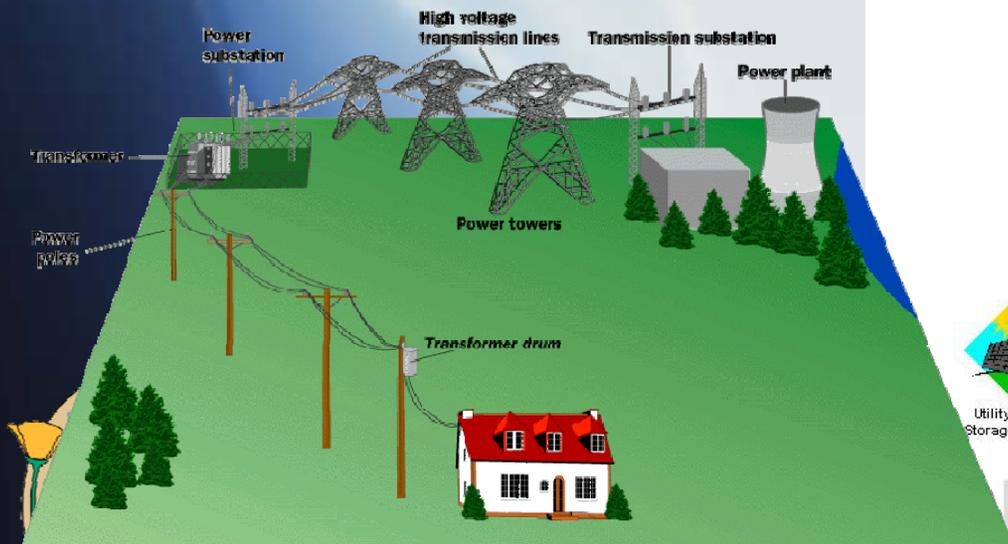
- ❖ IOU Ratepayer Funded Program
- ❖ Launched in 1997 by AB 1890
- ❖ \$86.5 Million Annual Budget FY 09/10
 - \$62.5 million electric
 - \$24 million natural gas



PIER Program Operates in the Context of Public and Private Programs



Smart Grid Integration



Why Smart Grid?

- ❖ Good for the Environment
 - Provides new options to reduce emissions & improve overall efficiency
 - Makes Green Grid a Reality
- ❖ Cleaner, lower cost operations, more efficient
 - New cost lowering technologies
 - Increased efficiency in operating existing systems → higher utilization rates
- ❖ Improved Grid Operations
 - Higher reliability
 - Less outage time / shorter outages / smarter decisions
- ❖ More Options for Consumers
 - Lower overall energy costs
 - More choices
 - More products and applications



Energy Commission PIER Smart Grid Research Ongoing at all Levels

Transmission



- Phasor Measurement
- Advanced displays
- Advanced comm & controls
- MRTU interface
- Energy Storage
- Renewables

Distribution



- Distribution Automation
- AMI
- Advanced C&C
- MRTU
- Energy Storage
- Renewables

Integration



- Renewables
- Standards
- Protocols
- Reference designs
- Micro Grids
- Automation
- Energy Storage

Consumer



- Automating Demand Response
- AMI
- Dynamic Rates
- Home Area Networks
- Plug in Hybrids
- Renewables
- Energy Storage



2008 Integrated Energy Policy Report – Energy Storage Focus

“Integrating large amounts of variable and intermittent resources like wind into California's electricity system is challenging.”

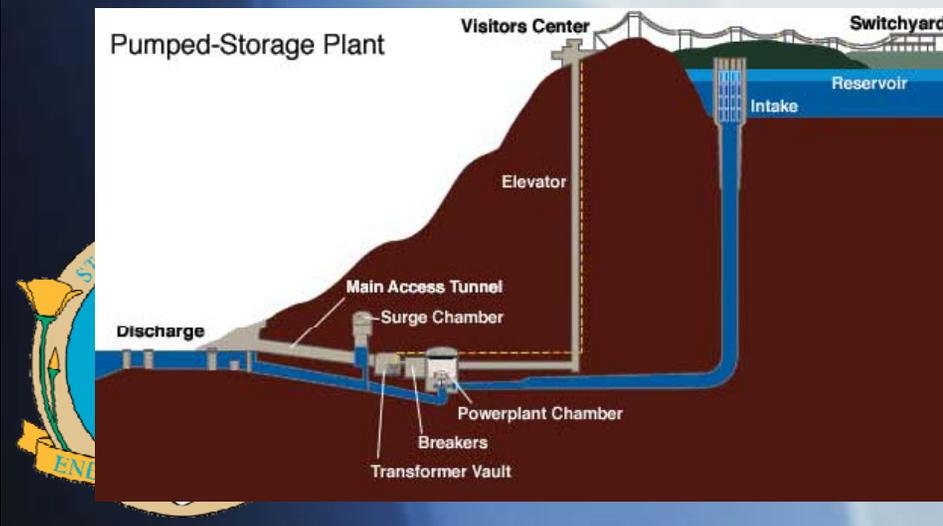
❖ The State should focus on:

- Identifying Energy Storage Technologies with most promise of providing grid stability and improving operations
- Reducing costs of those technologies
- Accelerating their commercialization

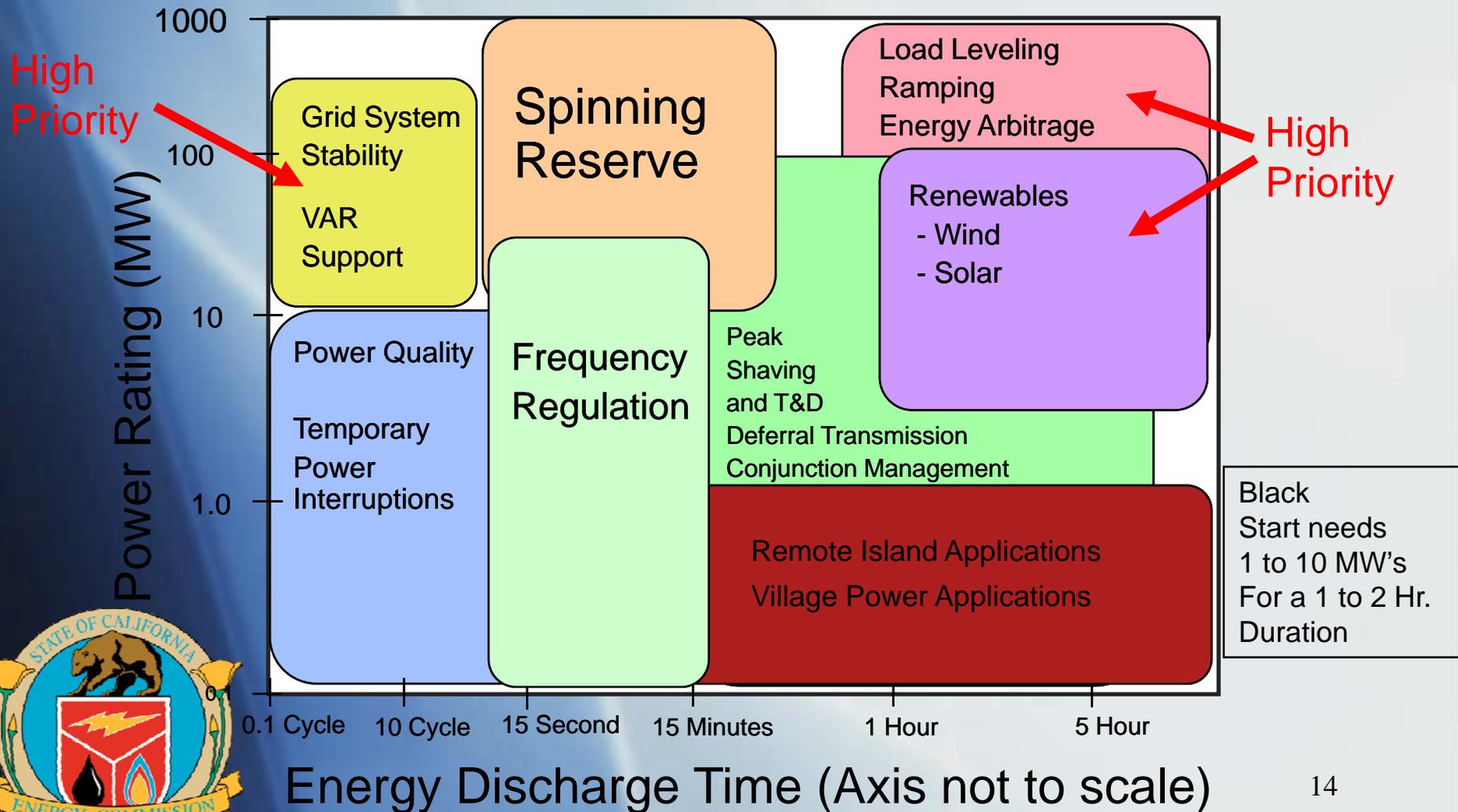


Energy Storage Technologies

- ❖ Pumped Hydro
- ❖ Pondage Hydro
- ❖ Compressed Air Energy Storage (CAES)
- ❖ Flywheels
- ❖ Batteries
- ❖ Super Capacitors (SuperCaps)
- ❖ Superconducting Magnetics
- ❖ Thermal Storage
- ❖ Fuel Cells (reversible)
- ❖ Hydrogen Storage



Electric Energy Storage Applications



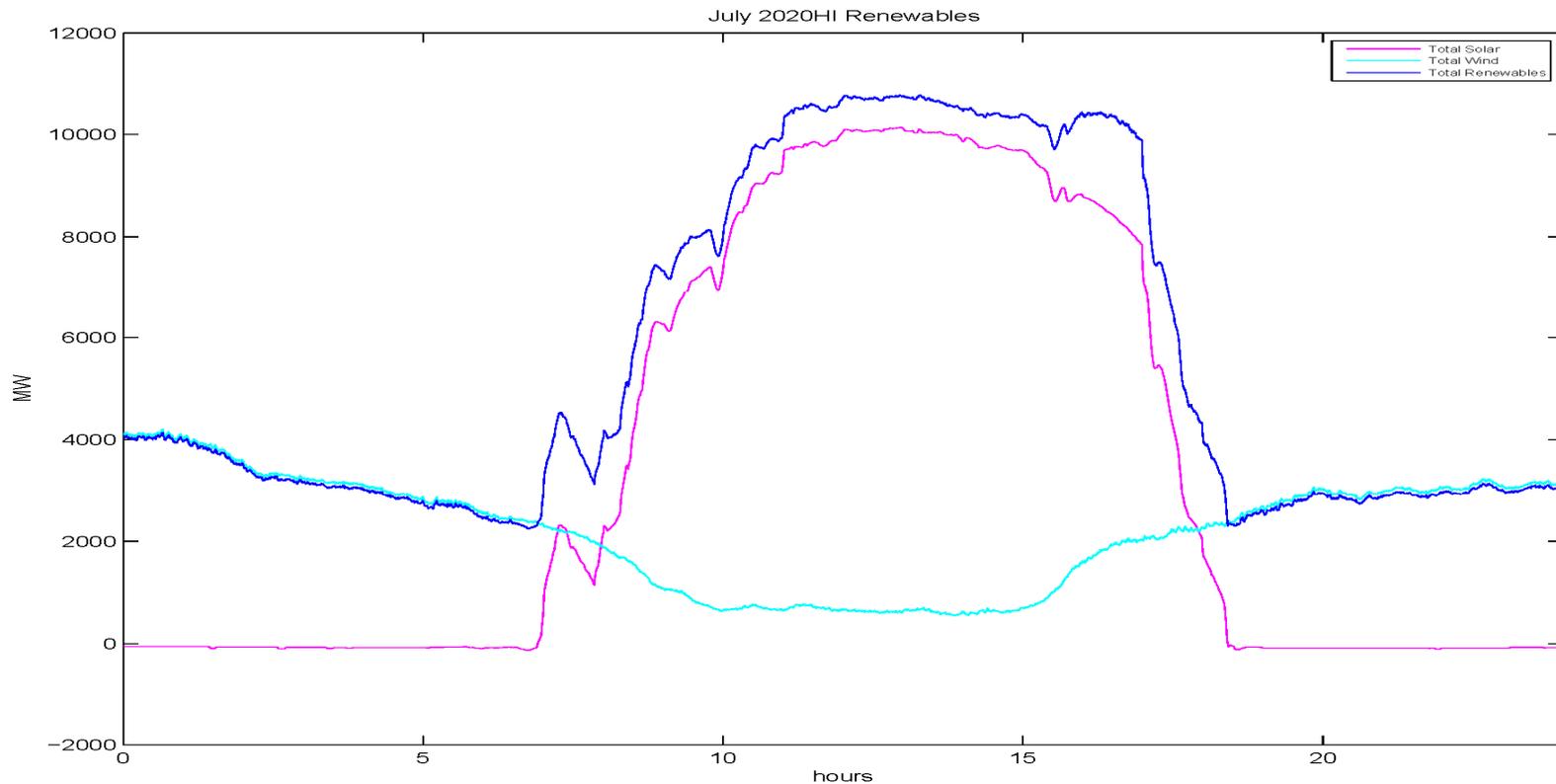
AB 2514 Energy Storage (Skinner)

- ❖ Governor has until September 30 to sign, veto, or become law without signature
- ❖ This bill would
 - define “energy storage system”
 - establish a process for determining viable and cost-effective energy storage procurement targets
 - require POUs to submit to the Energy Commission energy storage procurement target and policy reports; require load serving entities to submit to the CPUC energy storage procurement target and policy reports



KEMA Study: Research Evaluation of Wind Generation, Solar Generation, and Storage Impact on the California Grid

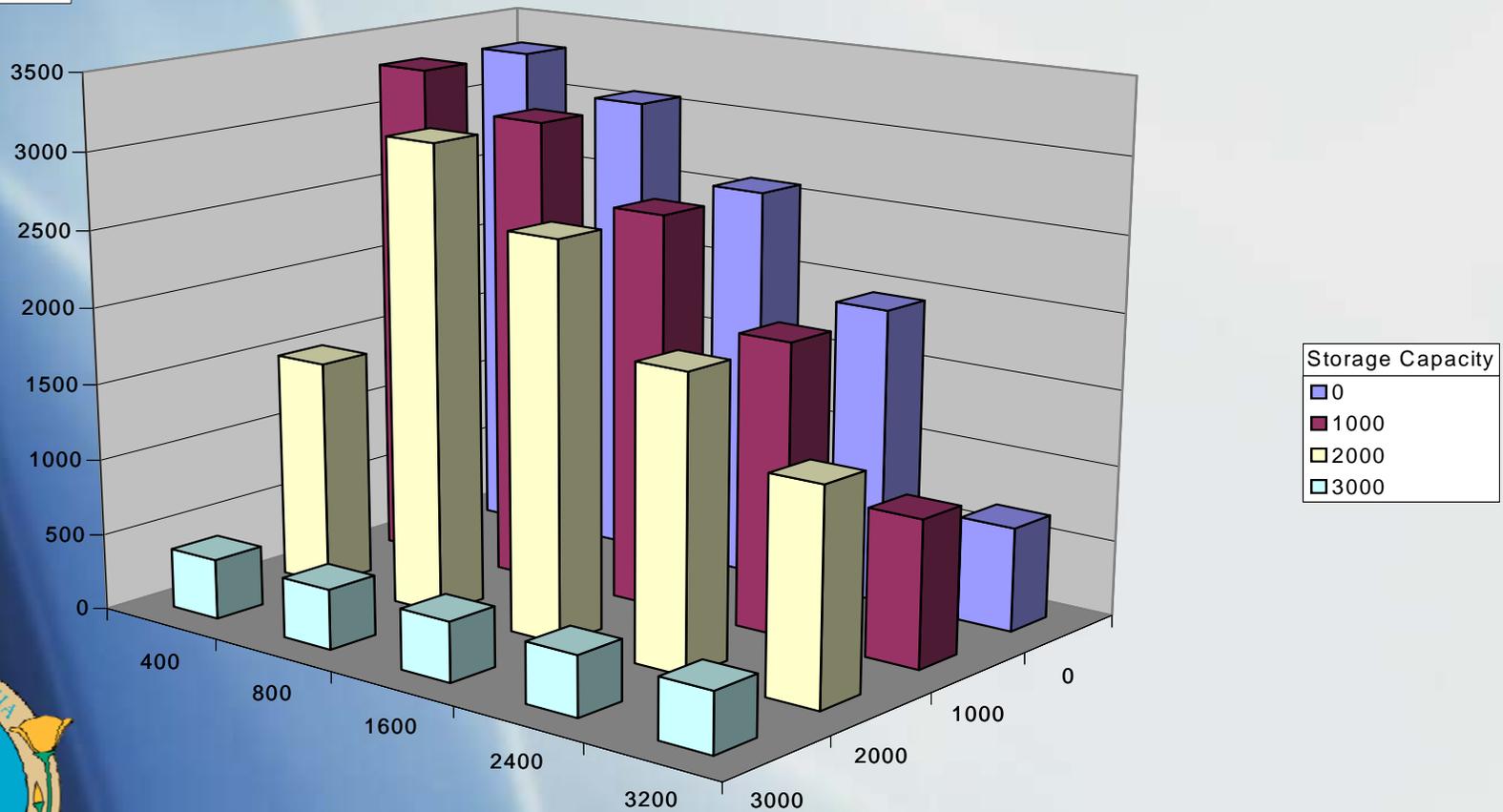
July Renewables – 2020 High Penetration



KEMA Study: Area Control Error maximums for July 2020HI

Day DAY07-09-2008 Scenario 2020HI CT 0.2 Hydro 0.2

Sum of ACE_Max.



AGC BW



KEMA Study: Major Conclusions

- ❖ System Requires > 800 MW Regulation in 2012 and Approx. 1600 MW in 2020 for “Normal” (non-ramping) Periods
- ❖ In the 2020 33% High Renewable Capacity Case the System may Require 3000 – 4000 MW of Regulation & Reserves
- ❖ 3000 MW / 6000MWH of Storage will Suffice (except possibly for the April day Studied)
- ❖ Storage Requires an Aggregate Ramping Capability of 0 – 100% in 5 minutes in the 33% scenario



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