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

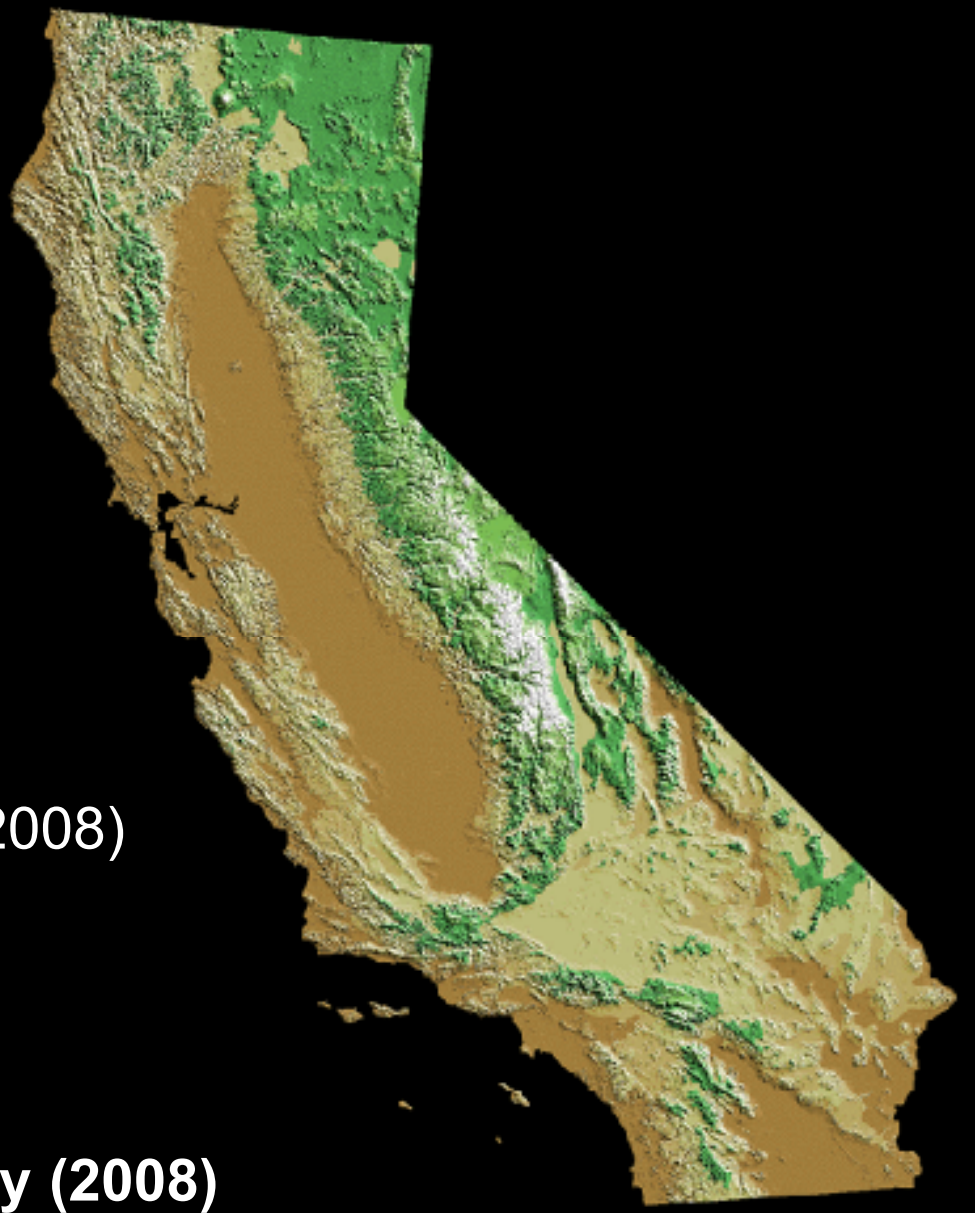
GSP ~$1.9 Trillion (2009)

Electricity Consumption
~287,000 GWh (2008)

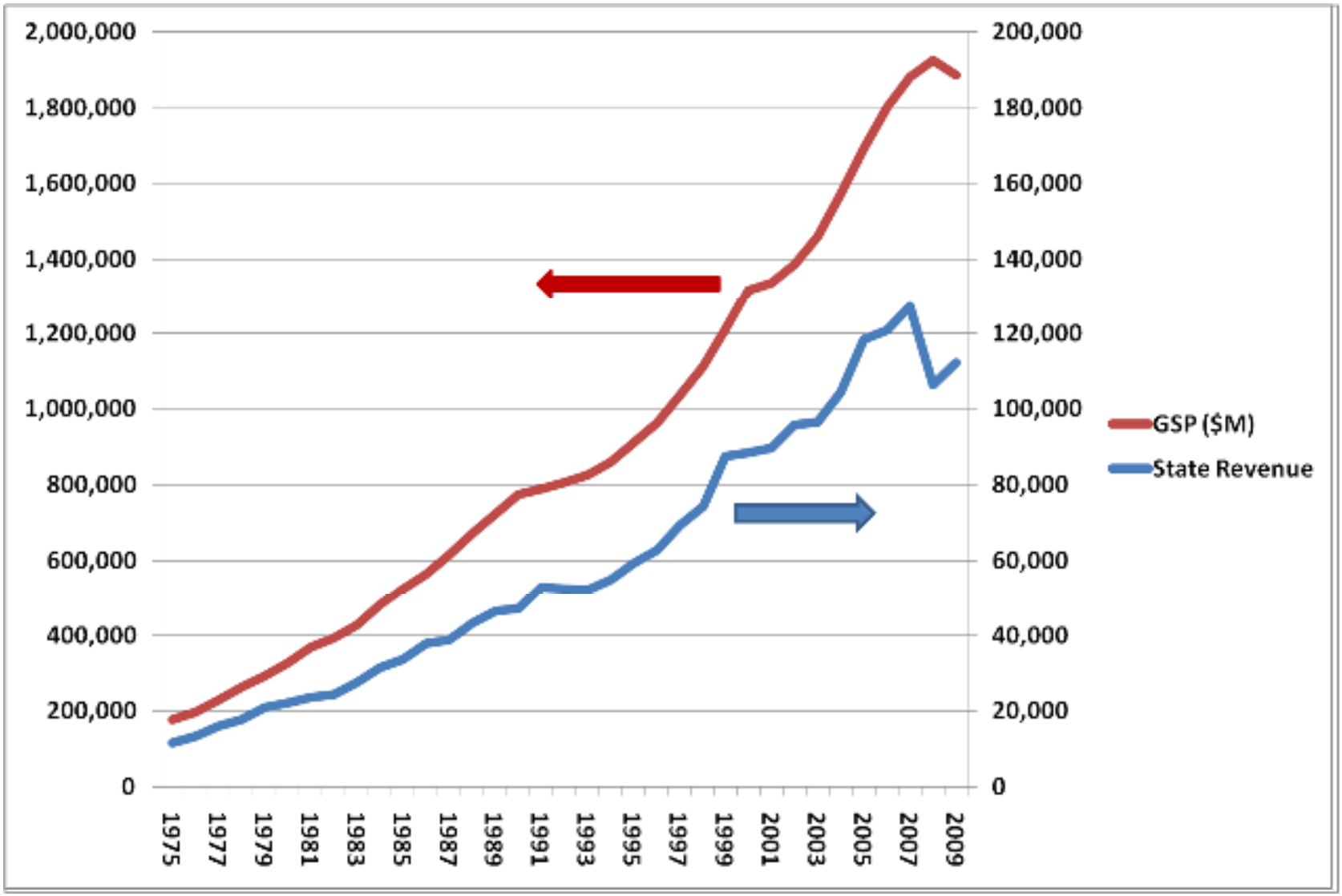
Peak Demand
~64,000 MW (2006)

Energy Expenditures (2008)
~$33.5B Electricity
~$17.6B Natural Gas
~$80B Petroleum

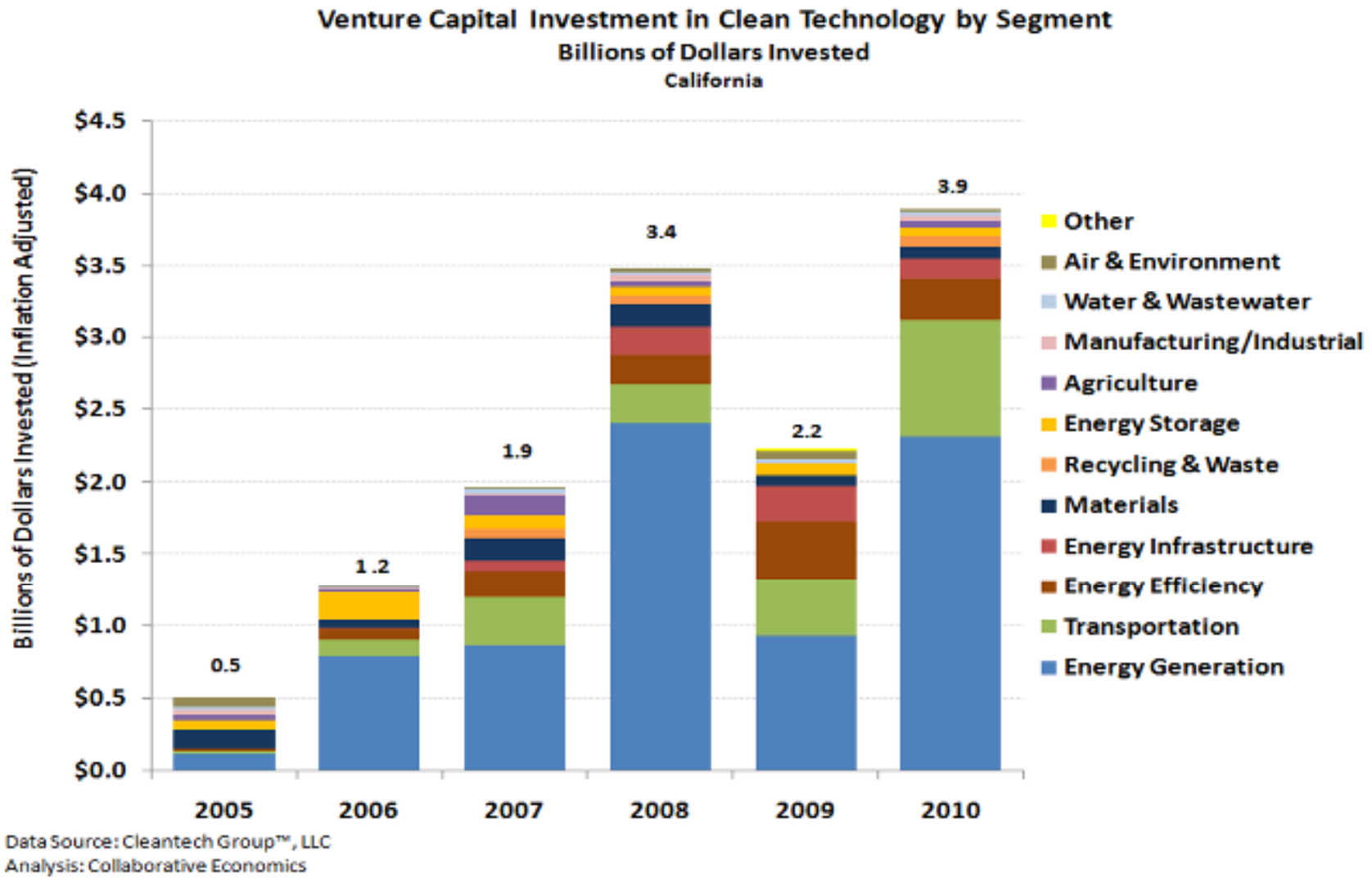
Total ~ $360Million/day (2008)



California GSP and State Revenue ($M)



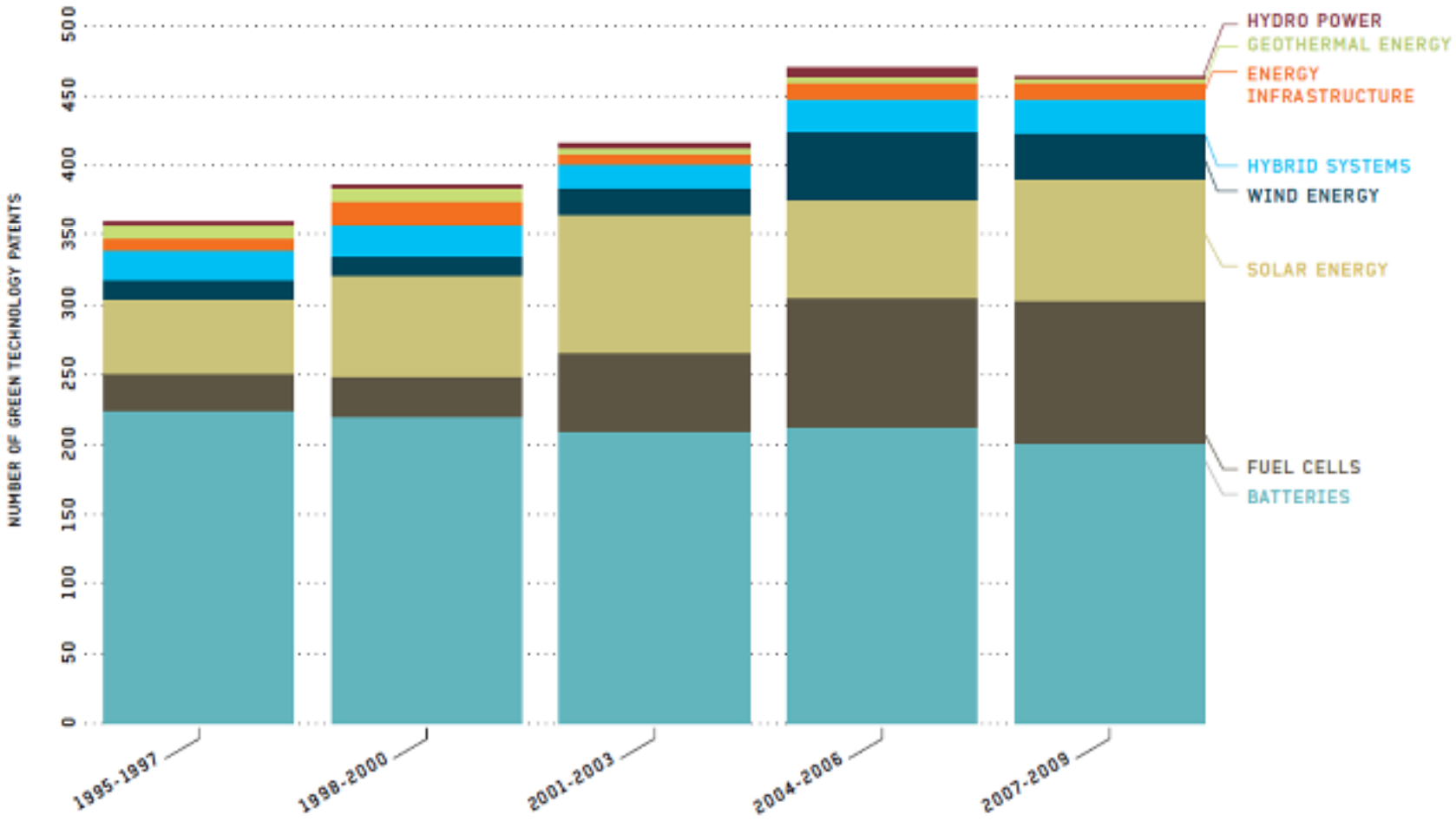
California Clean Tech Investment/Patents



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

California Clean Tech Investment/Patents

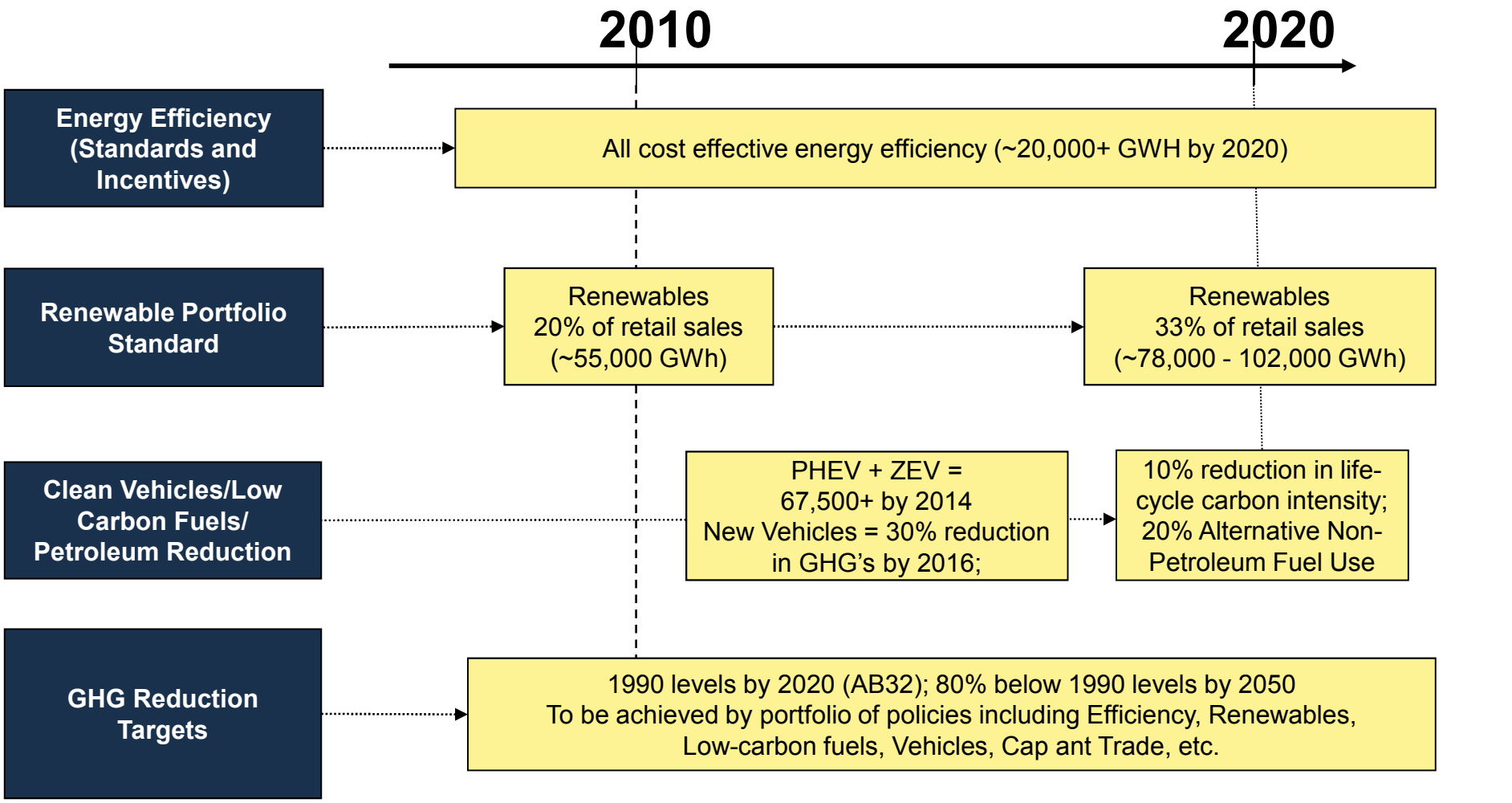
FIG 16. GREEN TECHNOLOGY PATENTS
BY TECHNOLOGY / CALIFORNIA



NEXT 10 CALIFORNIA GREEN INNOVATION INDEX. Data Source: 1790 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**

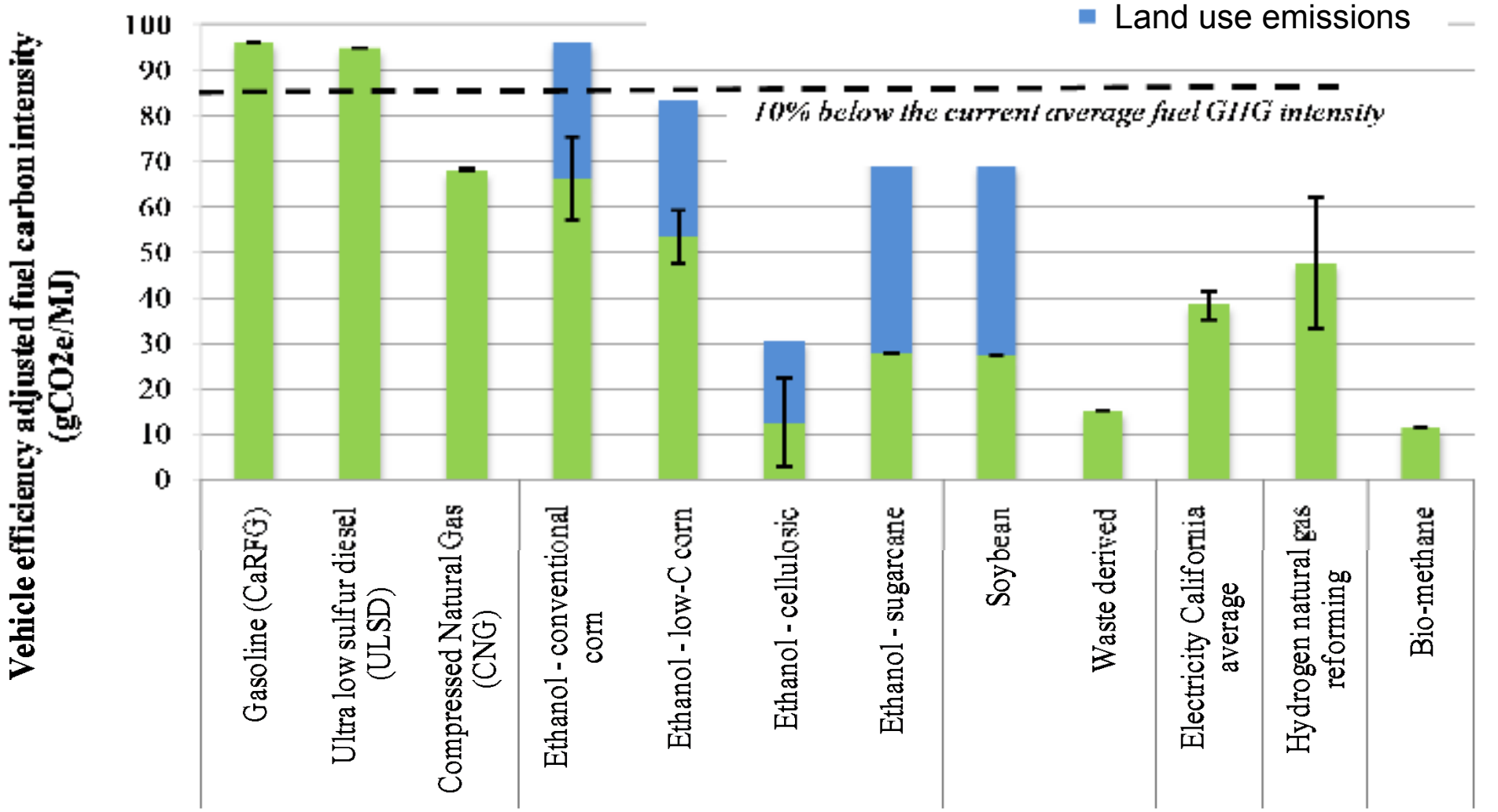
"Energy Carrier" *du jour* Phenomenon

- 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!*

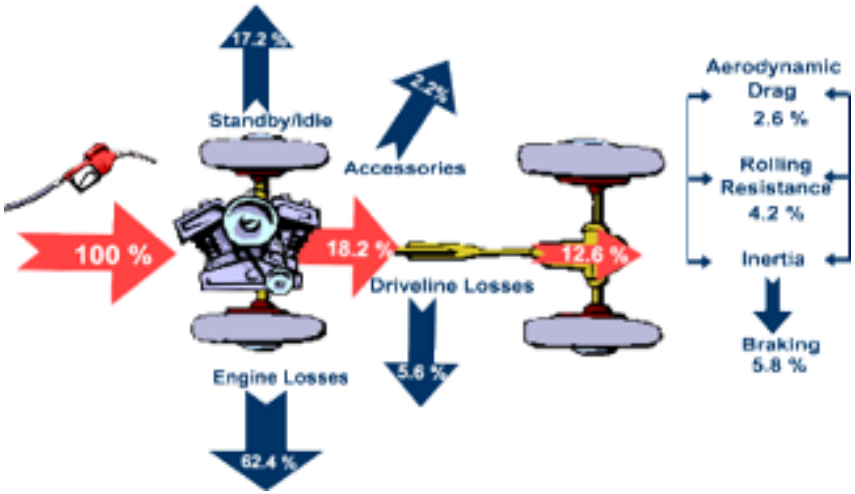
GHG (and Petroleum) Reduction strategies

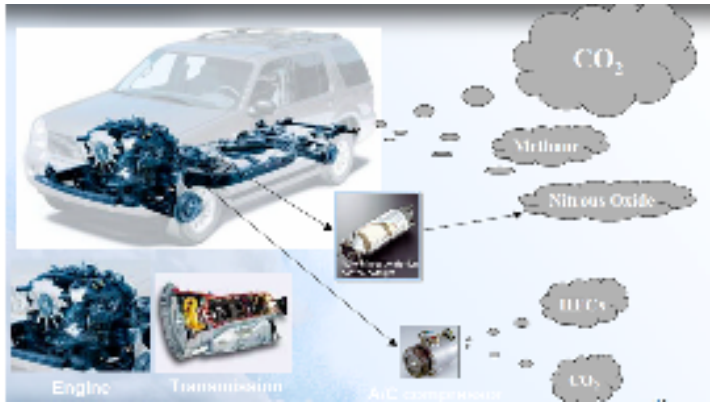
		Primary Energy		Average Efficiency		Total Demand
GHG (MTCO2e per Year)	=	GHG (MTCO2e) / Energy	x	Energy / Widget	x	Widgets / year
		⇧		⇧		⇧
		Low Carbon Fuels		Vehicle Standards		Land Use/ Transportation Planning

Performance Standards for Fuels

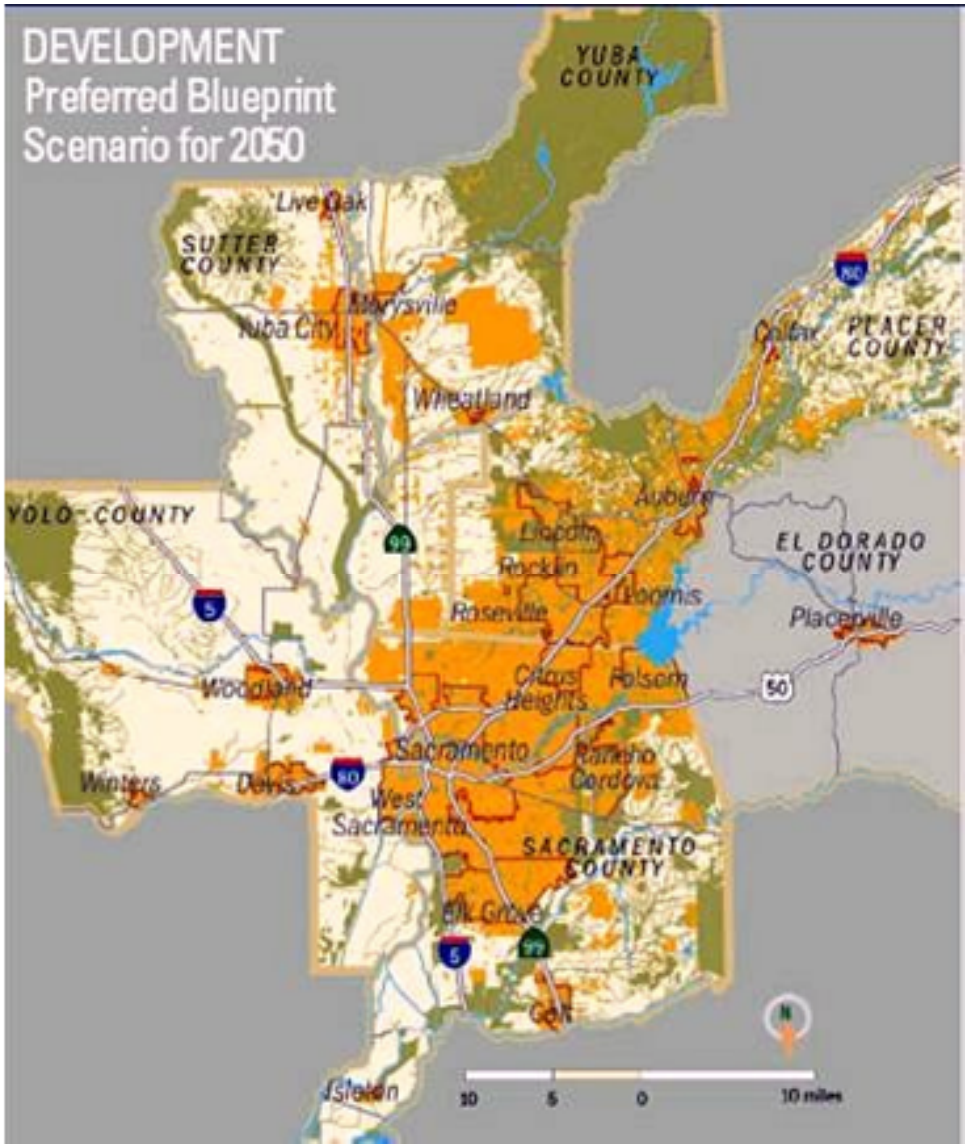


Performance Standards for Vehicles

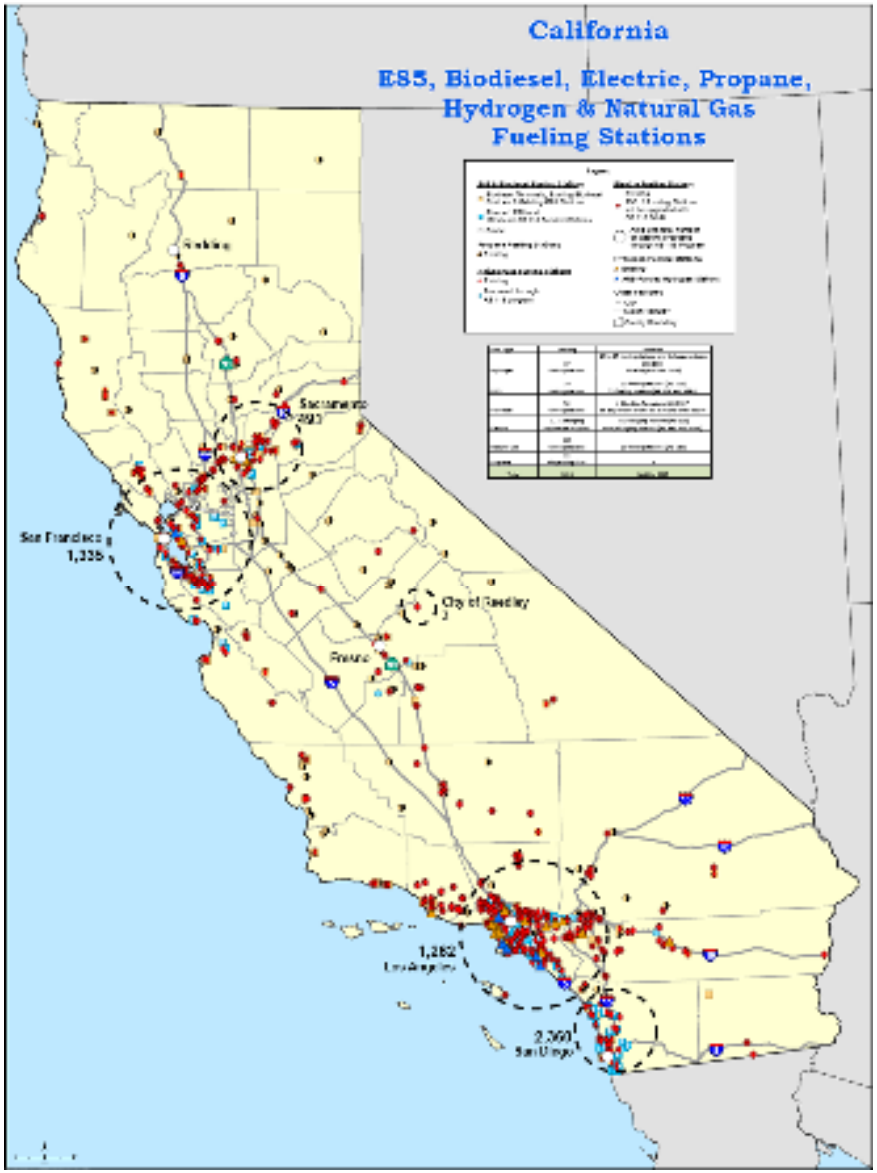




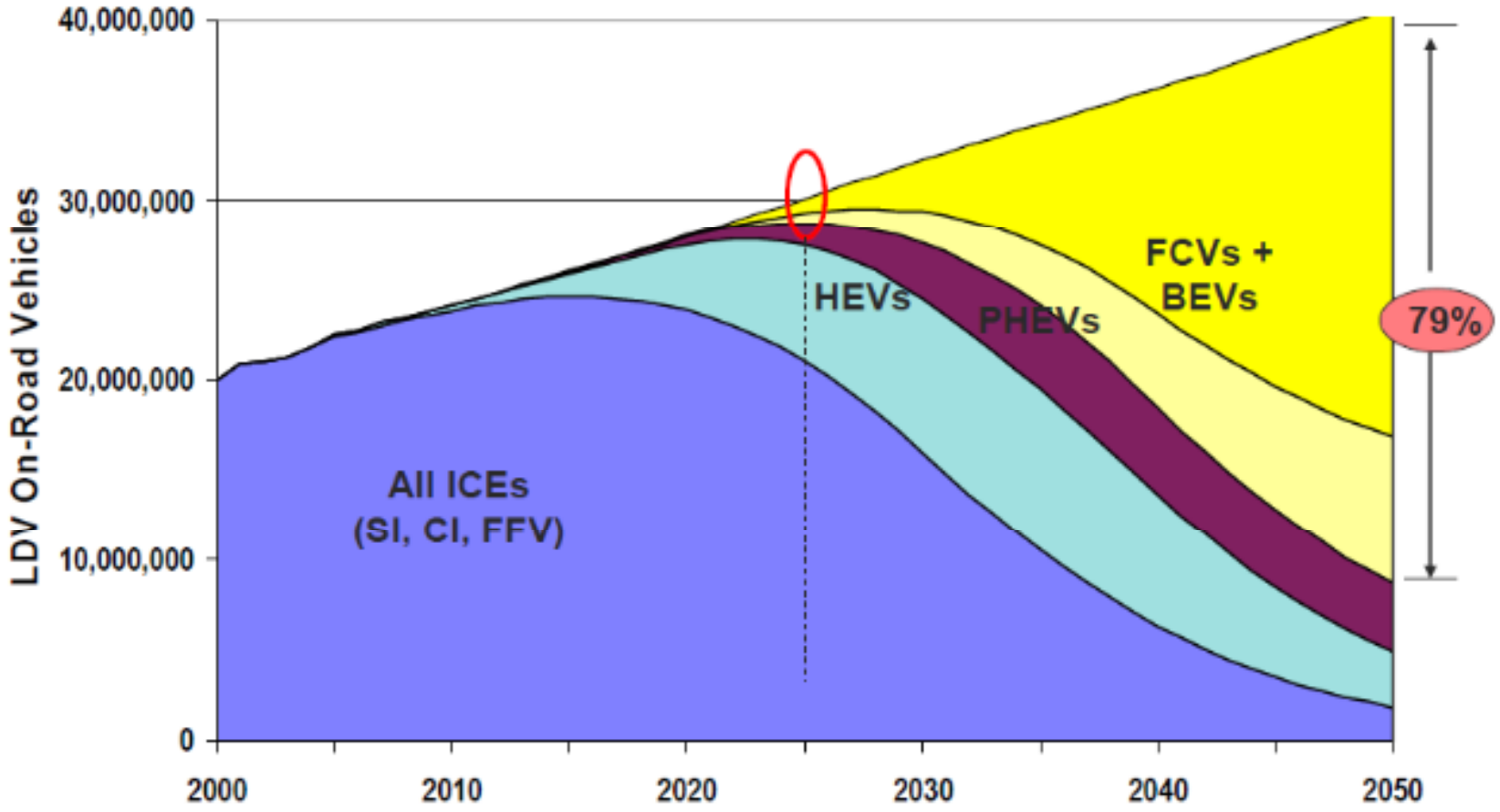
Performance Standards for Communities



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



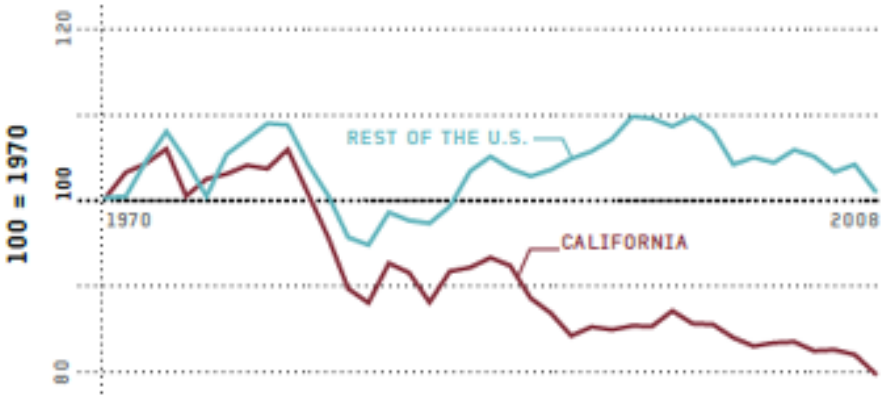
Getting to 2050 – One Scenario



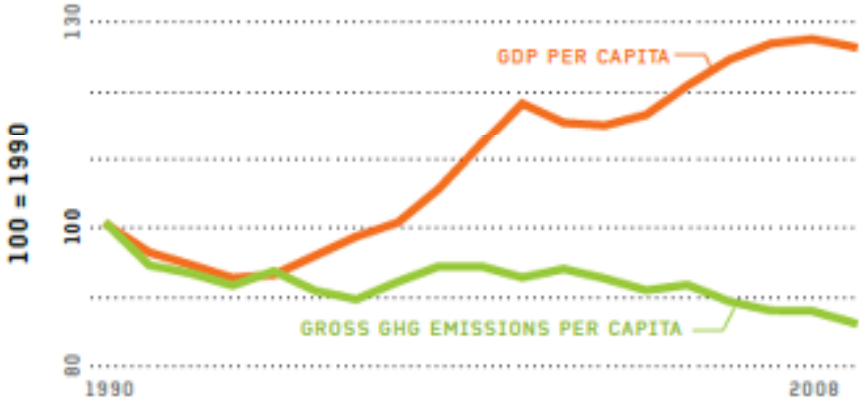
THANK YOU!

Leading indicators

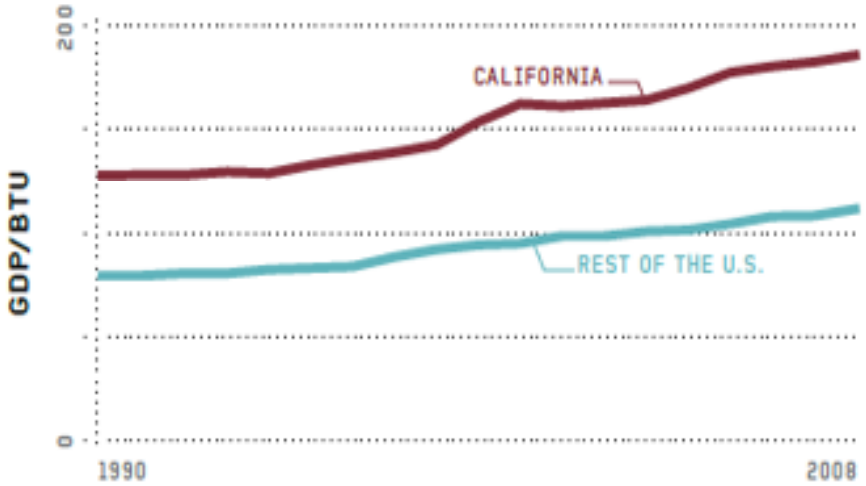
ENERGY CONSUMPTION (Per Capita)



GDP & EMISSIONS (Per Capita)



ENERGY PRODUCTIVITY _PAGE 18



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