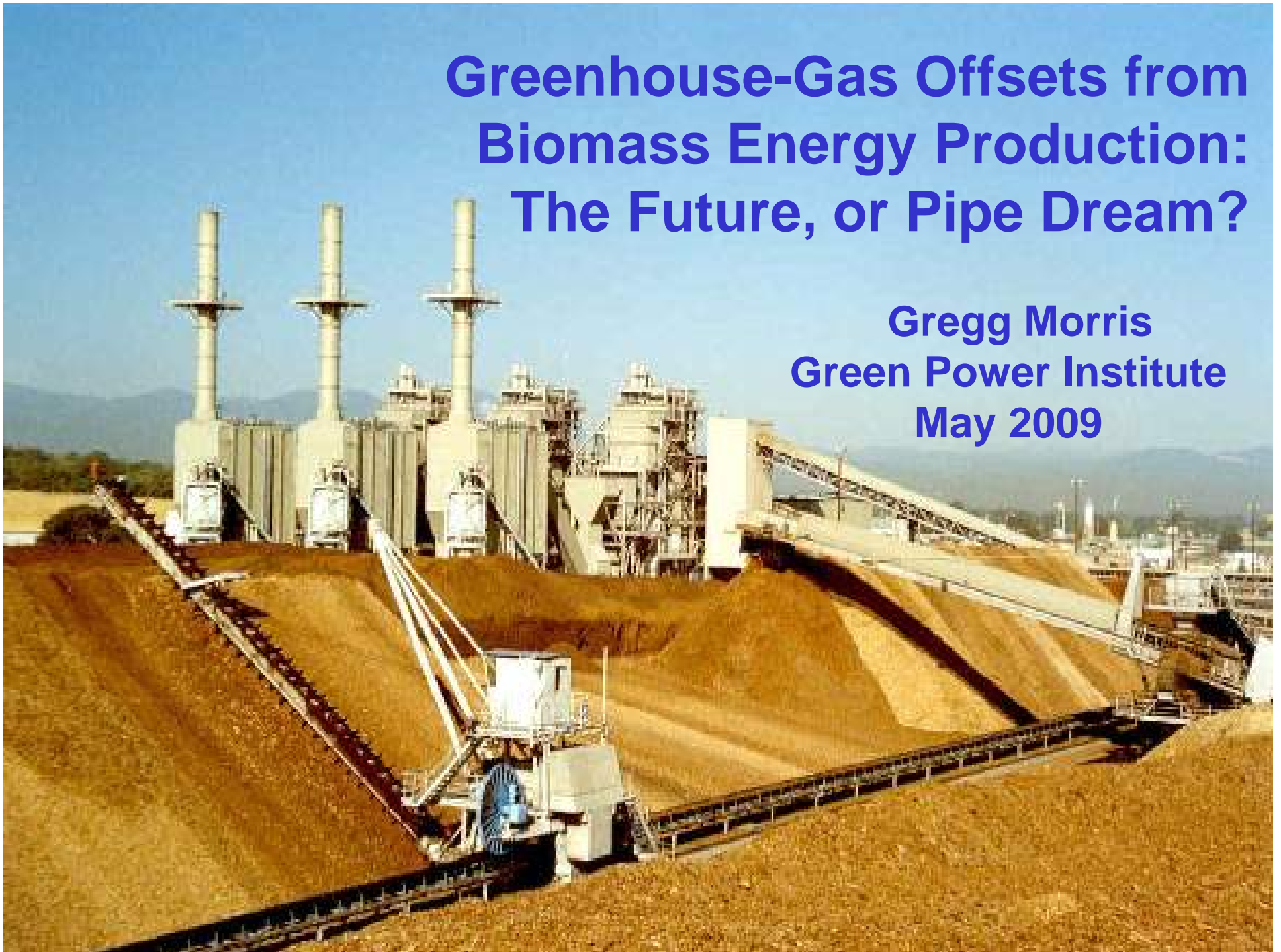


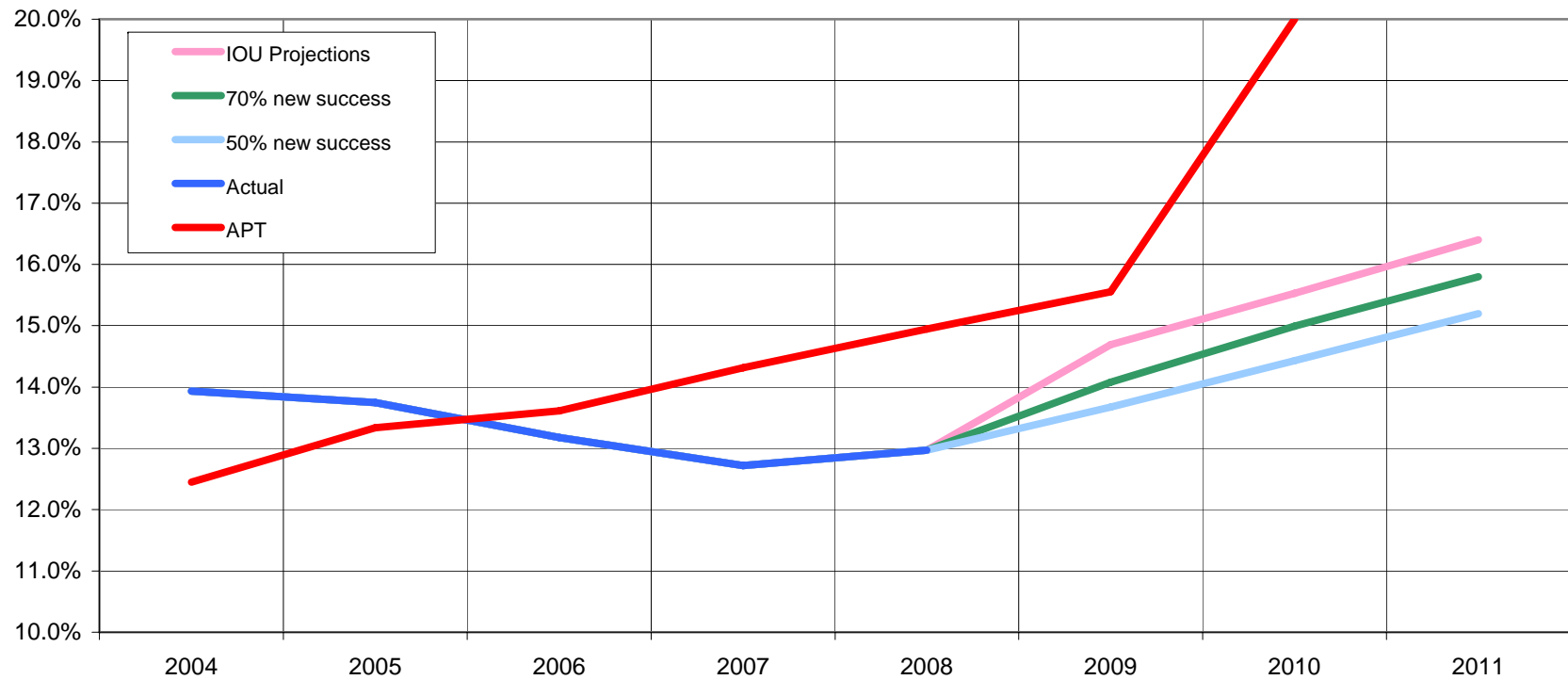
Greenhouse-Gas Offsets from Biomass Energy Production: The Future, or Pipe Dream?

Gregg Morris
Green Power Institute
May 2009



**The RPS Itself is
Not on Track**

California RPS Progress (3 IOUs)



Renewables and Greenhouse Gases

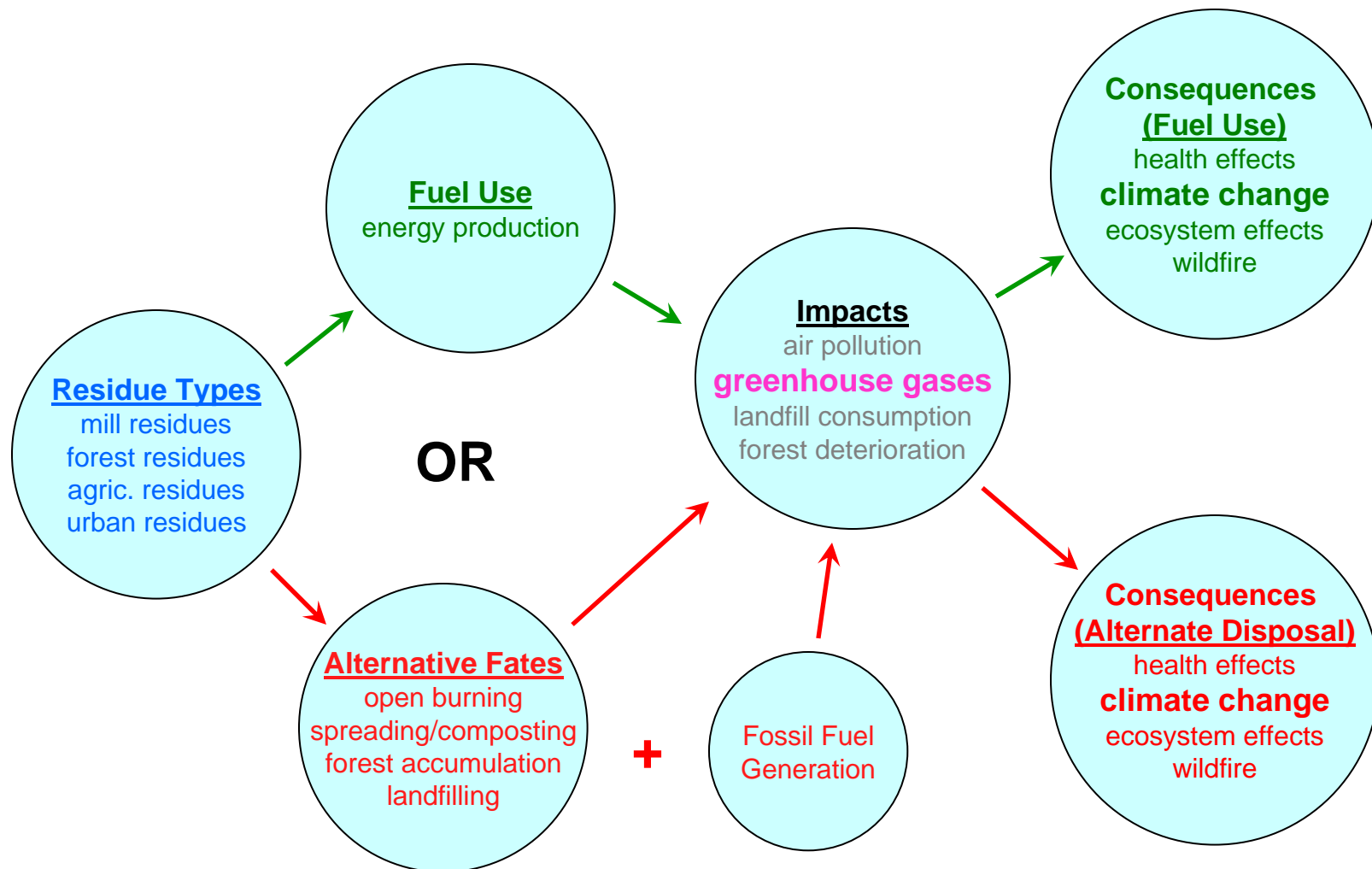
All Renewables are Carbon Neutral.

RECs contain the attribute of avoided fossil fuel use.

Renewables do not need allowances, and do not generate offsets based on avoided fossil fuel use outside of the REC.

Biomass and Greenhouse Gases

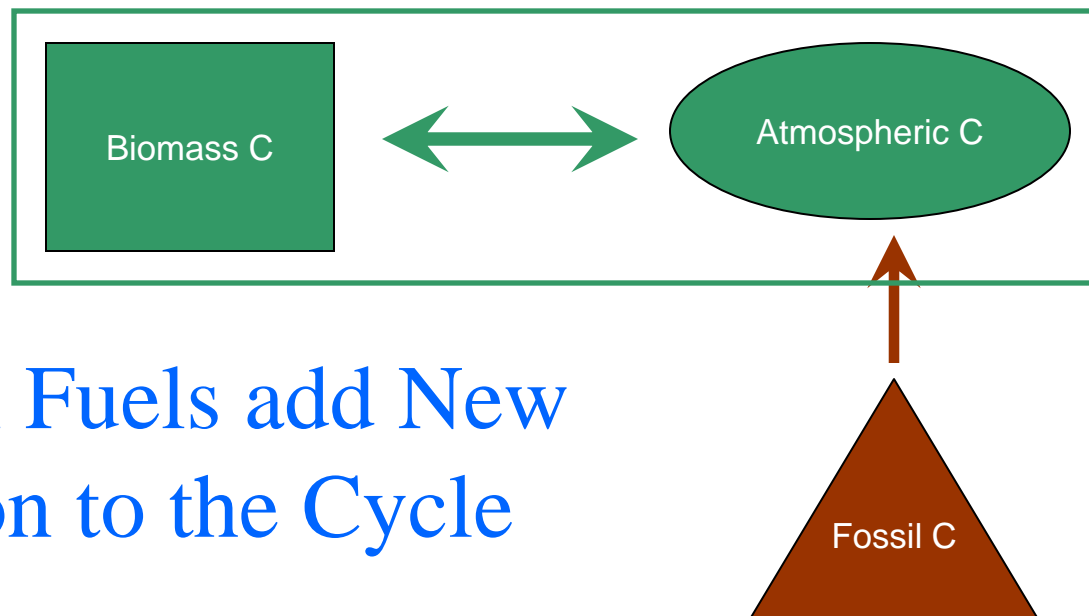
Biomass Benefits Framework



GHGs and Biomass

- Biomass is Carbon Neutral

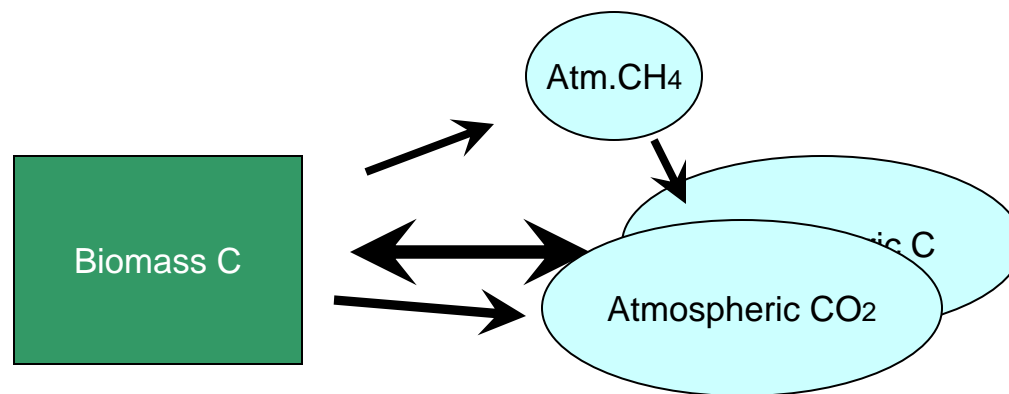
- Carbon stocks in the biosphere and atmosphere are already linked and in rapid exchange. No new carbon is being added to the system.



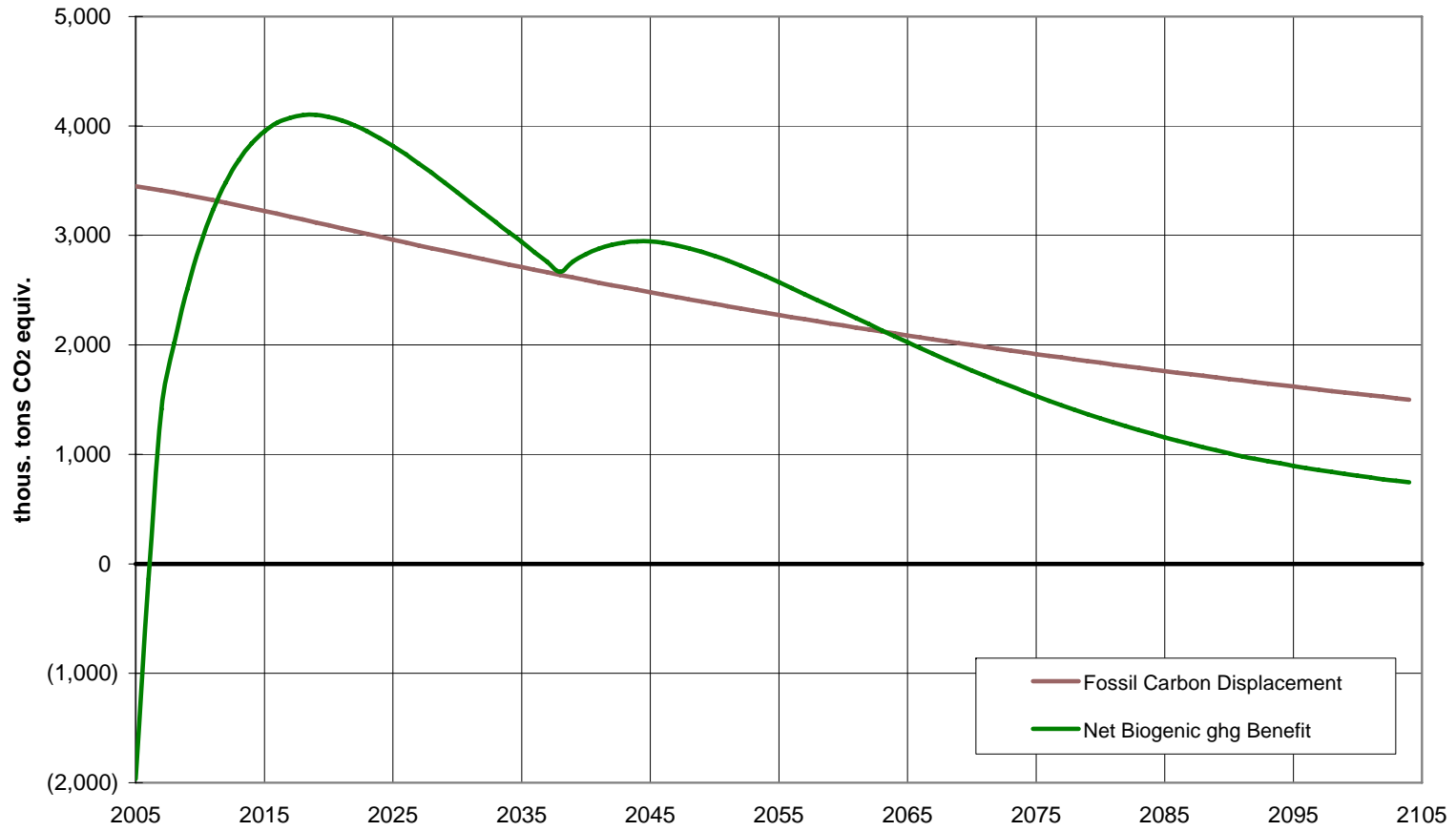
- Fossil Fuels add New Carbon to the Cycle

GHGs and Biomass

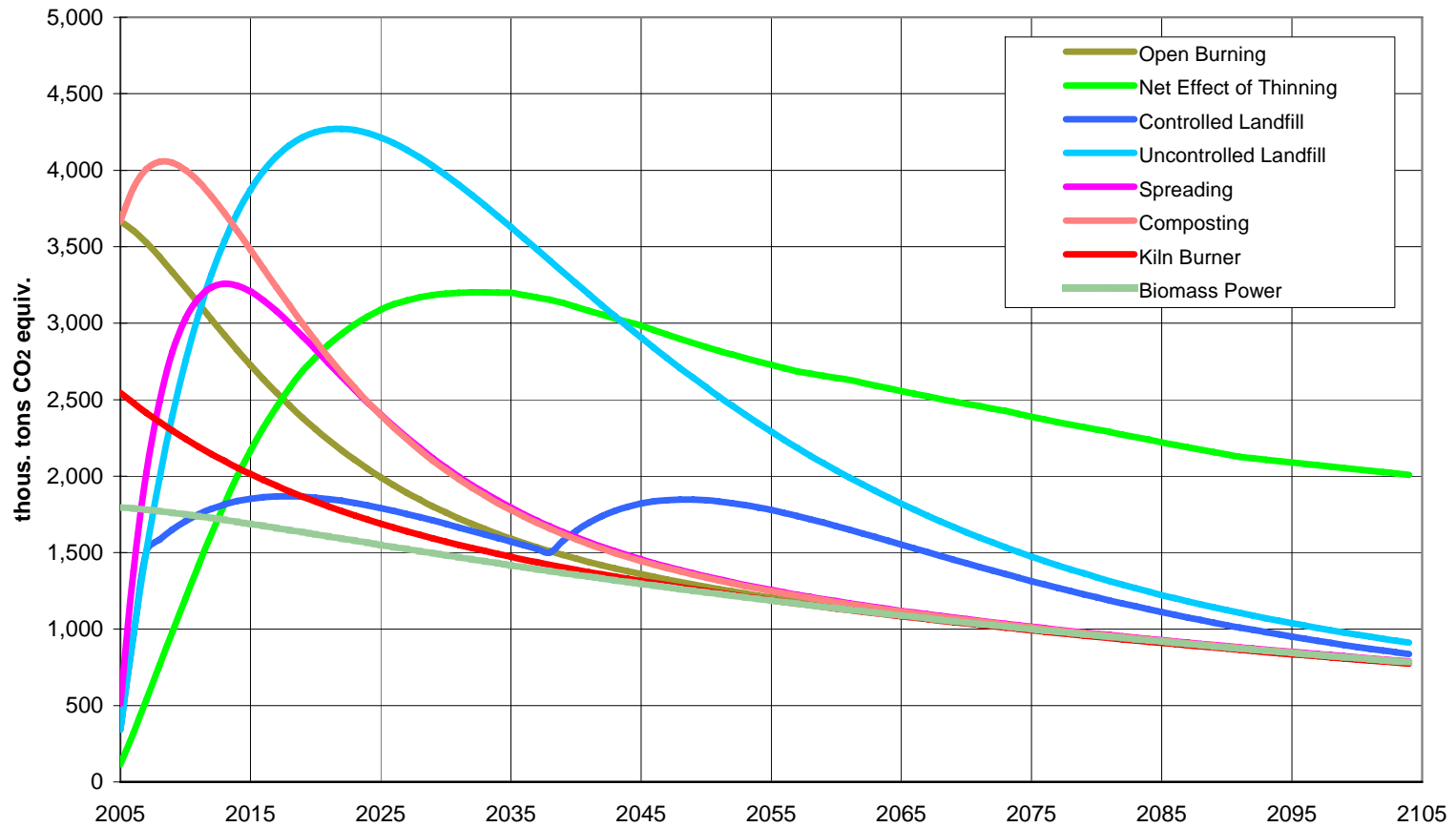
- It's More Complicated than that
 - Biomass stocks can grow or decline over time, either sequestering or releasing net carbon to the atmospheric stock.
 - Carbon can be emitted to the atmosphere in either oxidized (CO_2) or reduced (CH_4) form. Reduced is 25 times more potent as a greenhouse gas.



GHG Benefits associated with California Biomass Power Production in 2006



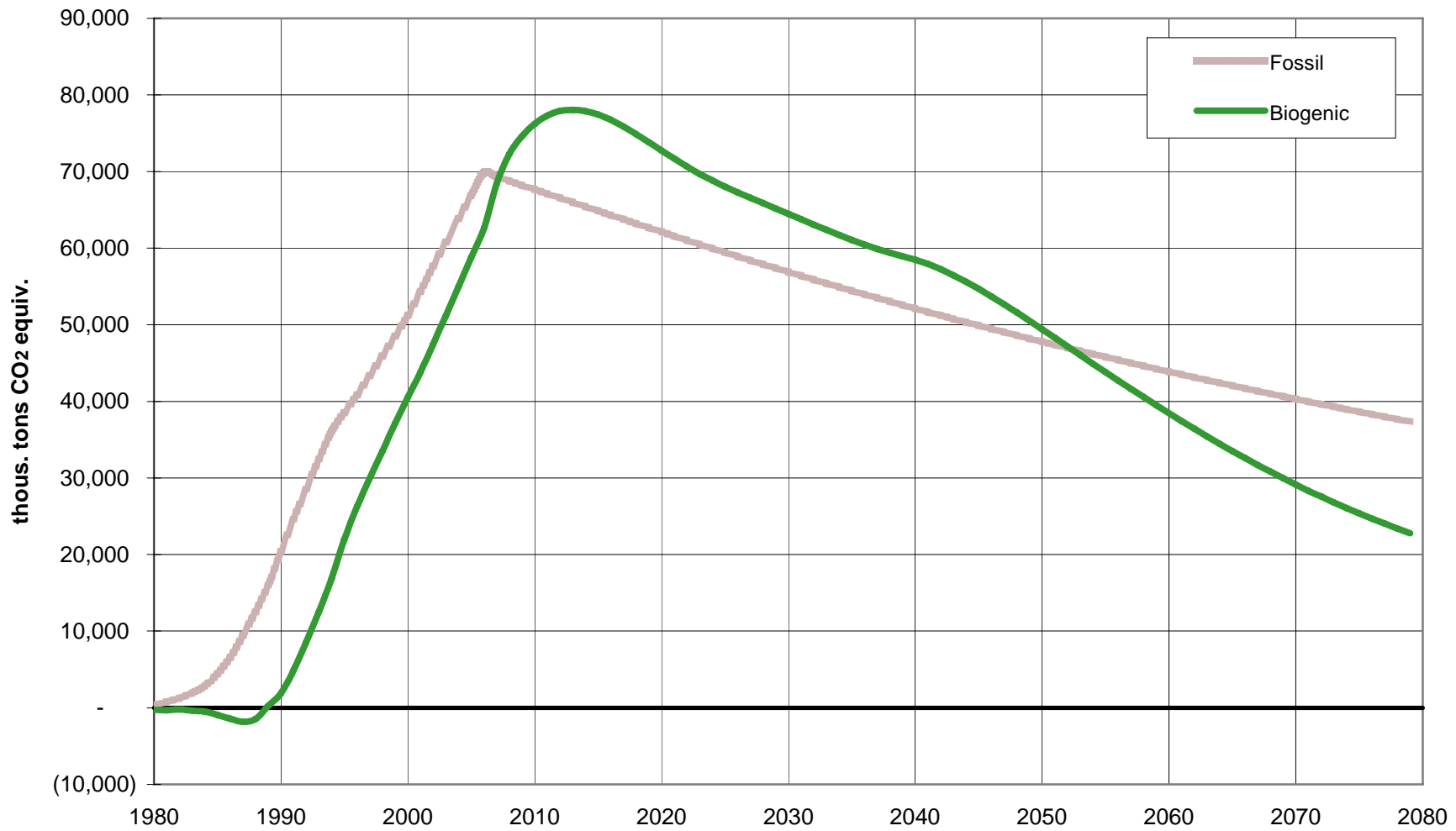
GHG Burden associated with the Disposal of 1 million bdt of Biomass



Greenhouse Gas Emissions Factors for Biomass and Biogas
 (all factors expressed as equivalent year-1 emissions of CO₂ equivalents)

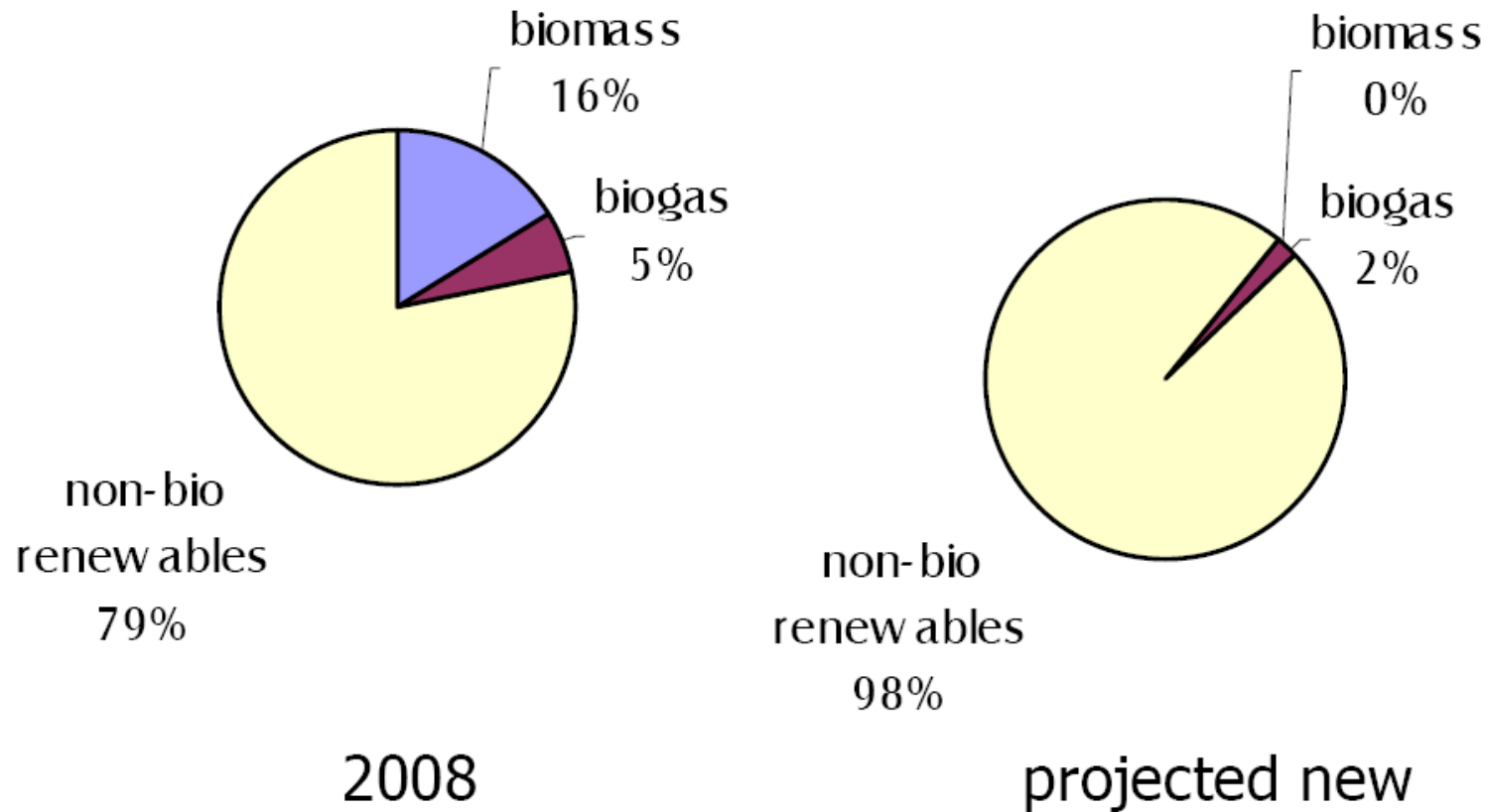
	<u>ton/bdt</u>	<u>ton/bil.btu</u>	<u>ton/MWh</u>
Biomass			
Net Reduction in Biogenic C			
Open Burning	0.62	36	0.62
Forest Accumulation	1.87	110	1.87
Uncontrolled Landfill	2.28	134	2.28
Controlled Landfill	0.27	16	0.27
Spreading	0.69	41	0.69
Composting	1.00	59	1.00
Kiln Boiler / Fireplaces	0.22	13	0.22
California Biomass Mix 2005	0.81	48	0.81
Avoided Fossil Fuel Use	0.80	47	0.80
Landfill Gas (LFG)			
Net Reduction in Biogenic C			
Uncontrolled Landfill		241	2.89
Controlled Landfill		22	0.26
Avoided Fossil Fuel Use		65	0.78
Dairy Manure			
Net Reduction in Biogenic C	2.88	180	8.64
Avoided Fossil Fuel Use	0.26	16	0.78

GHG Benefit from Operations of the CA Biomass Industry, 1980 - 1986

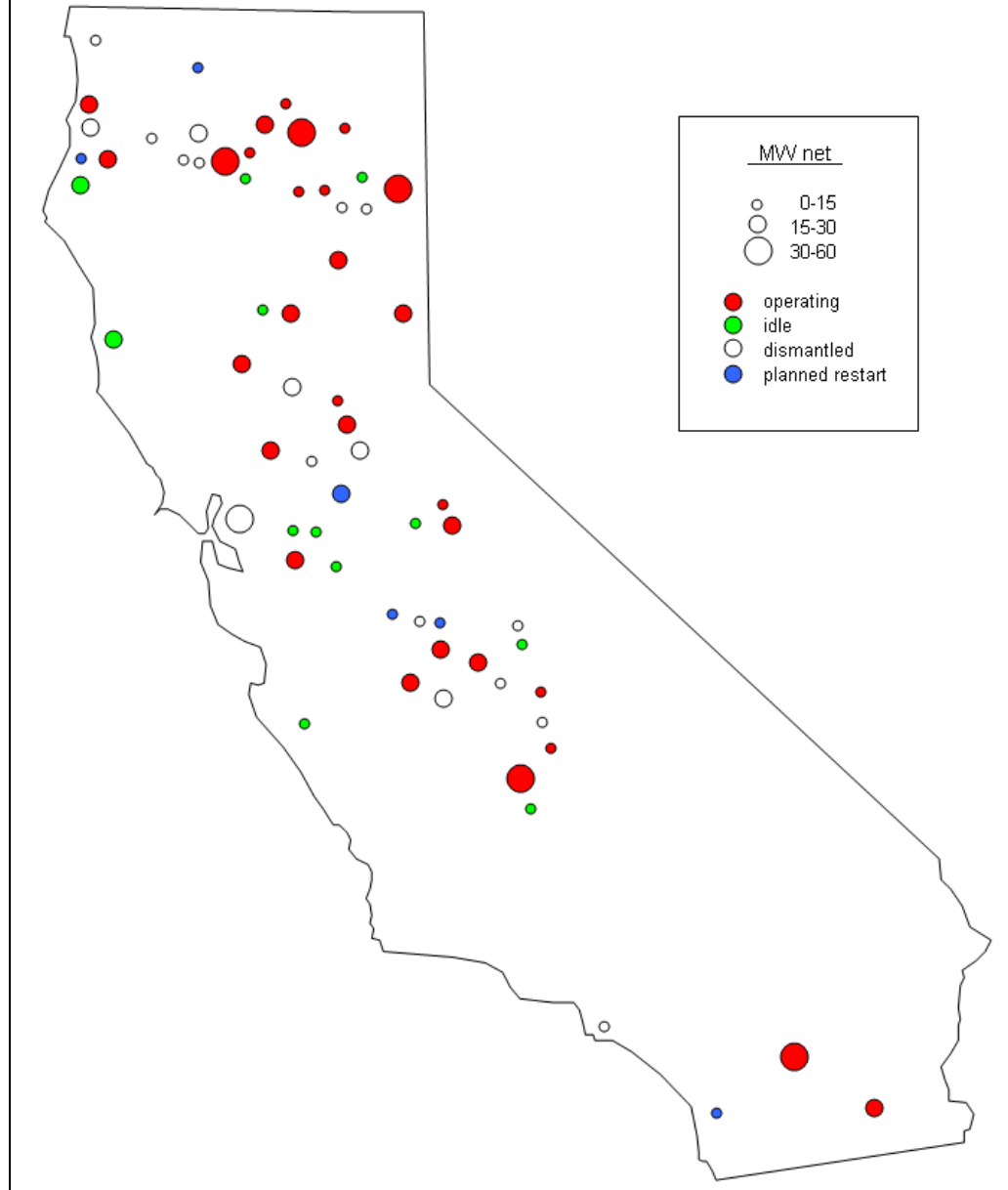


Biomass in California Today

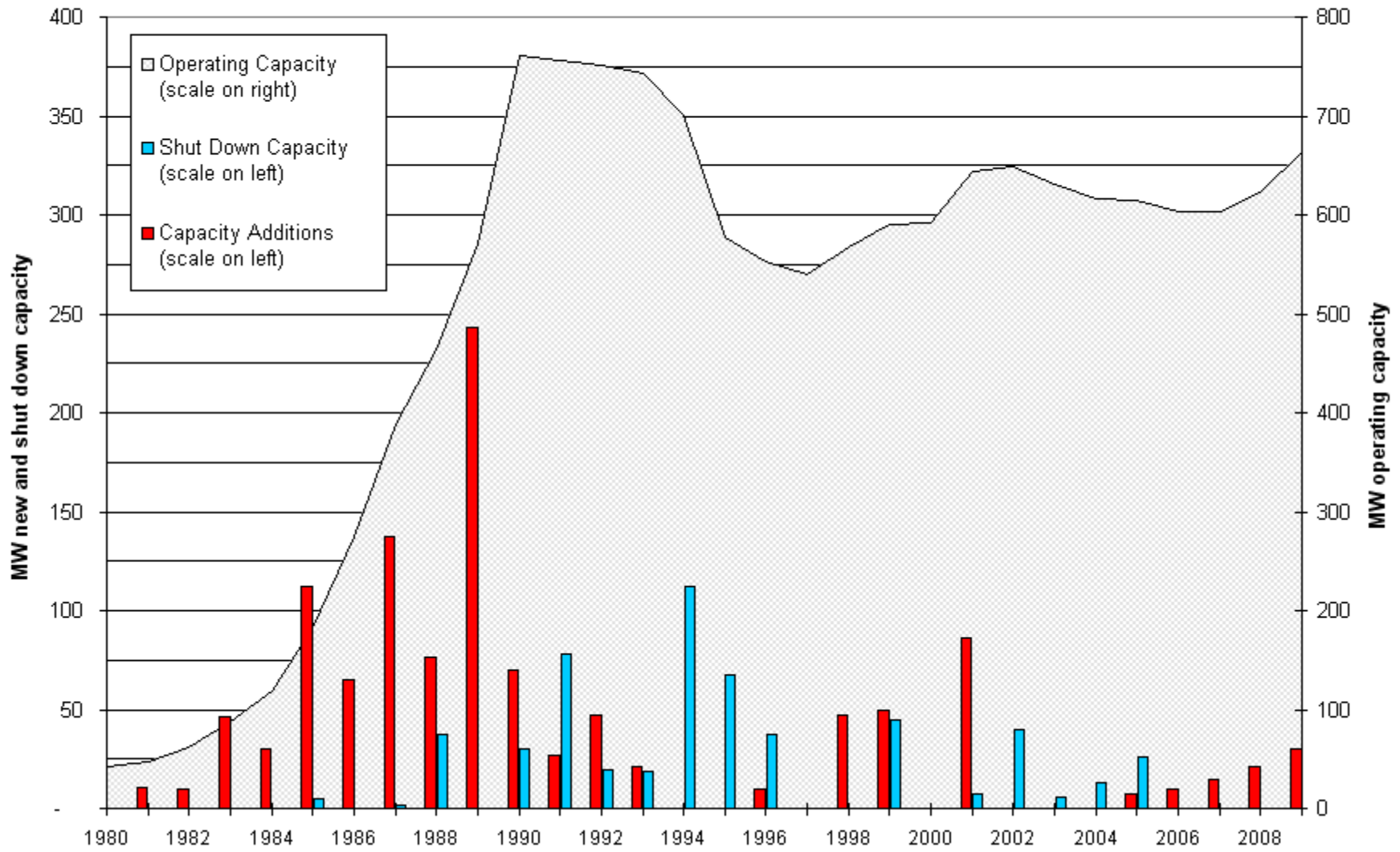
EO S-06-06: Biomass 20% of RPS



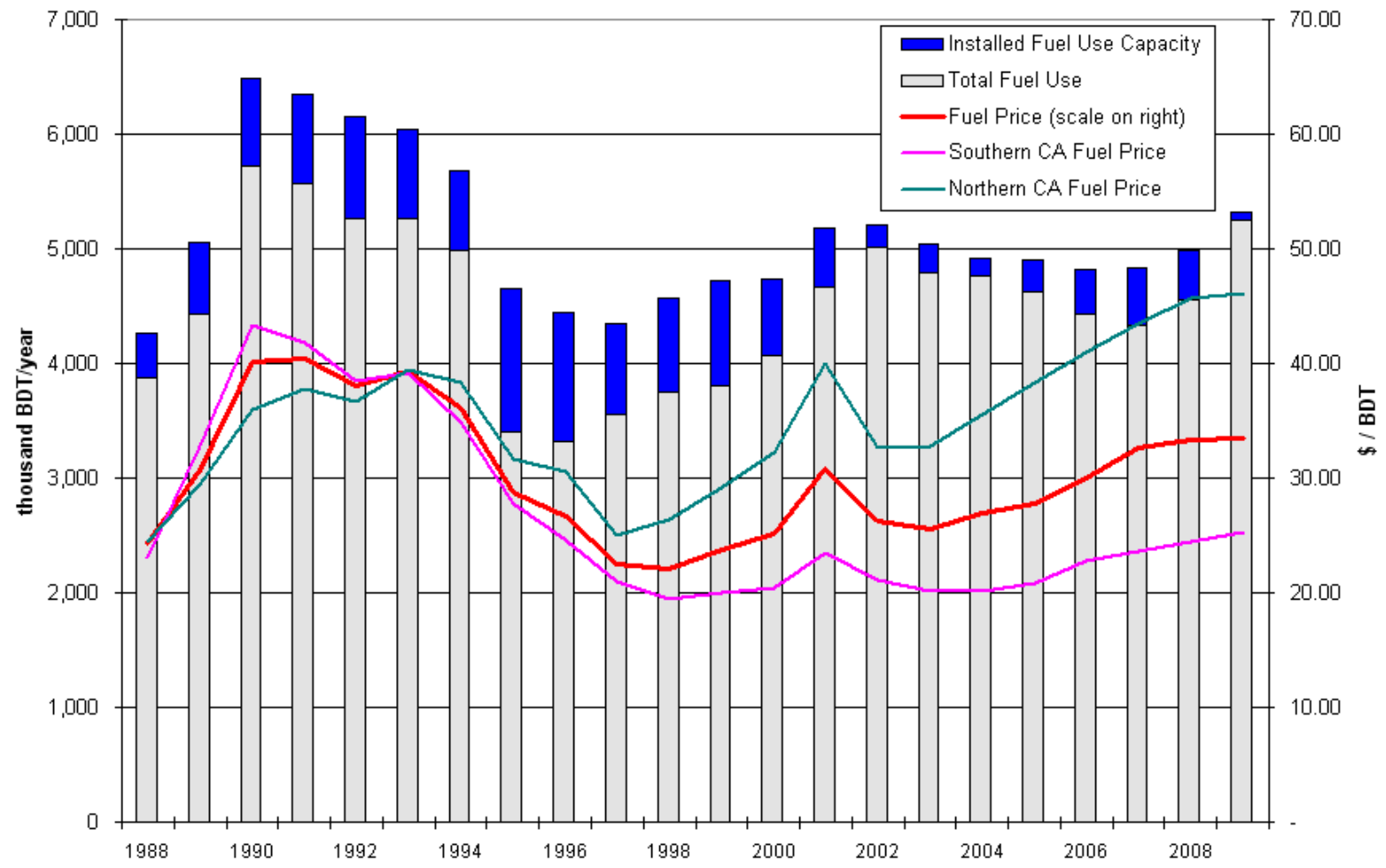
California Biomass Power plants 2008



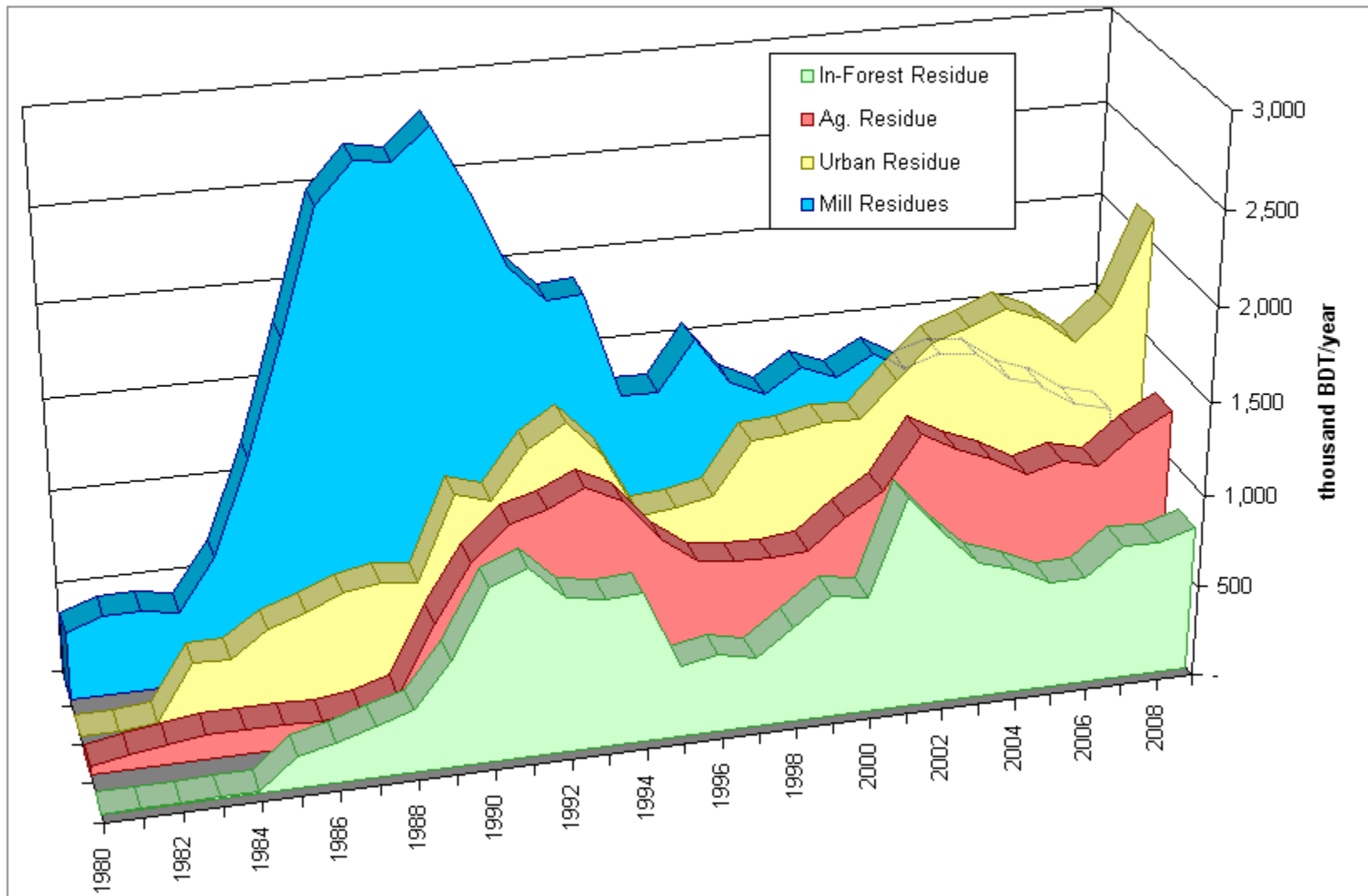
California Biomass Power Capacity



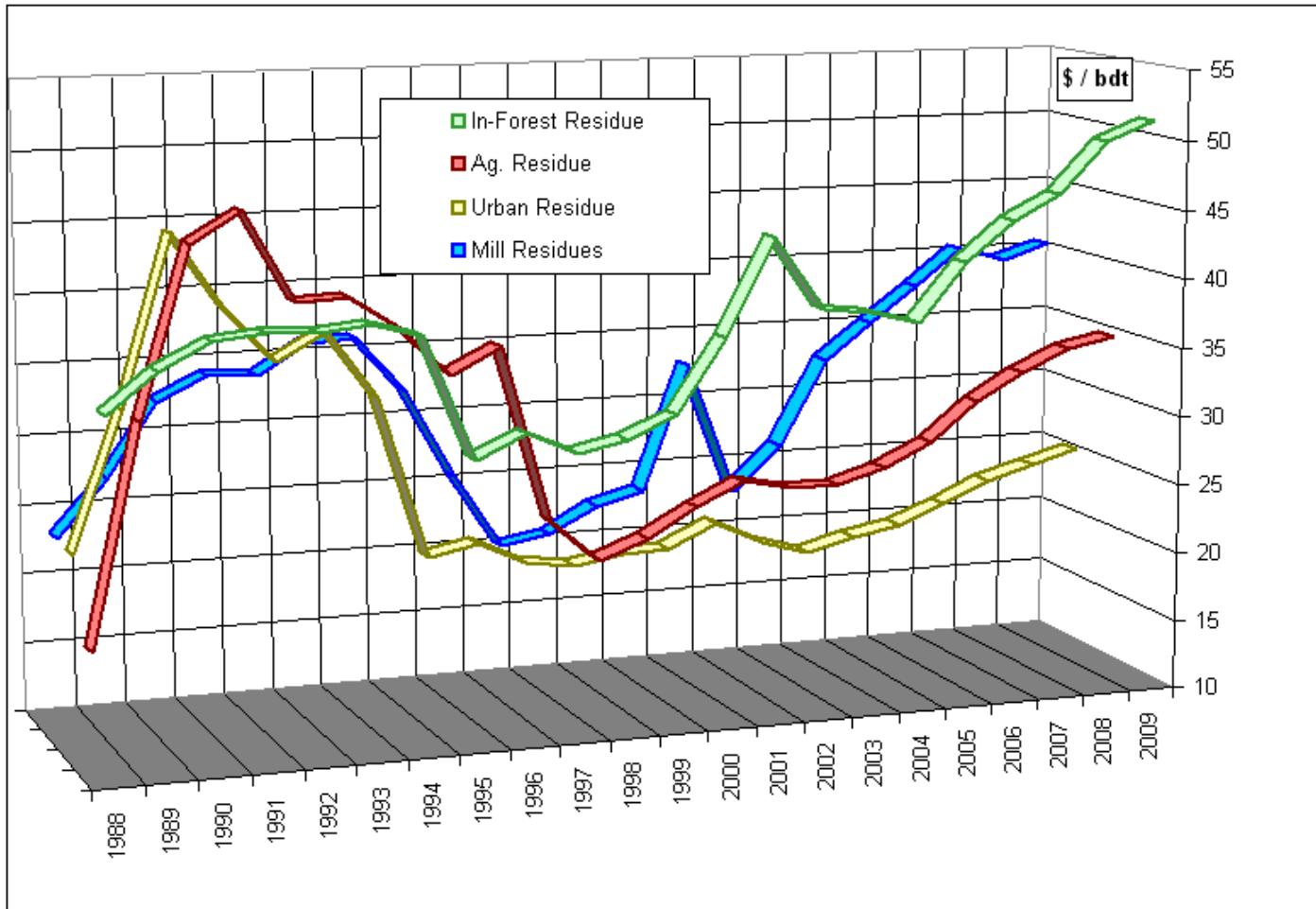
California Biomass Fuels Market



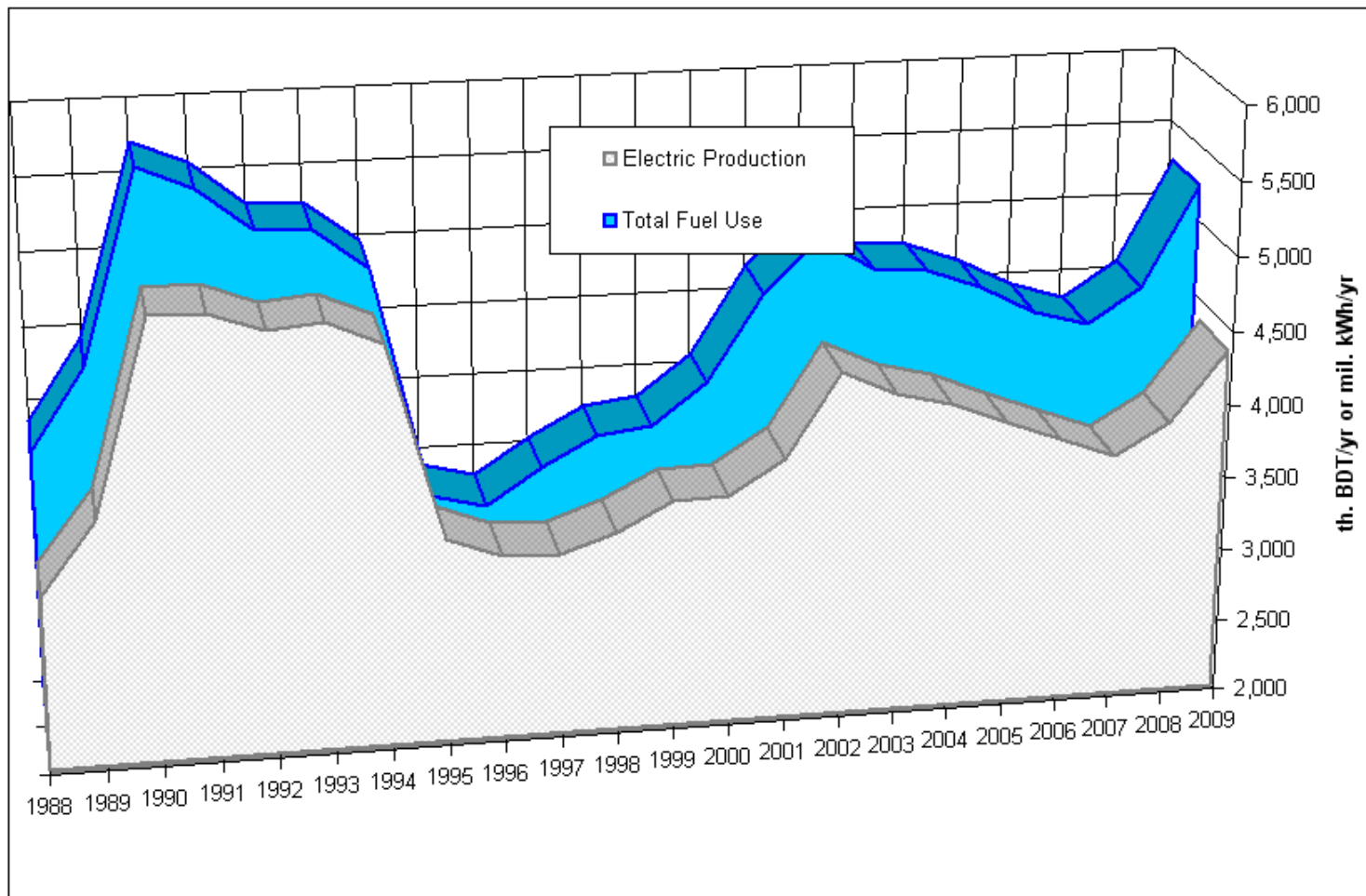
California Biomass Fuels Market by Category



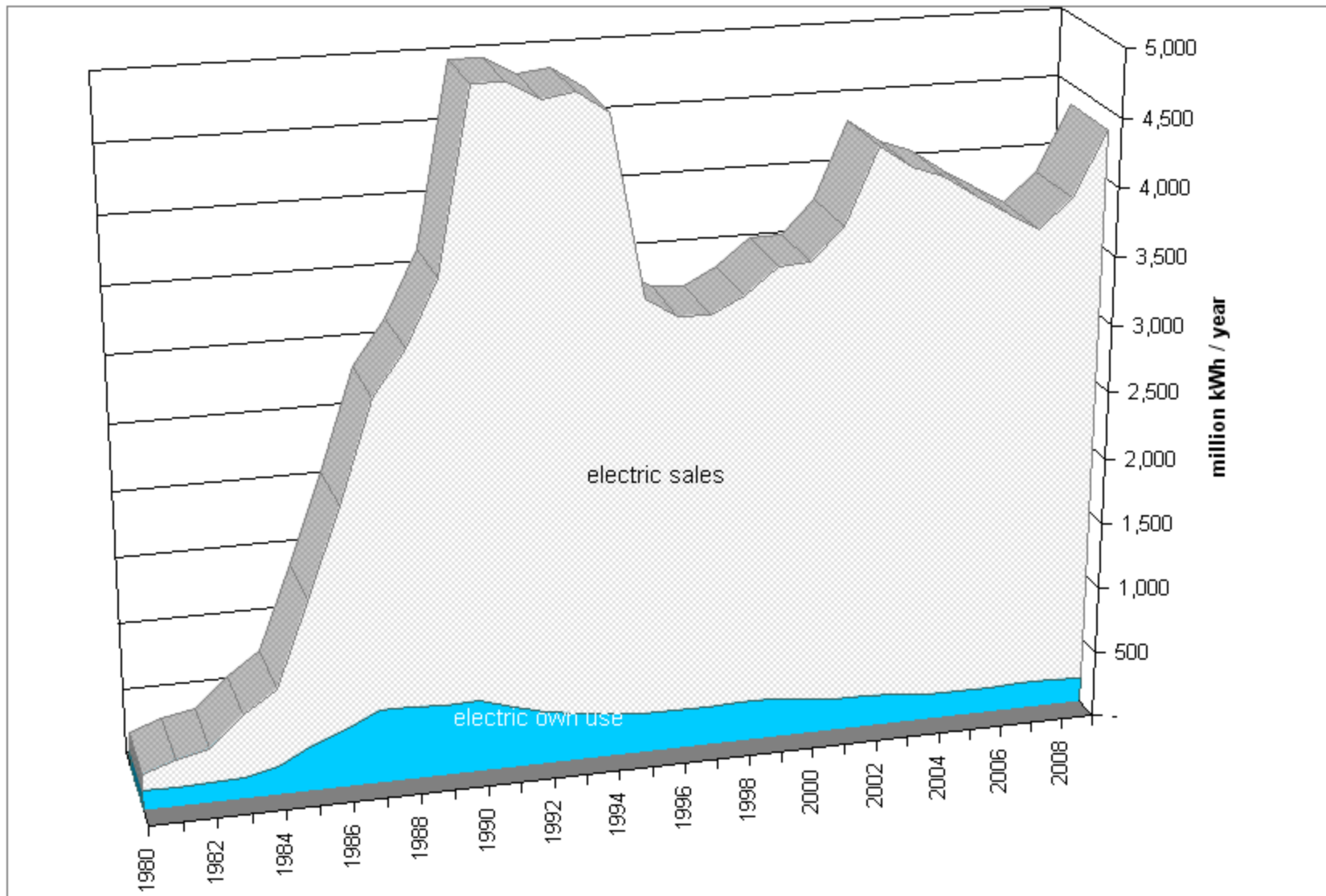
Biomass Fuel Prices by Category



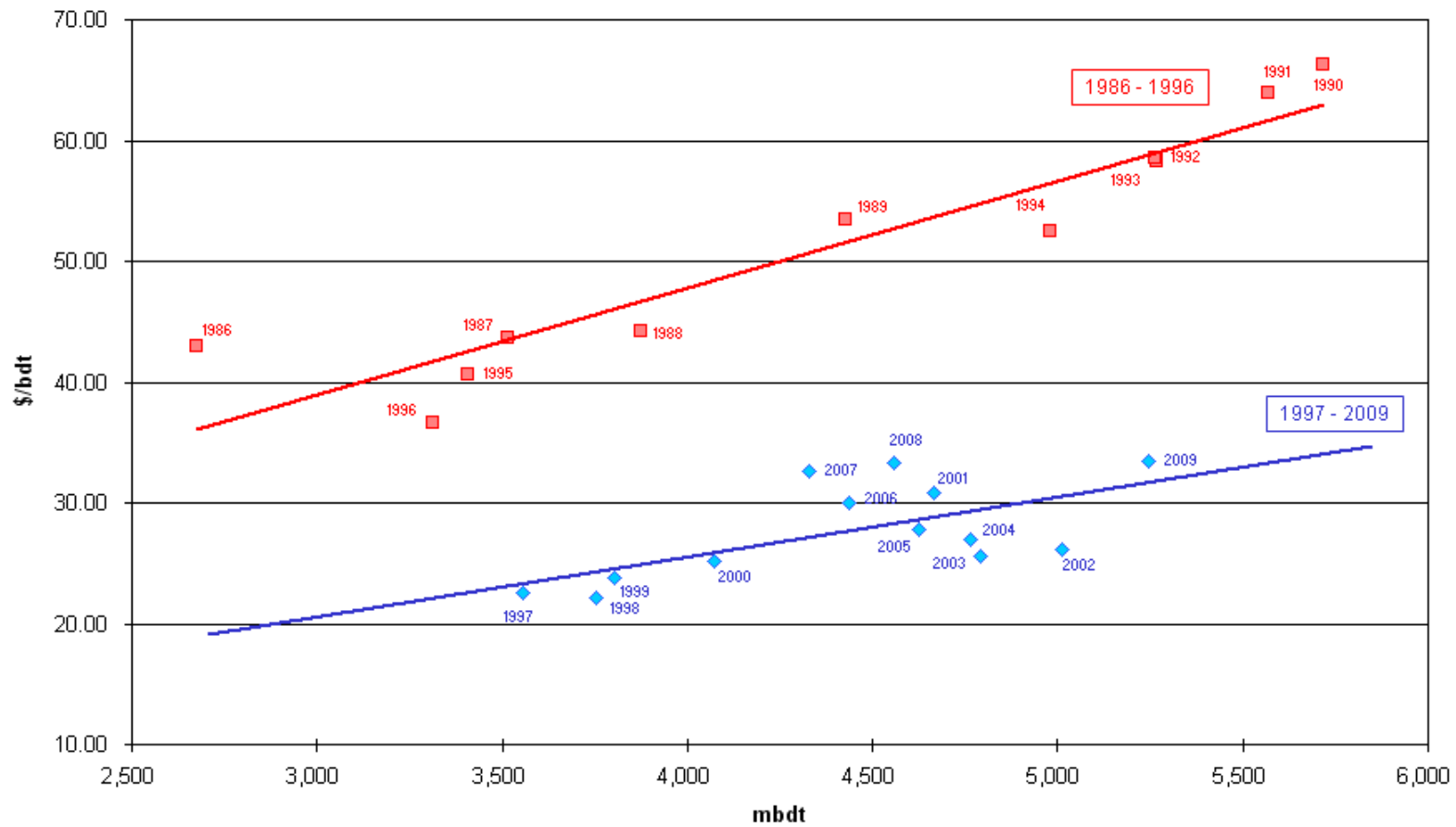
California Biomass Fuel Use and Electricity Production



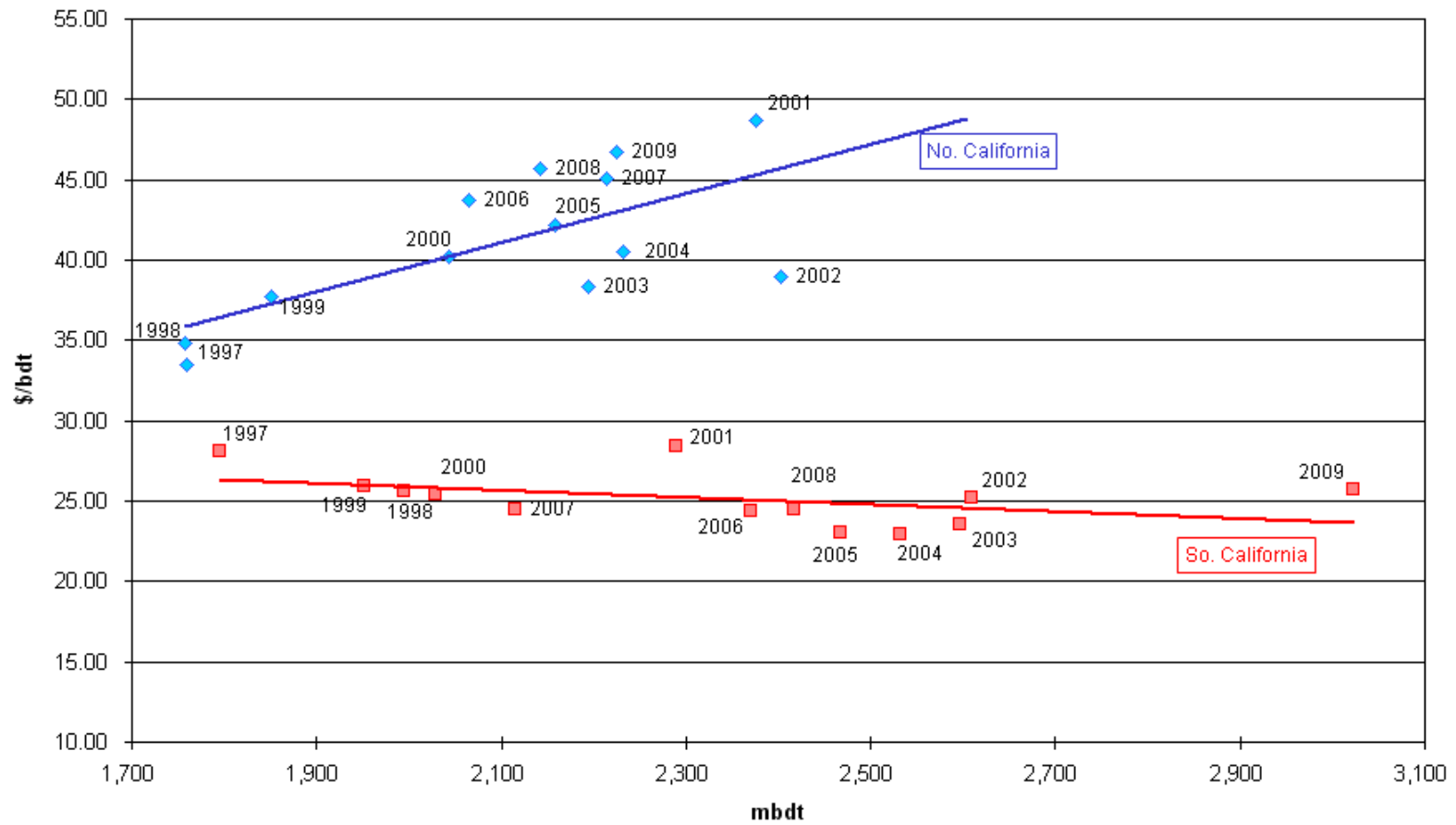
California Biomass Electricity Production



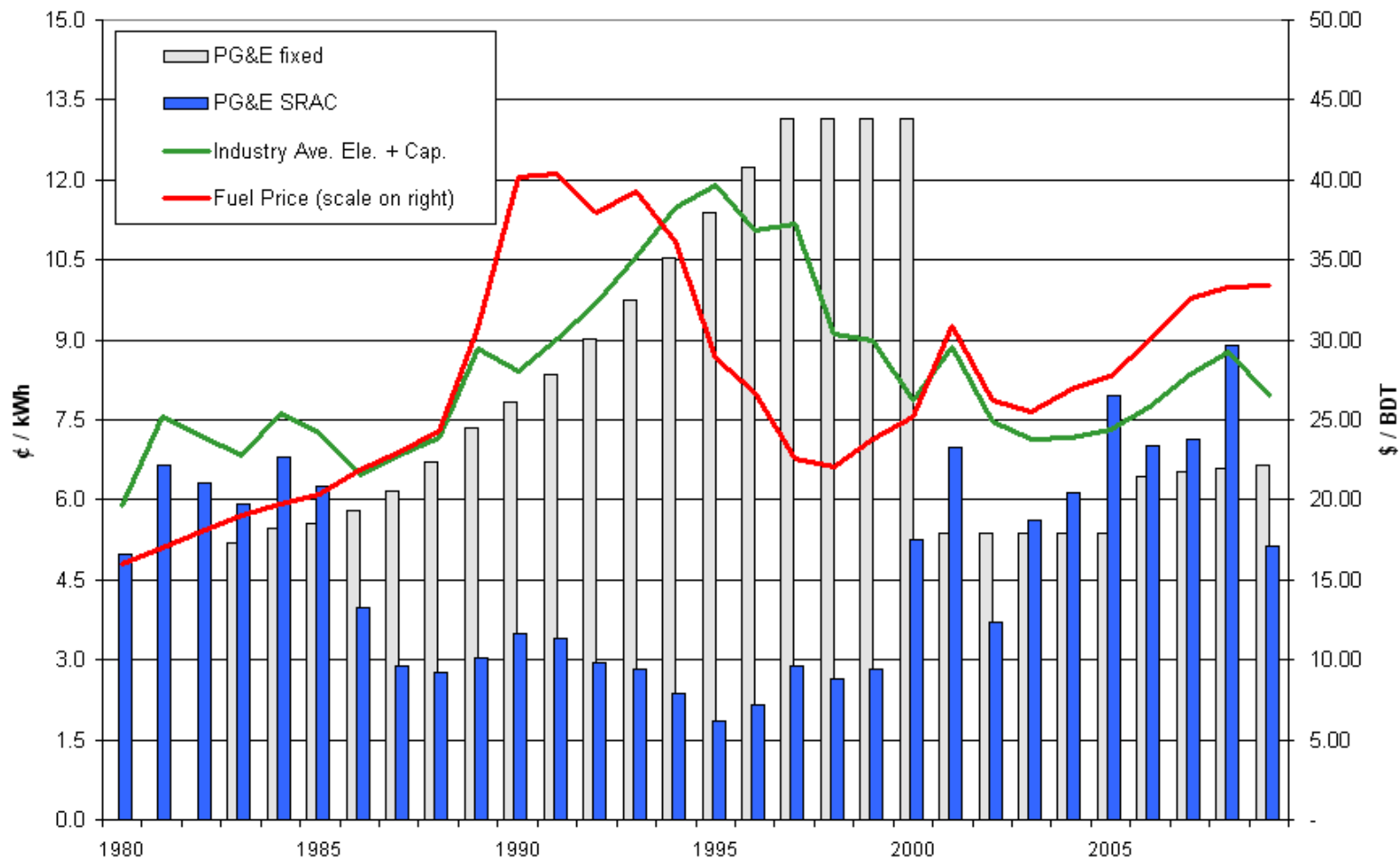
California Biomass Fuel Supply Curve (2008 \$s)



California Biomass Fuel Supply Curve (2008 \$s)



California Wholesale Electricity and Biomass Fuels Prices



Cap & Trade
vs.
Carbon Tax

Theoretically Equivalent

CT sets Price, C&T Quantity

Carbon Tax Simpler

All Signs Point to C&T

Either Could Work for Biomass