



# Carbon Capture & Storage at SCE

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# About Southern California Edison

## ❖ One of Our Country's Largest Investor-Owned Utilities

- 50,000 square miles
- 13 million customers

## ❖ Environmental Leadership

- 2006 – 08 EE Results
  - ✓ More than 4 billion kWh & 746 MW – Enough to power over 500,000 homes for an entire year and reducing GHG emissions by more than 2 million tons, the equivalent of removing 250,000 cars off the road
  - ✓ Number one utility in the US for EE savings 4 out of the last 5 years
- Leading US Purchaser of Renewable Energy
  - ✓ 16% from wind, solar, biomass, biogas, geothermal and small hydro

### Top U.S. Utility Energy-Efficiency Programs, 92-05 Savings shown in megawatt-hours (MWh) or thousands of kWh.

Utility	Total MWh Saved
<b>Southern California Edison</b>	<b>8,901,686</b>
Electric	6,232,939
Power	3,787,182
Light	3,663,877
Heat &	2,118,687
Energy	2,086,208
	2,052,368
Electric	1,990,984
	1,346,101
& Light	1,136,646
Power	892,802
Energy	657,216



✓ Largest DR portfolio in California

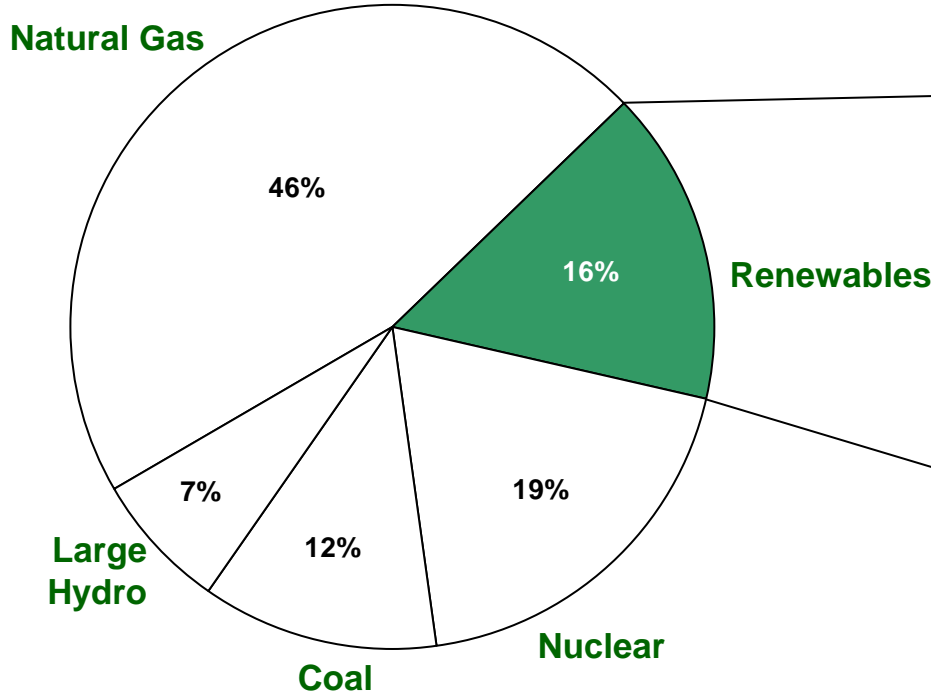
✓ Edison SmartConnect wins industry leadership award

✓ Largest private EV fleet in the country

# SCE's 2008 Resource Mix (Projected)

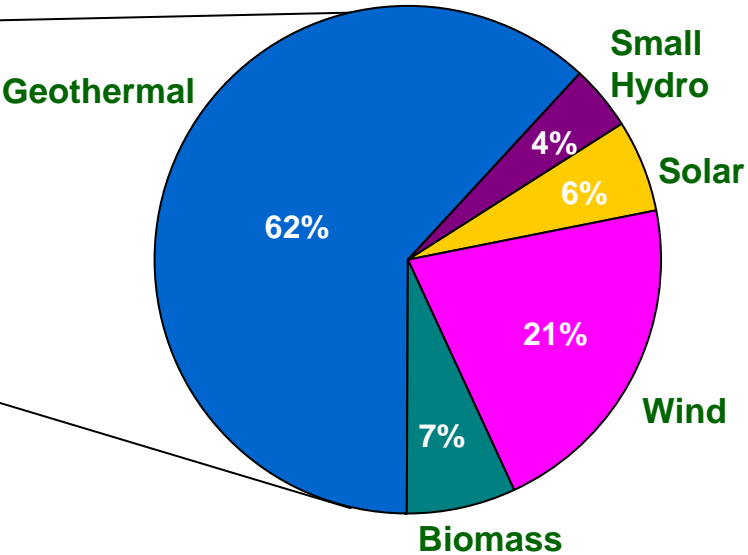
## All Resources

100% = 79 Billion kWh



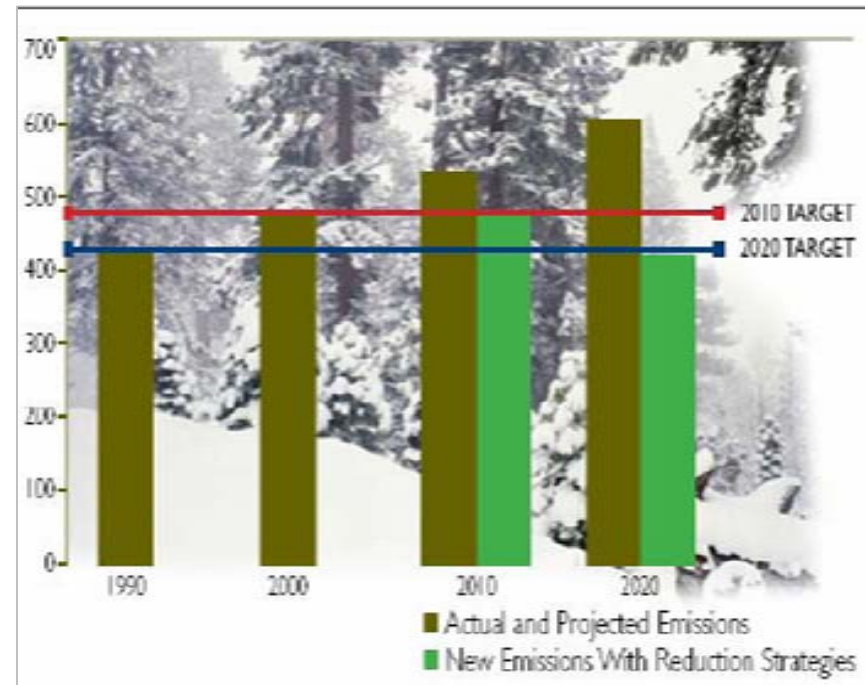
## Renewable Resources

100% = 12.6 Billion kWh



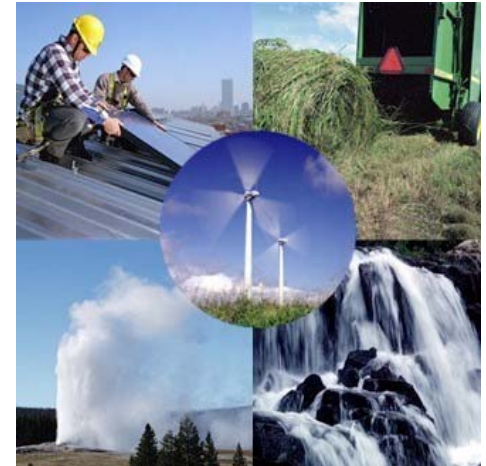
# California's Energy Policy – Global Warming Solutions Act (AB 32)

- ❖ World's 12<sup>th</sup> Largest Source of Carbon Dioxide
- ❖ California Global Warming Solutions Act = Reduce California GHG levels to:
  - 2000 levels by 2010
  - 1990 levels by 2020
- ❖ Scoping Plan Adopted December 2008:
  - Describes California's role in the West Coast Regional Carbon Sequestration Partnership (WESTCARB) - a public-private collaboration to characterize regional carbon capture and sequestration opportunities.
  - Supports near-term development of sequestration technology.



# California Energy Policy – Emissions Performance Standard

- ❖ California Senate Bill 1368: Establishes emissions standards for baseload generation owned by, or under long-term contract to publicly owned utilities, of 1,100 lbs CO<sub>2</sub> per megawatt-hour (MWh).
- ❖ Encourages the development of power plants (10MW and larger) that meet California's growing energy needs while minimizing their emissions of greenhouse gases.



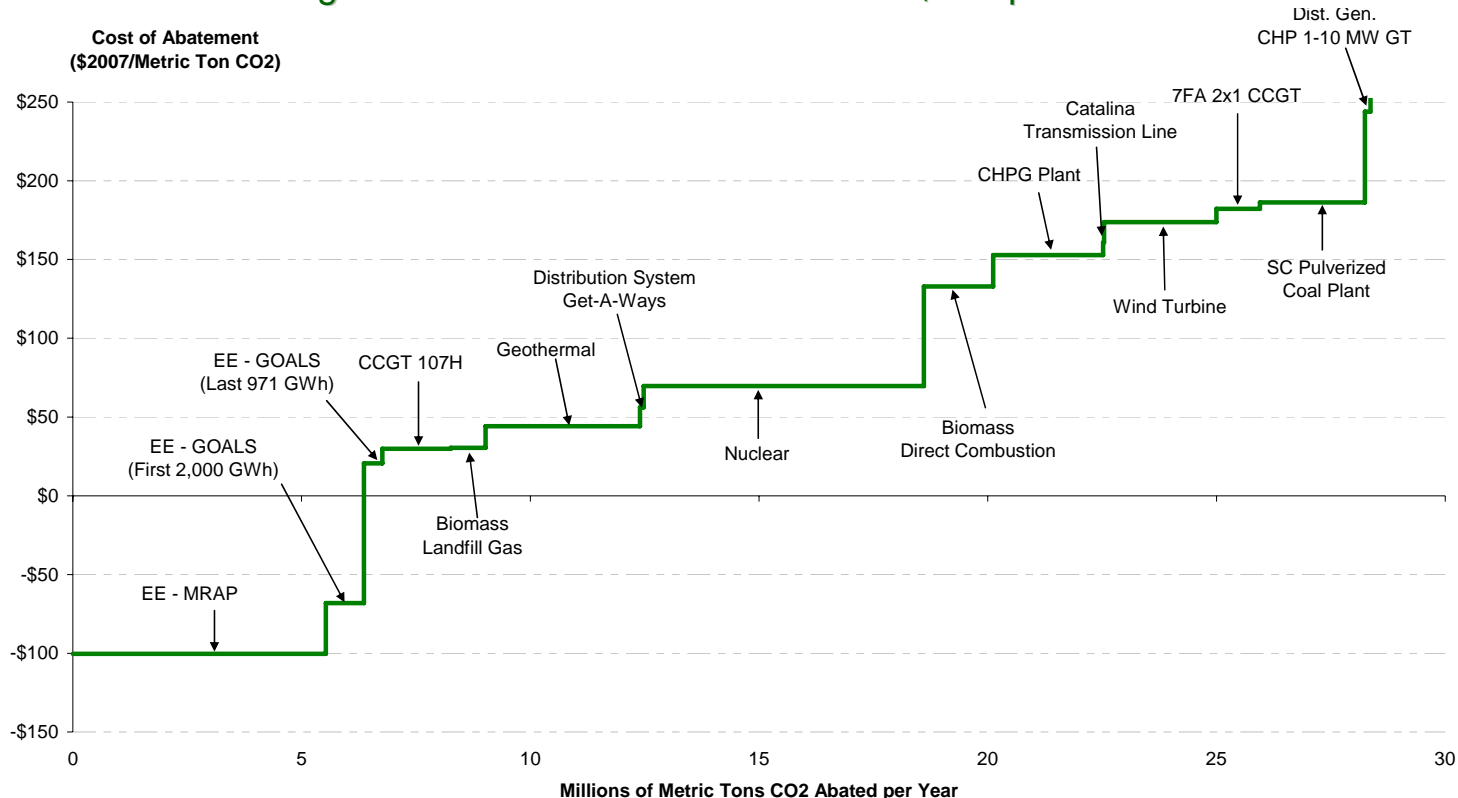
# EPS & CCS – Peaceful Co-Existence

- ❖ For covered procurements that employ geological formation injection for CO2 sequestration, the annual average carbon dioxide emissions **shall not include the carbon dioxide emissions that are projected to be successfully sequestered.** The EPS for such power plants shall be determined based on projections of net emissions over the life of the power plant.
  
- ❖ Carbon dioxide emissions shall be considered successfully sequestered if the sequestration project meets the following requirements:
  1. Includes the capture, transportation, and geologic formation injection of CO2 emissions;
  2. Complies with all applicable laws and regulations; and
  3. Has an economically and technically feasible plan that will result in the permanent sequestration of CO2 once the sequestration project is operational.

# Impact of GHG Regulation on Resource Planning

- ❖ GHG abatement costs will impact future resource planning
- ❖ Energy Efficiency is still the most cost effective GHG abatement tool but we cannot afford to pursue only one solution to climate change

2020 GHG Abatement Curve – Potentially Achievable  
Technologies with abatement costs less than \$250 per metric ton CO2



# Why Pursue Carbon Capture & Storage? A “Green” Portfolio Manager’s View

- ❖ Potential to advance California’s move towards reduced GHG emissions and, if feasible, will also produce reliable, baseload power.
  - Near-Term – Domestic supply of “cheap” coal and potential for application of existing technology makes CCS a promising bridge technology to buy time for a zero GHG emissions future
  - Long-Term -- If feasible, CCS technologies can be part of a diversified portfolio that increases the nation’s energy security and provides stability for customer rates by using an abundant (300-year supply) domestic fuel ... Potential application for fossil fuels other than coal and for sustainable biomass
  
- ❖ Bottom Line = We must be every bit as committed to preserving energy security and reliability as we are to reducing GHG emissions ... Let’s not lock in problems with myopic approaches to tackling the issues we face and/or doom ourselves to failure through dogmatic opposition to potential solutions ... Let’s solve problems and expand available near and long term solutions!

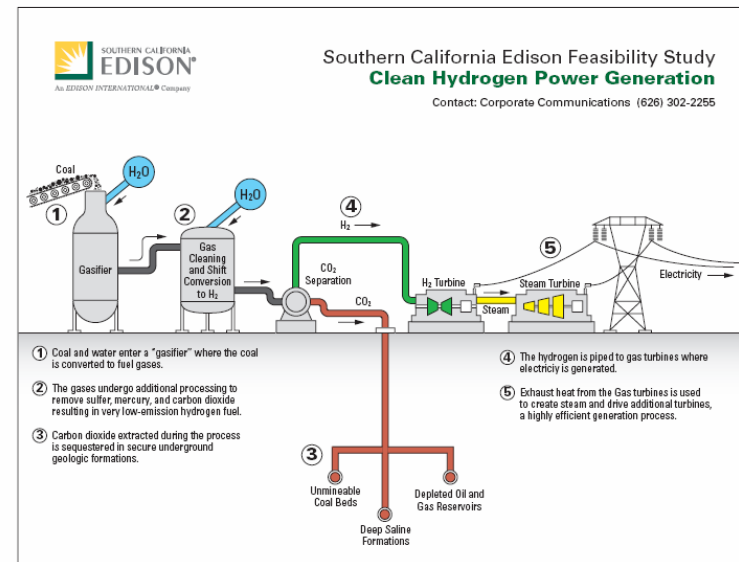


# SCE Investments in CCS Development

- ❖ Cool Water demonstration plant
  - Barstow, CA in the 1980's
  - 1<sup>st</sup> major use of coal gasification to generate electric power in U.S. (110MW)
  - Established early technical foundation for future Integrated Gasification Combined Cycle (IGCC) power plants
  
- ❖ West Coast Regional Carbon Sequestration Partnership (WESTCARB) & Southwest Partnership
  - WESTCARB -- US DOE funded (\$81.2 million to date) collaborative research partnership to study regional carbon sequestration opportunities
  - California Energy Commission = Major co-funder who manages the WESTCARB team of 80 public agencies, private companies, nonprofits, institutions and others
  - SOUTHWEST – SCE has 48% ownership of coal plant in four corners area of US
  - \$12 – 15 million investment in CCS development
  
- ❖ Hydrogen Energy California (HECA)
  - Partnering to conduct first feasibility study in U.S. of combining several “clean” coal technologies on a full commercial scale.
  - The advanced technologies in the Clean Hydrogen Power Generation (CHPG) study are being considered or tested individually elsewhere, however this is the first assessment of a full scale facility that employs all of them.

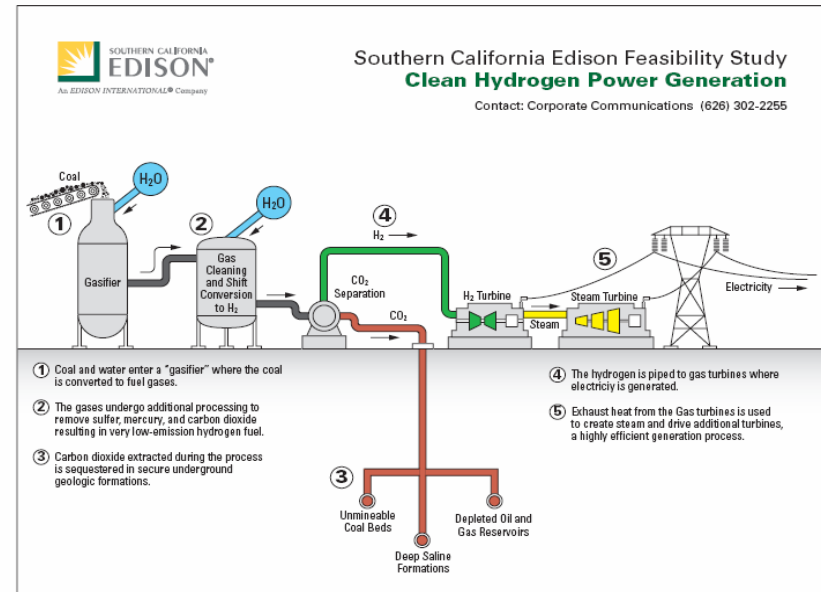
# Hydrogen Energy California Project

- ❖ SCE is co-funding (\$30M) the BP/Rio Tinto HECA study that will evaluate the feasibility of a facility that would:
  - Produce low-carbon baseload electricity by gasifying California's non-conventional fuels (i.e. petroleum coke) to produce hydrogen for electric generation through an Integrated Gasification Combined Cycle plant, *PLUS* ...
  - Capture the CO<sub>2</sub> emissions for Enhanced Oil Recovery (EOR) with sequestration in California's oil fields.
  
- ❖ First of Its Kind Full Scale Plant Combining:
  - Combined cycle generation
  - Extracting low emission hydrogen from petcoke
  - Extensive CCS in California oilfields
  
- ❖ SCE's Potential Benefits
  - Help SCE reach GHG reduction mandates
  - Potential for Equity Ownership
  - Potential Power Purchase Agreements



# Status of HECA Project

- ❖ October 2008, SCE filed an Advice Letter with the CPUC to participate in the HECA project.
- ❖ February 20, 2009, the CPUC issued a Resolution acting on the Advice Letter filing which established a Memo Account to track HECA costs.
- ❖ April 2009, SCE anticipates filing Application for recovery of SCE's share of HECA costs.



Source: Southern California Edison



# Thank You



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