



California's Clean Energy Future Where do we go from here?

**U.S Department of Energy
Annual Merit Review**

May 9th, 2011

Key Takeaways

- 
- Many of the greatest business opportunities in the 21st century will be associated with the ‘new energy economy’.
 - Those nations, states, institutions, and companies that aggressively pursue the right **portfolio** of policies and strategies will be the winners.
 - Our energy system is massive, achieving our goals will take time and sustained effort, and there will be many bumps along the way.

California

by the numbers

GSP ~\$1.9 Trillion (2009)

Electricity Consumption
~287,000 GWh (2008)

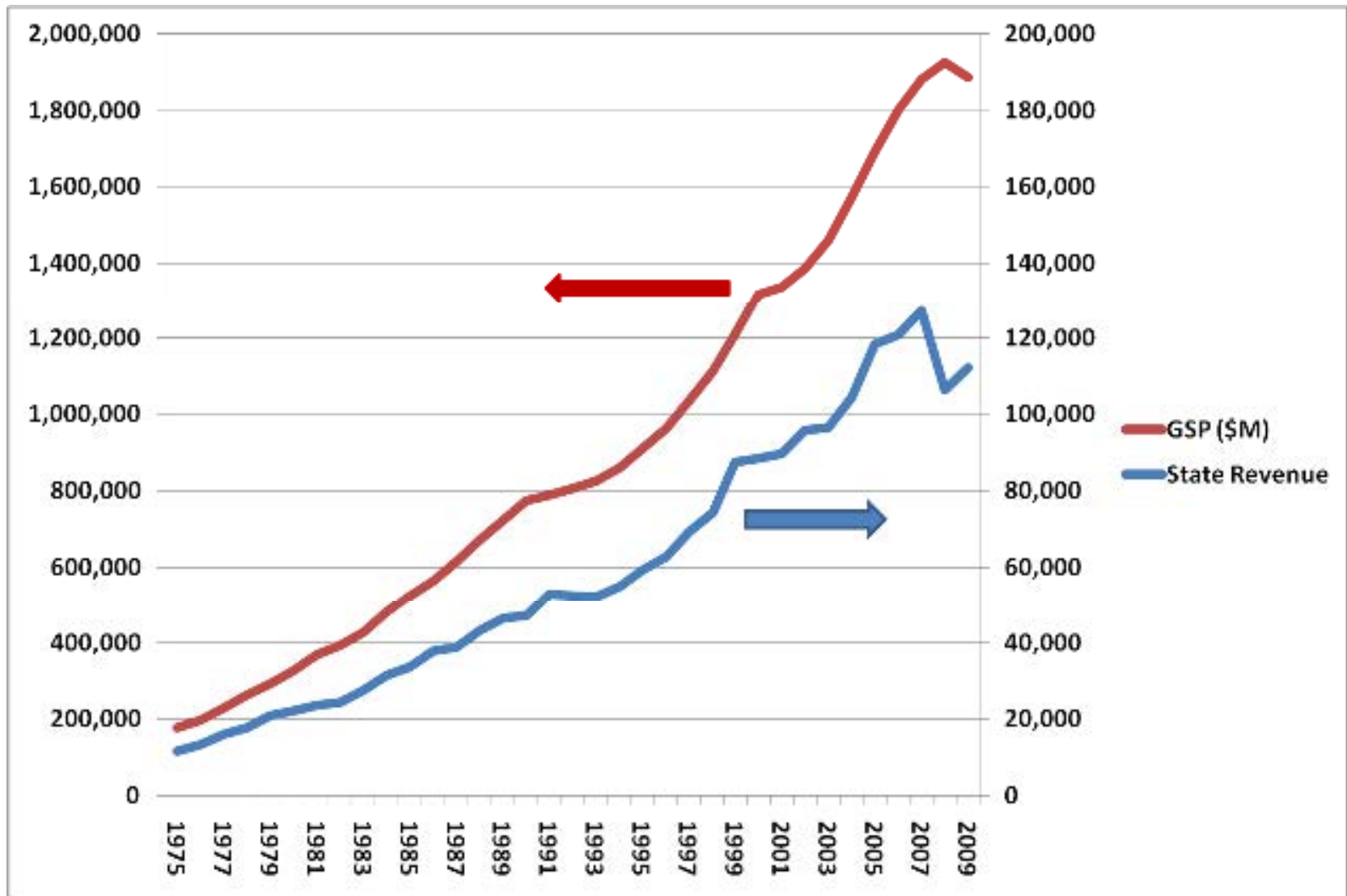
Peak Demand
~64,000 MW (2006)

Energy Expendit
~\$33.5B Electric
~\$17.6B Natural
~\$80B Petroleun

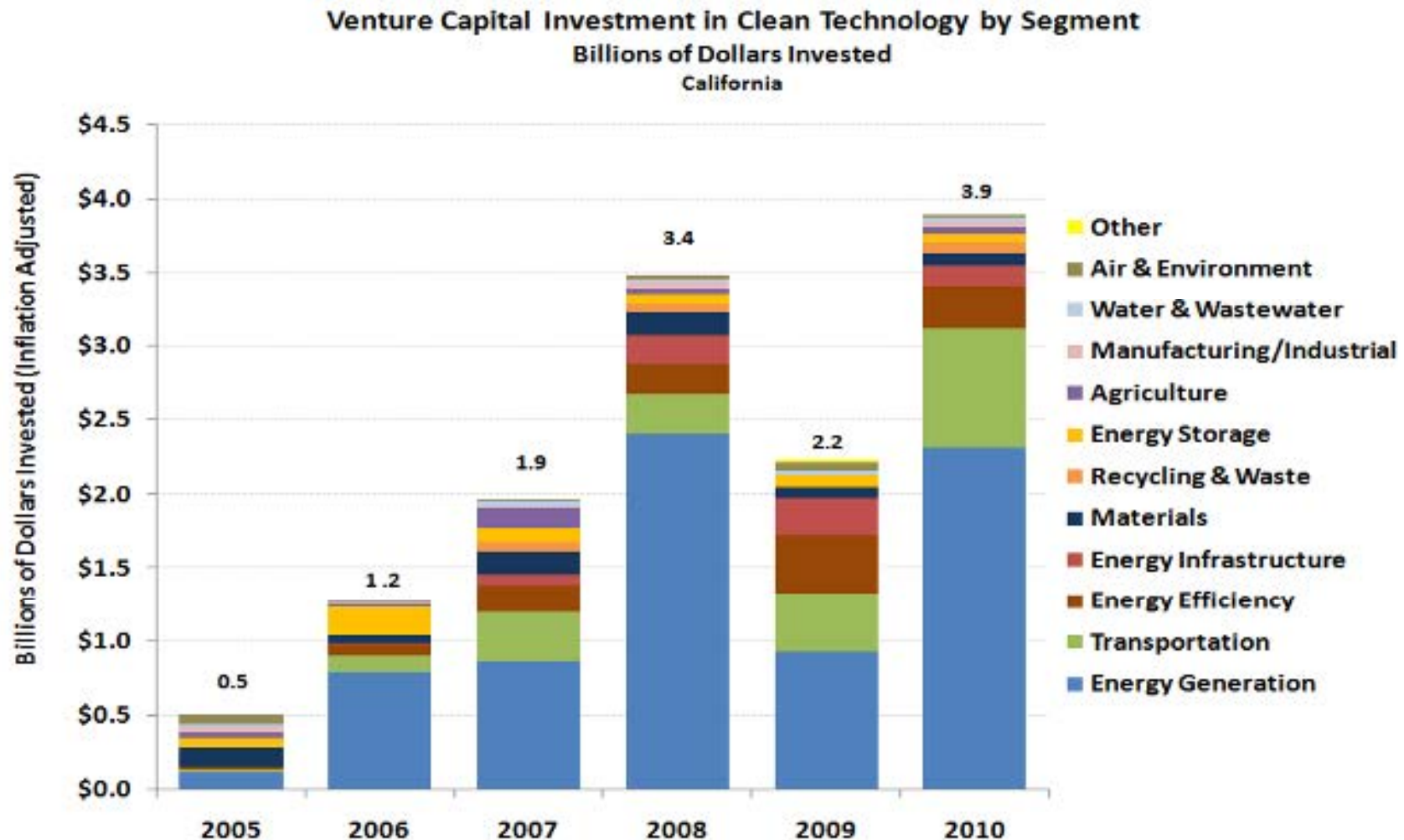
Total ~ \$360Mill



California GSP and State Revenue (\$M)



California Clean Tech Investment/Patents

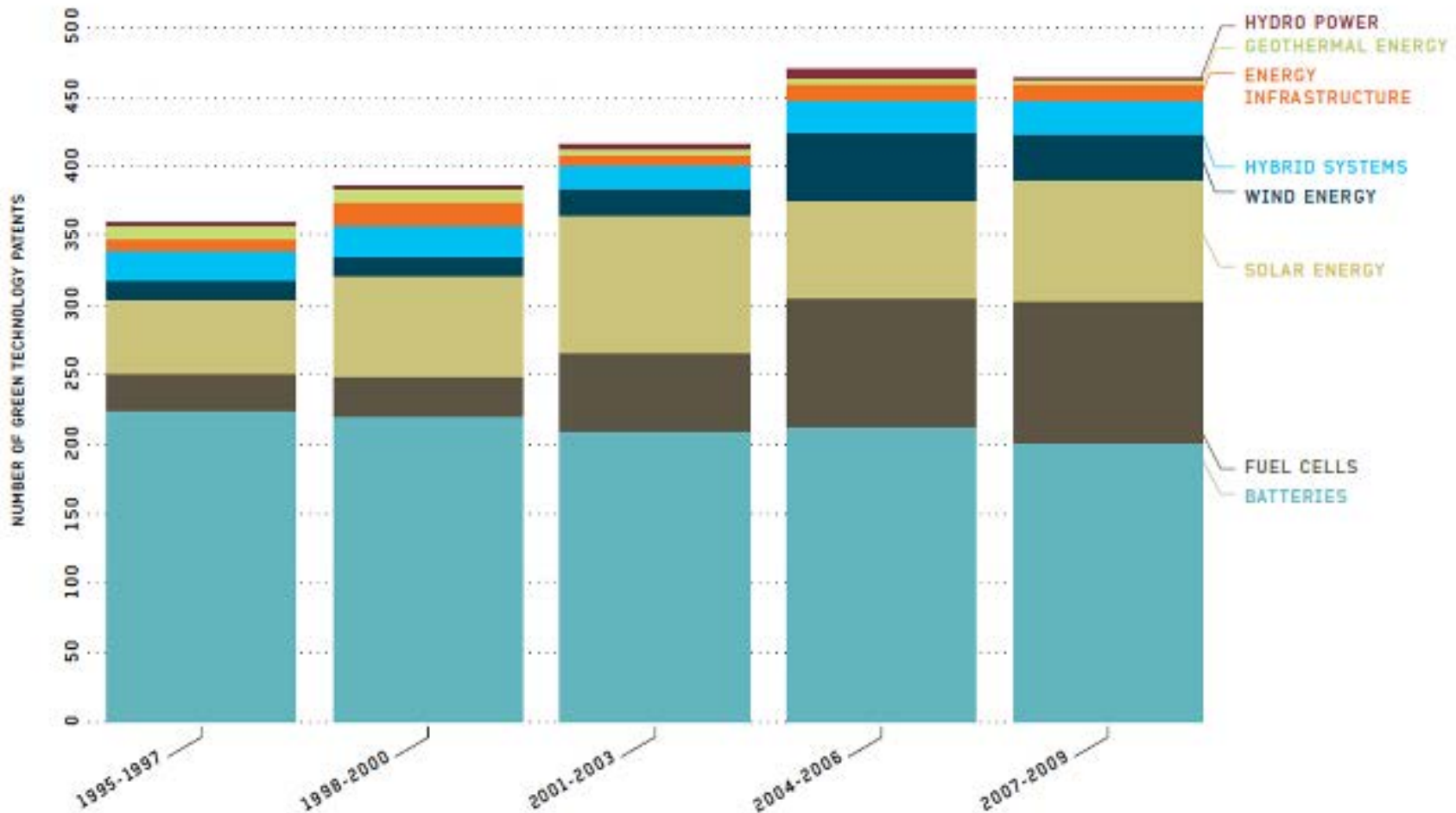


Data Source: Cleantech Group™, LLC
Analysis: Collaborative Economics

Source: "2010 California Green Innovation Index", Next 10, <http://next10.org/environment/greenInnovation09.html>

California Clean Tech Investment/Patents

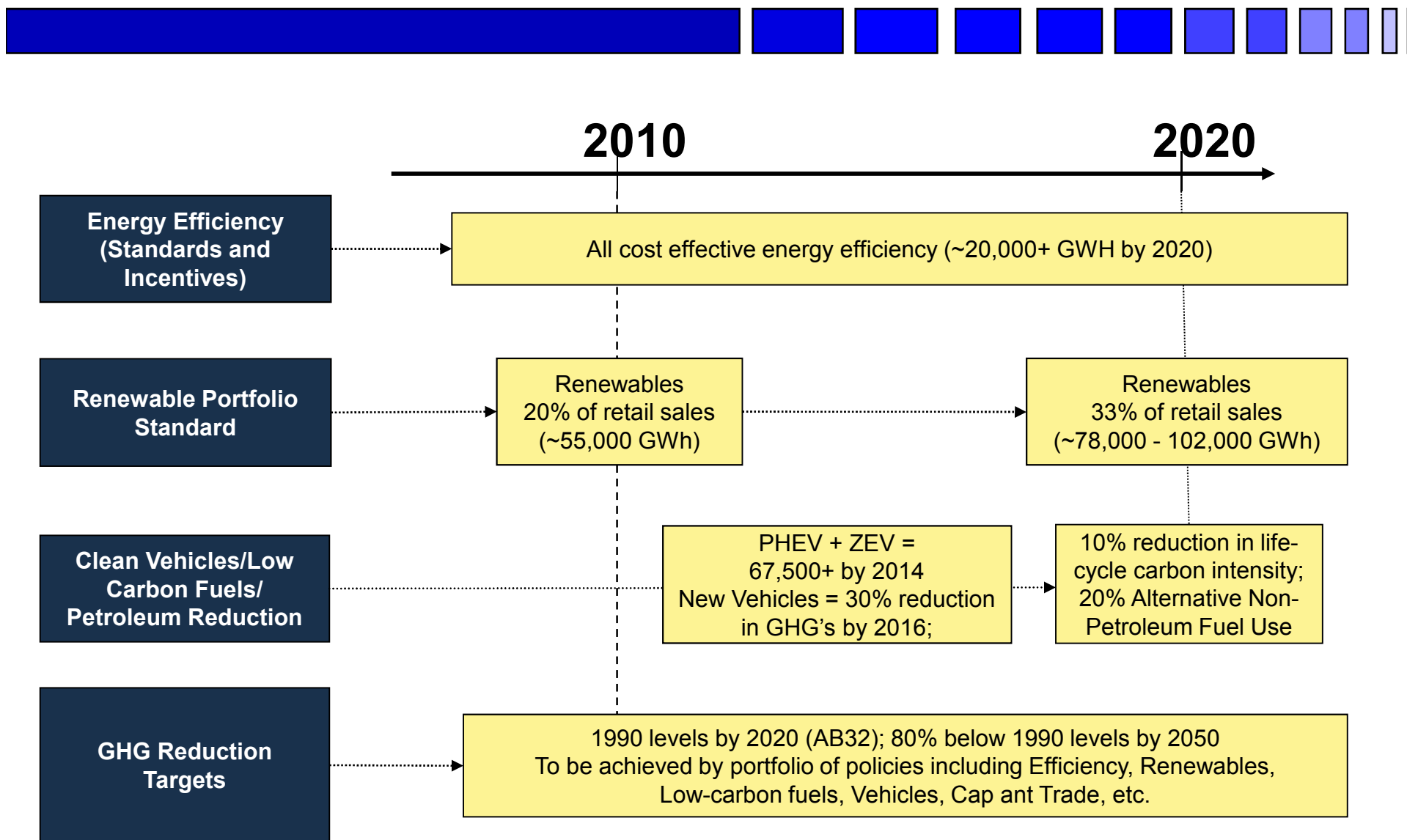
FIG 16. GREEN TECHNOLOGY PATENTS
BY TECHNOLOGY / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: ITRD Analytics, Patents by Technology; USPTO Patent File. Analysis: Collaborative Economics

Source: "2010 California Green Innovation Index", Next 10, <http://next10.org/environment/greenInnovation09.html>

California's Major Energy Policy Initiatives



Government Role in Enabling Energy Technologies



The “Pipeline” Policy Strategy to drive innovation

- **Research and Development**
- **Deployment Incentives**
- **Codes and Standards**
- **Fiscal Policies**

“Energy Carrier” *du jour* Phenomenon



- **30 years ago – Synfuels (oil shale, coal)**
- **25 years ago – Methanol**
- **18 years ago – Electricity (Battery EVs)**
- **8 years ago – Hydrogen (Fuel cells)**
- **4 years ago – Ethanol/Biofuels**
- **Today – Electricity again (EV+PHEV)**
- ***Next year ?***
- ***Conclusion – we need a new strategy!***

GHG (and Petroleum) Reduction strategies



**Primary
Energy**

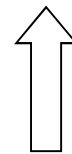
**Average
Efficiency**

**Total
Demand**

$$\text{GHG (MTCO2e per Year)} = \frac{\text{GHG (MTCO2e)}}{\text{Energy}} \times \frac{\text{Energy}}{\text{Widget}} \times \frac{\text{Widgets}}{\text{year}}$$



**Low Carbon
Fuels**



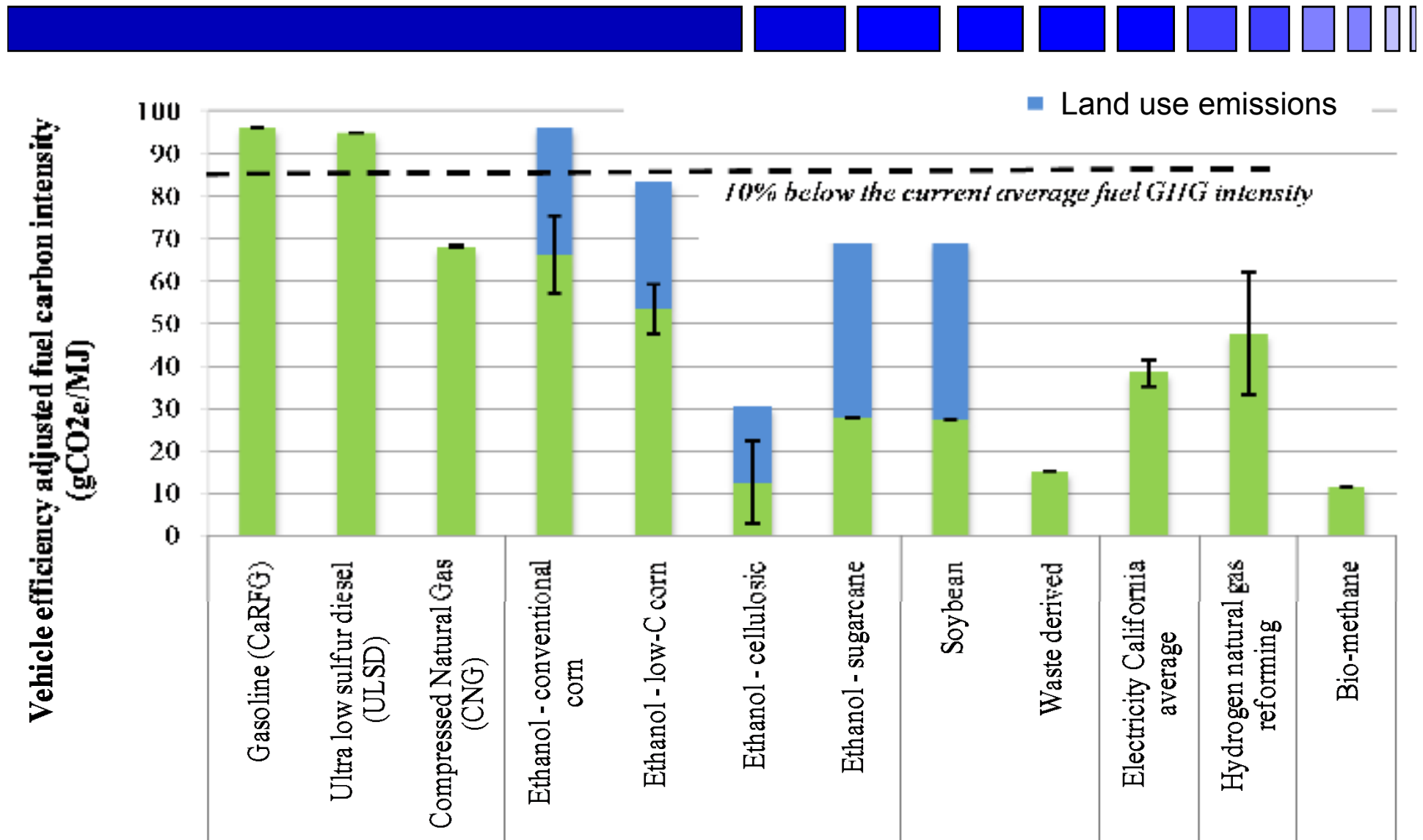
**Vehicle
Standards**



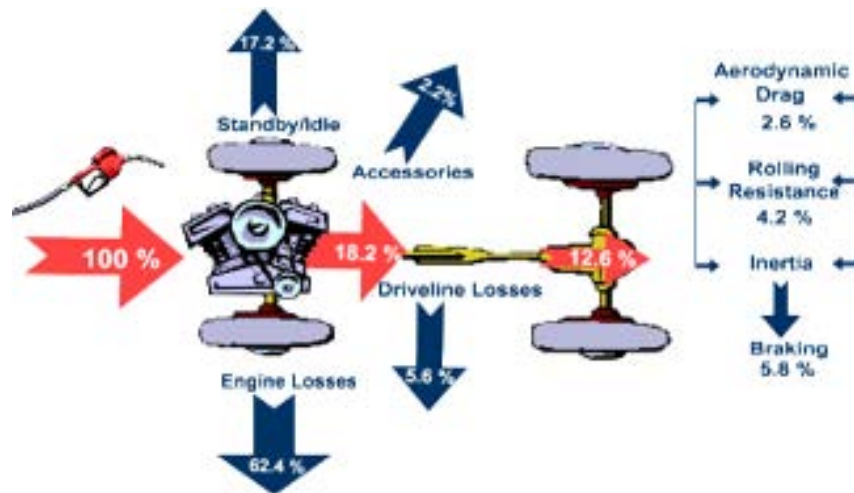
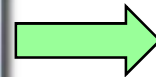
**Land Use/
Transportation
Planning**



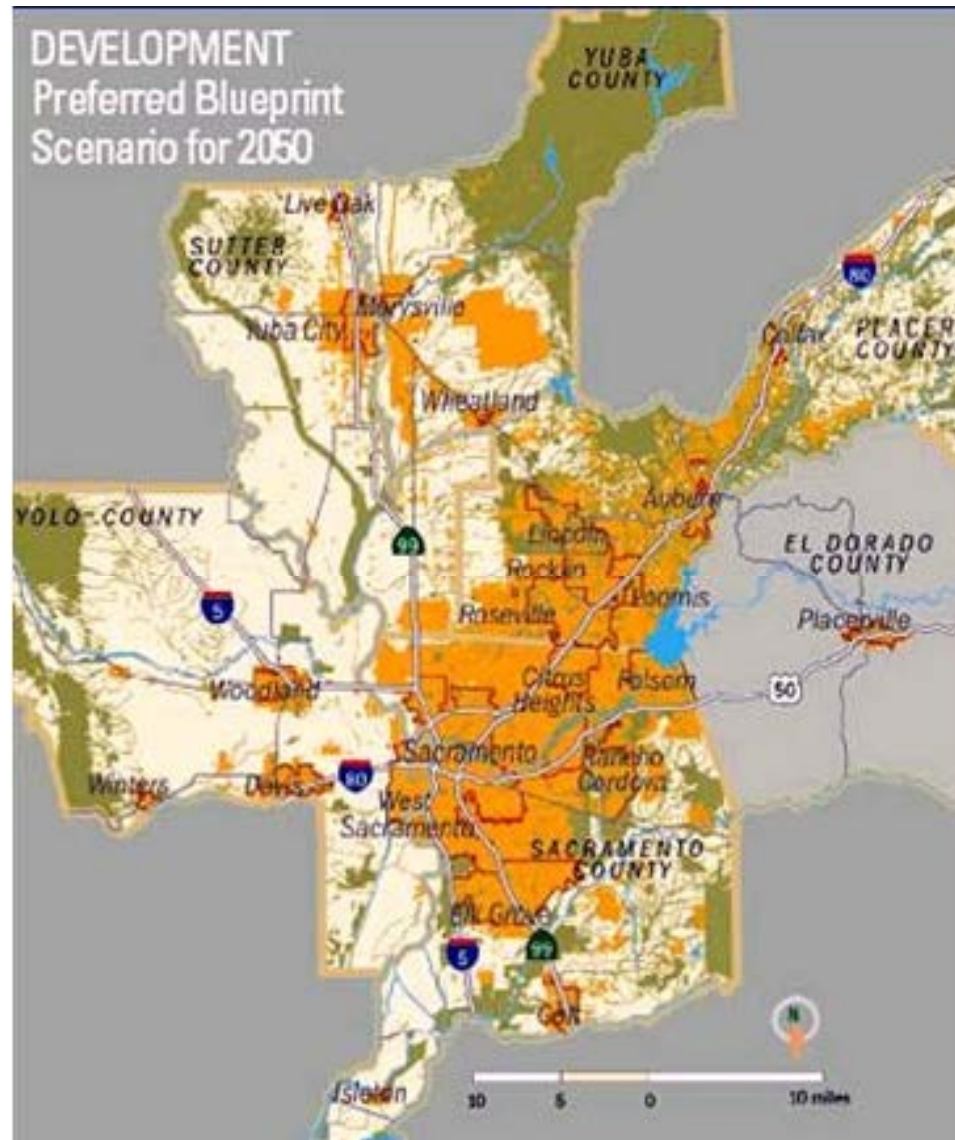
Performance Standards for Fuels



Performance Standards for Vehicles



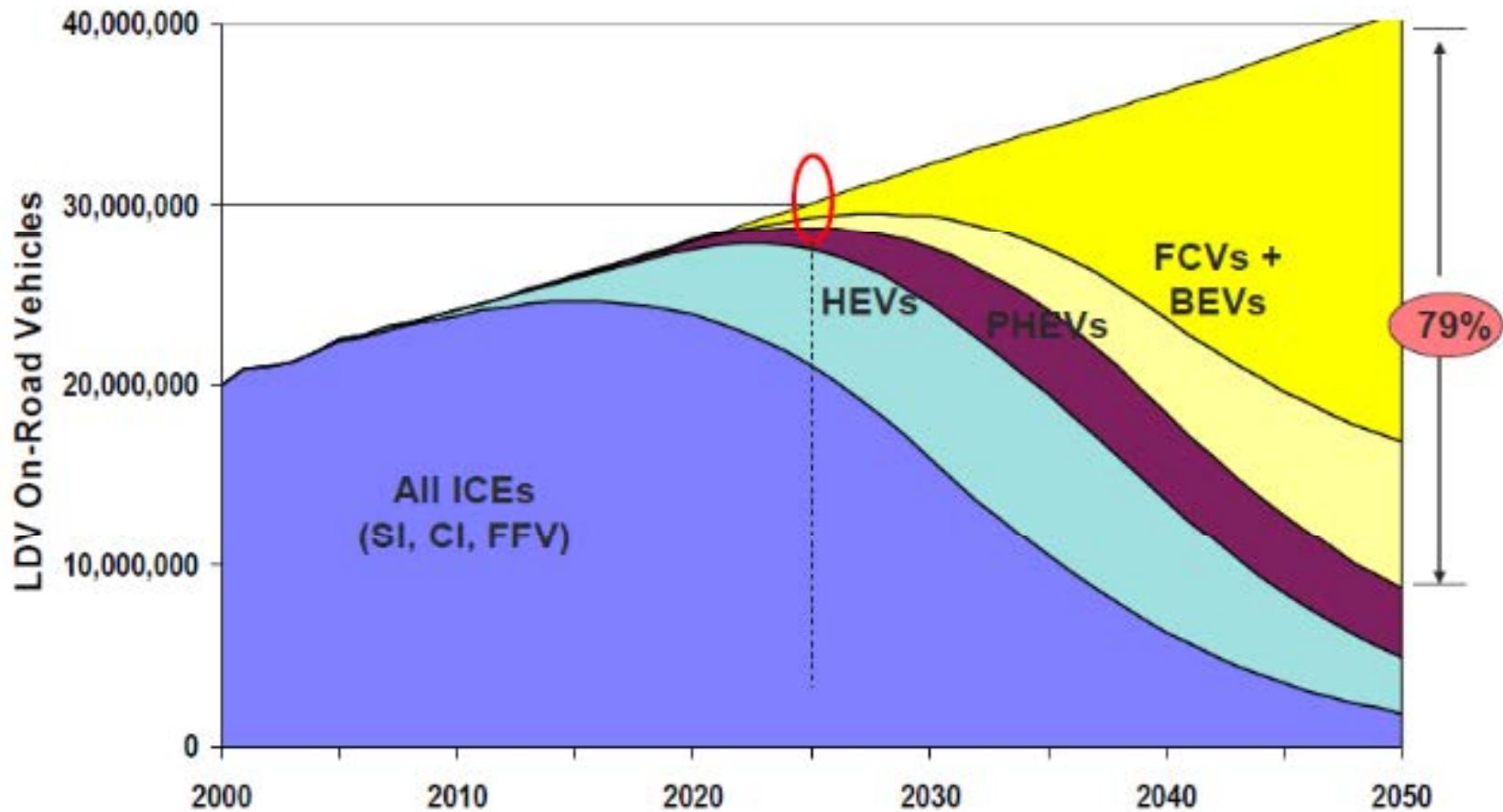
Performance Standards for Communities



Public Support for Portfolio of Clean Vehicle/Fuel Development and Deployment



Getting to 2050 – One Scenario





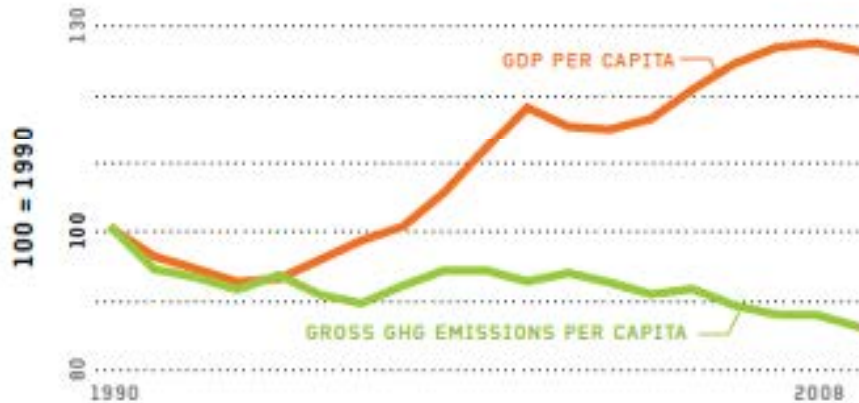
THANK YOU!

Leading indicators

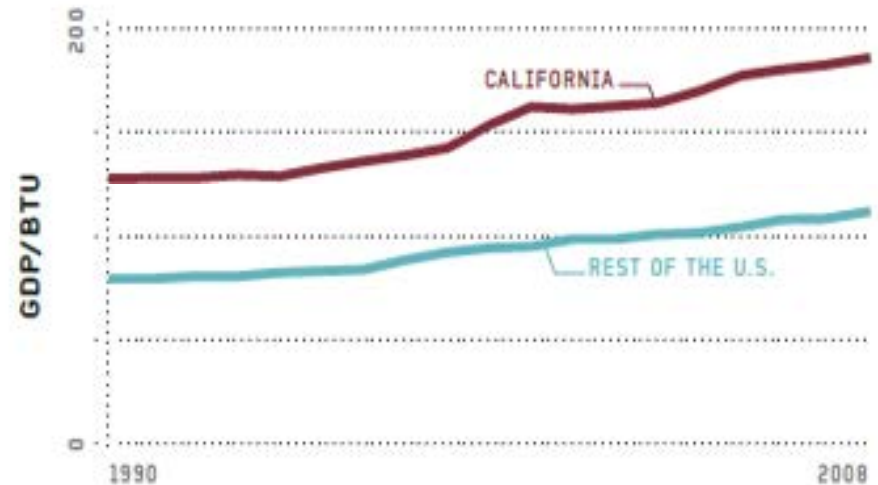
ENERGY CONSUMPTION (Per Capita)



GDP & EMISSIONS (Per Capita)



ENERGY PRODUCTIVITY _PAGE 18



Source: "2010 California Green Innovation Index", Next 10, <http://next10.org/environment/greenInnovation09.html>