Energy Efficiency for California, the US, the World No. 1 in the California "Loading Order"

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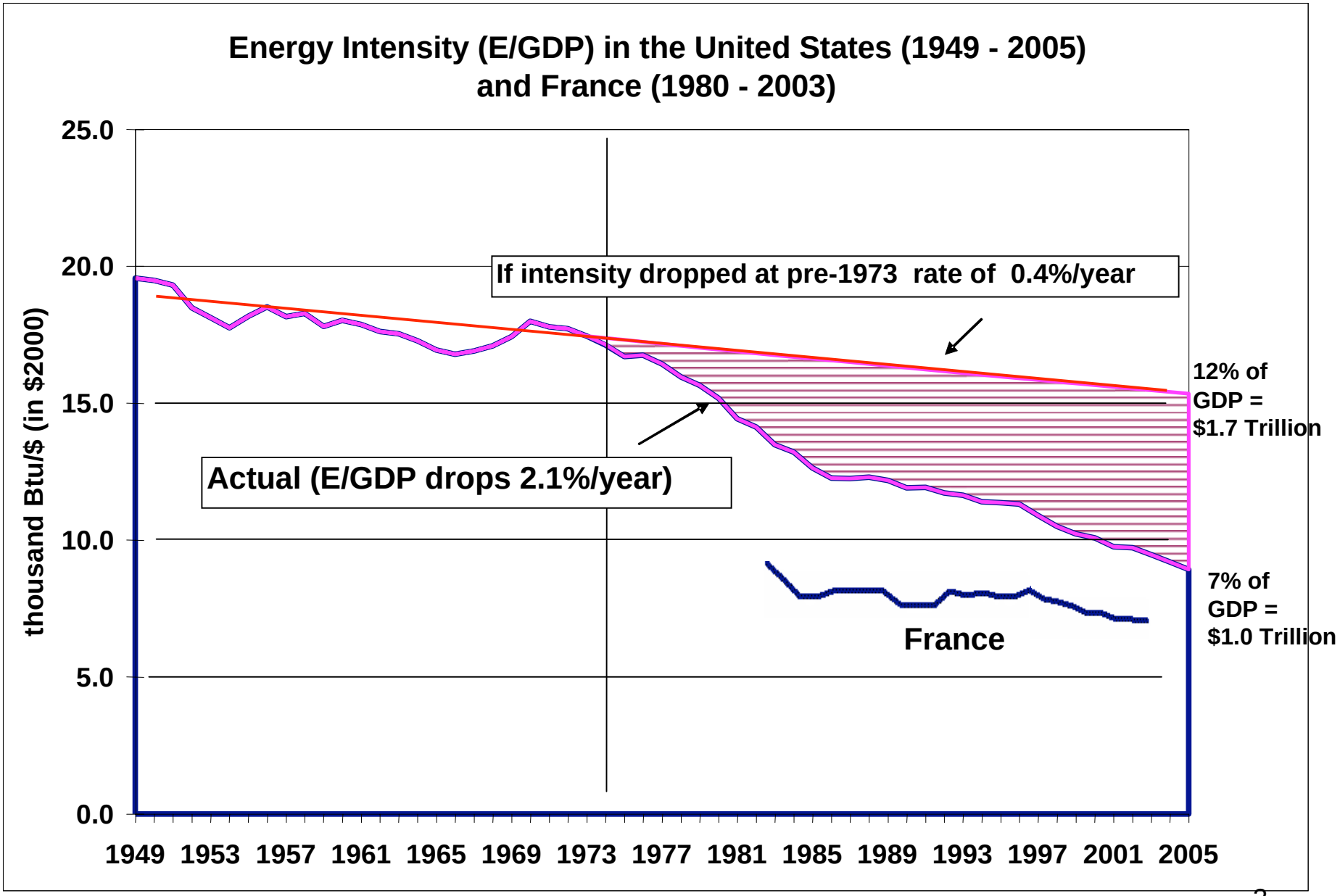
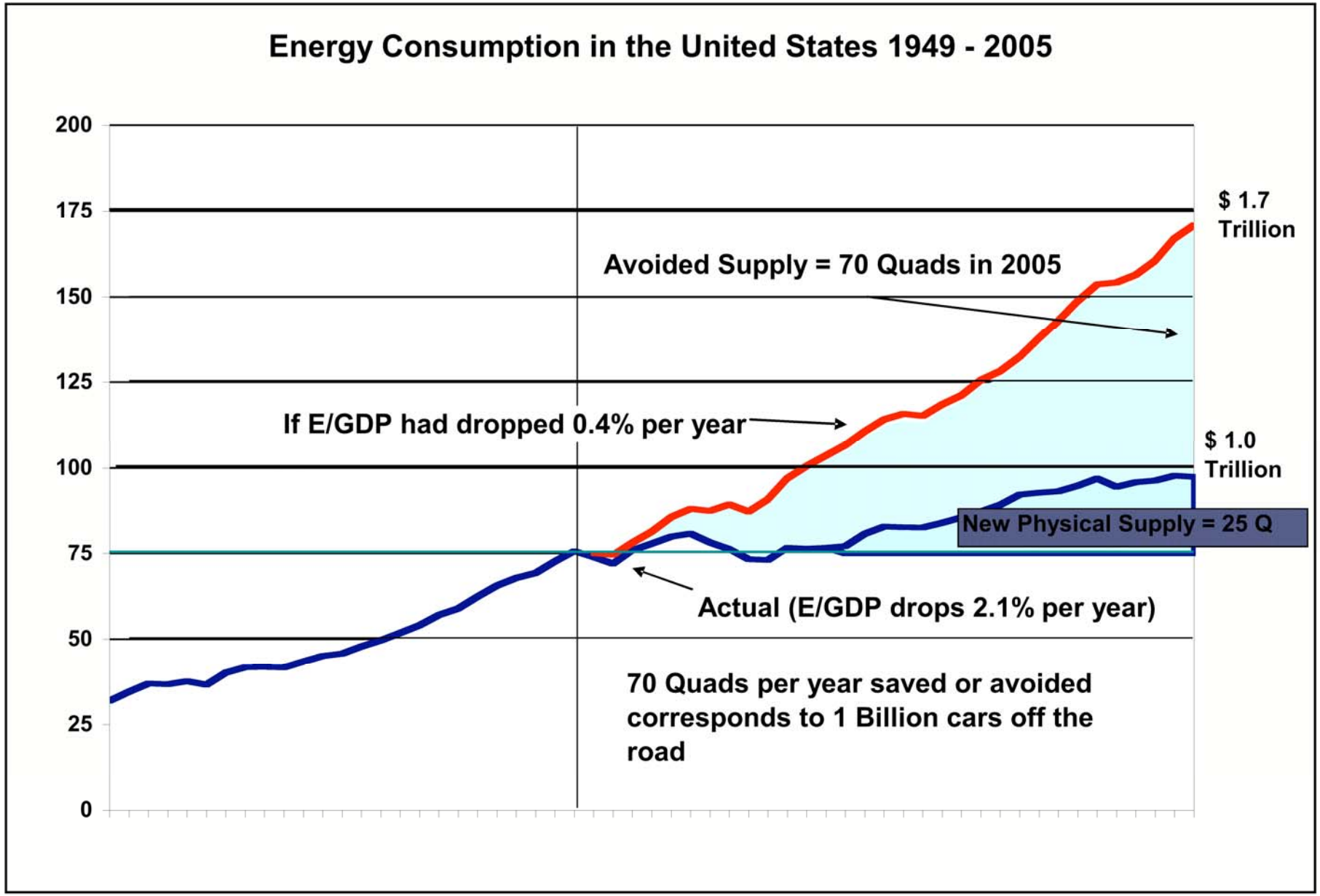
or just Google "Art Rosenfeld"


Energy Intensity (E/GDP) in the United States (1949 - 2005)
and France (1980 - 2003)
thousand Btu/$ (in $2000)
25.0
20.0
15.0
10.0
5.0
0.0
1949
1953
1957
1961
1965
1969
1973
1977
1981
1985
1989
1993
1997
2001
2005
If intensity dropped at pre-1973 rate of 0.4%/year
Actual (E/GDP drops 2.1%/year)
France
12% of GDP = $1.7 Trillion
7% of GDP = $1.0 Trillion


Energy Consumption in the United States 1949 - 2005
200
175
150
125
100
75
50
25
0
$ 1.7 Trillion
Avoided Supply = 70 Quads in 2005
If E/GDP had dropped 0.4% per year
$ 1.0 Trillion
New Physical Supply = 25 Q
Actual (E/GDP drops 2.1% per year)
70 Quads per year saved or avoided corresponds to 1 Billion cars off the road

McKinsey Quarterly

A **cost curve** for greenhouse gas reduction

A global study of the size and cost of measures to reduce greenhouse gas emissions yields important insights for businesses and policy makers.

Per-Anders Enkvist, Tomas Nauclér, and Jerker Rosander

http://www.mckinseyquarterly.com/Energy_Resources_Materials/A_cost_curve_for_greenhouse_gas_reduction_abstract

CO2 Conservation Supply Curves Explained

Start with conservation & supply curves for electricity or natural gas

Net benefit = annual saved bills – annualized first cost of measure

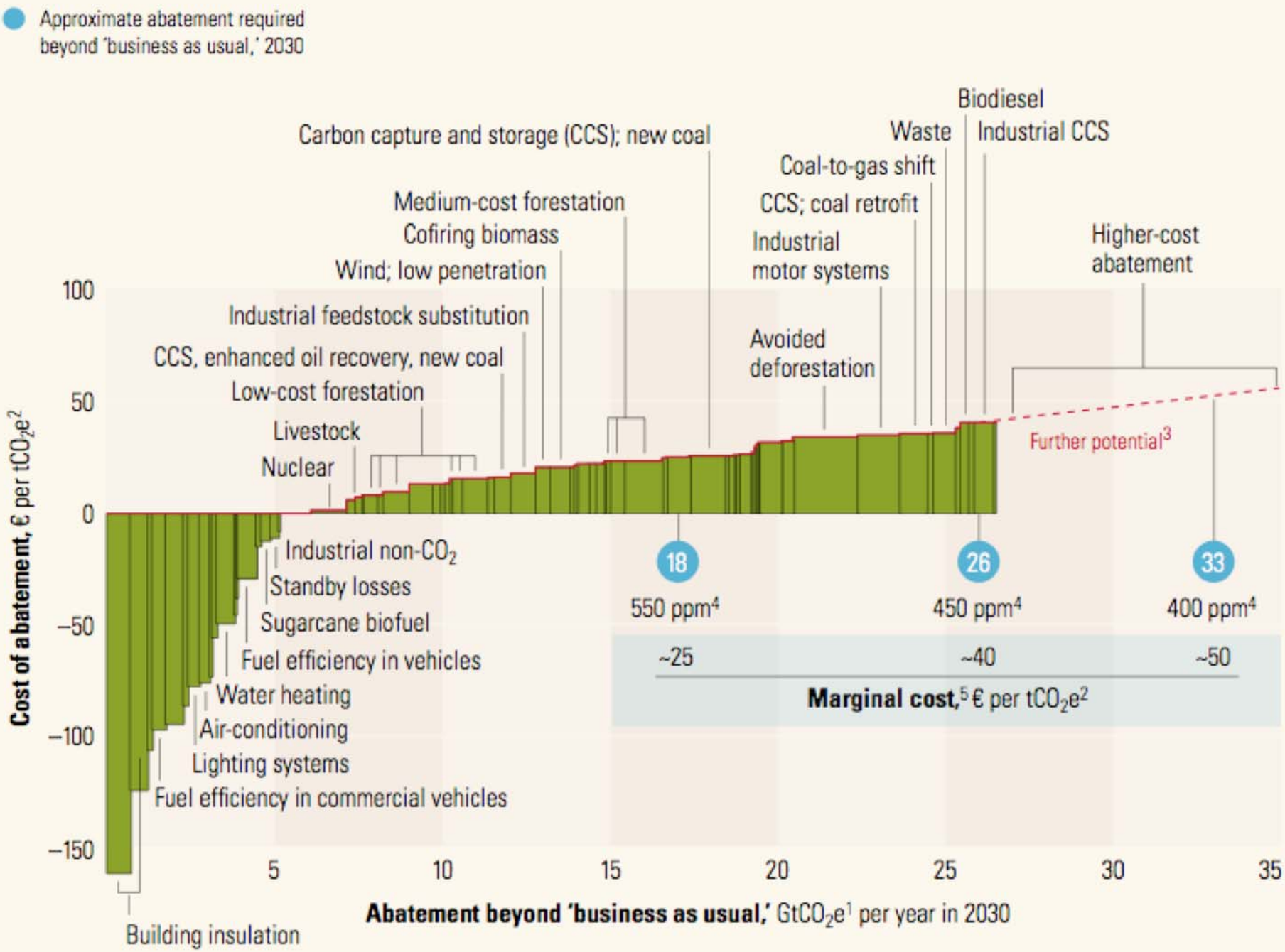
(of course saved bills depends on price of electricity).

Then convert kWh or therms to CO2

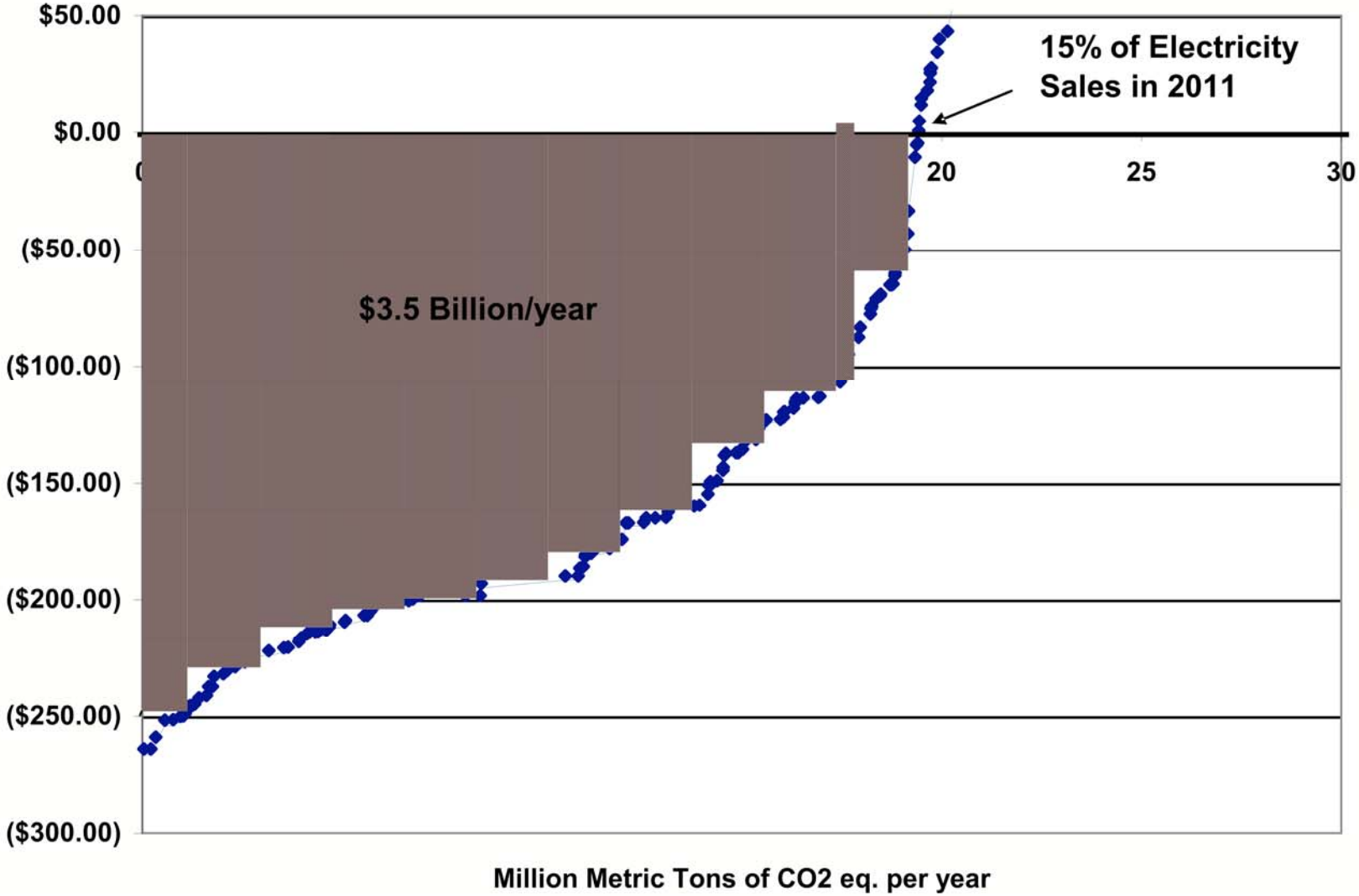
See NAS "Policy Implications of Greenhouse Warming" 1992, App. B

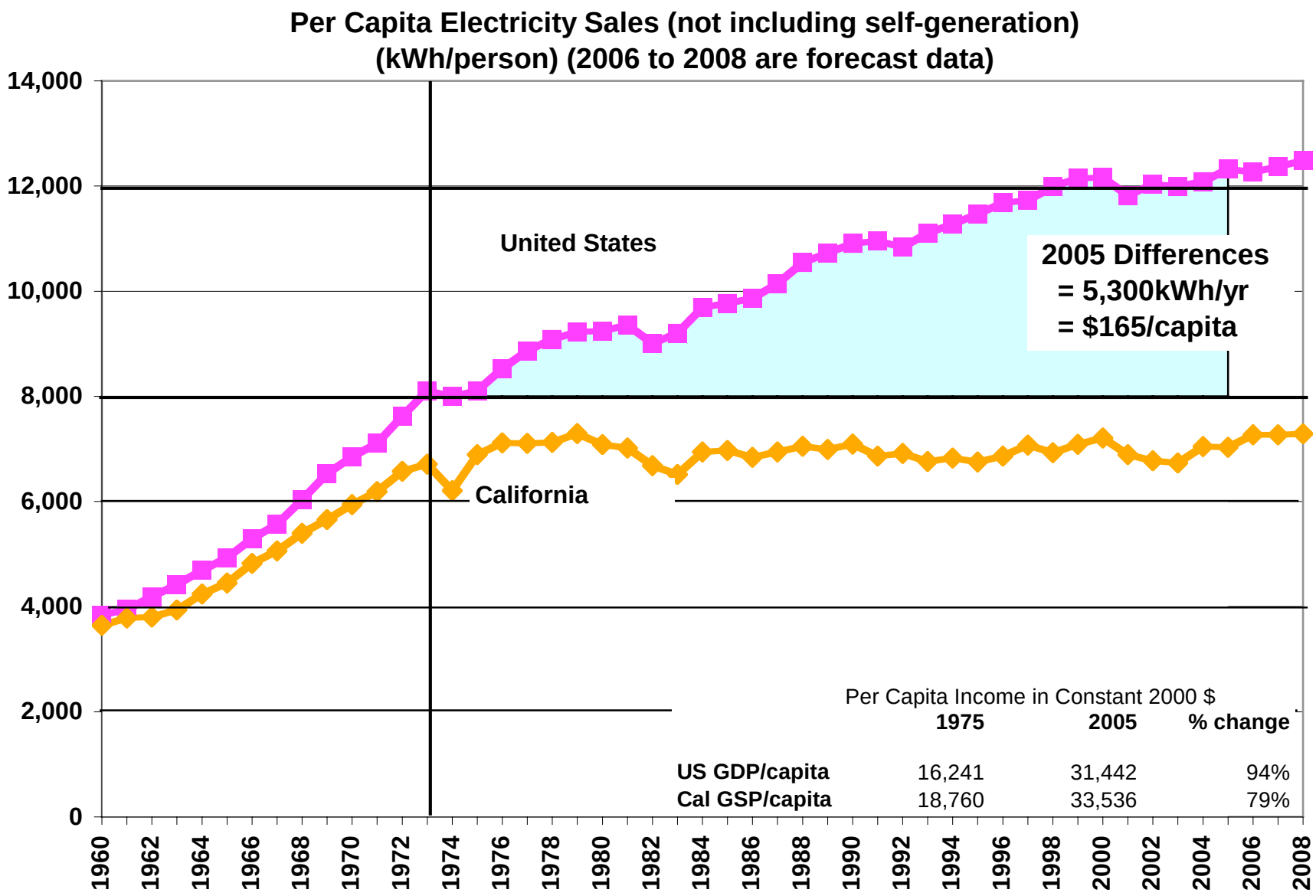
- **Policy Implications of Greenhouse Warming**:
- **Policy Implications of Greenhouse Warming**: Mitigation, Adaptation, and the Science Base (1992) Committee on Science, Engineering, and Public **Policy** (COSEPUP **...** books.nap.edu/books/0309043867/html - 42k - Cached - Similar pages

Global cost curve for greenhouse gas abatement measures beyond 'business as usual'; greenhouse gases measured in $GtCO_2e$[1]

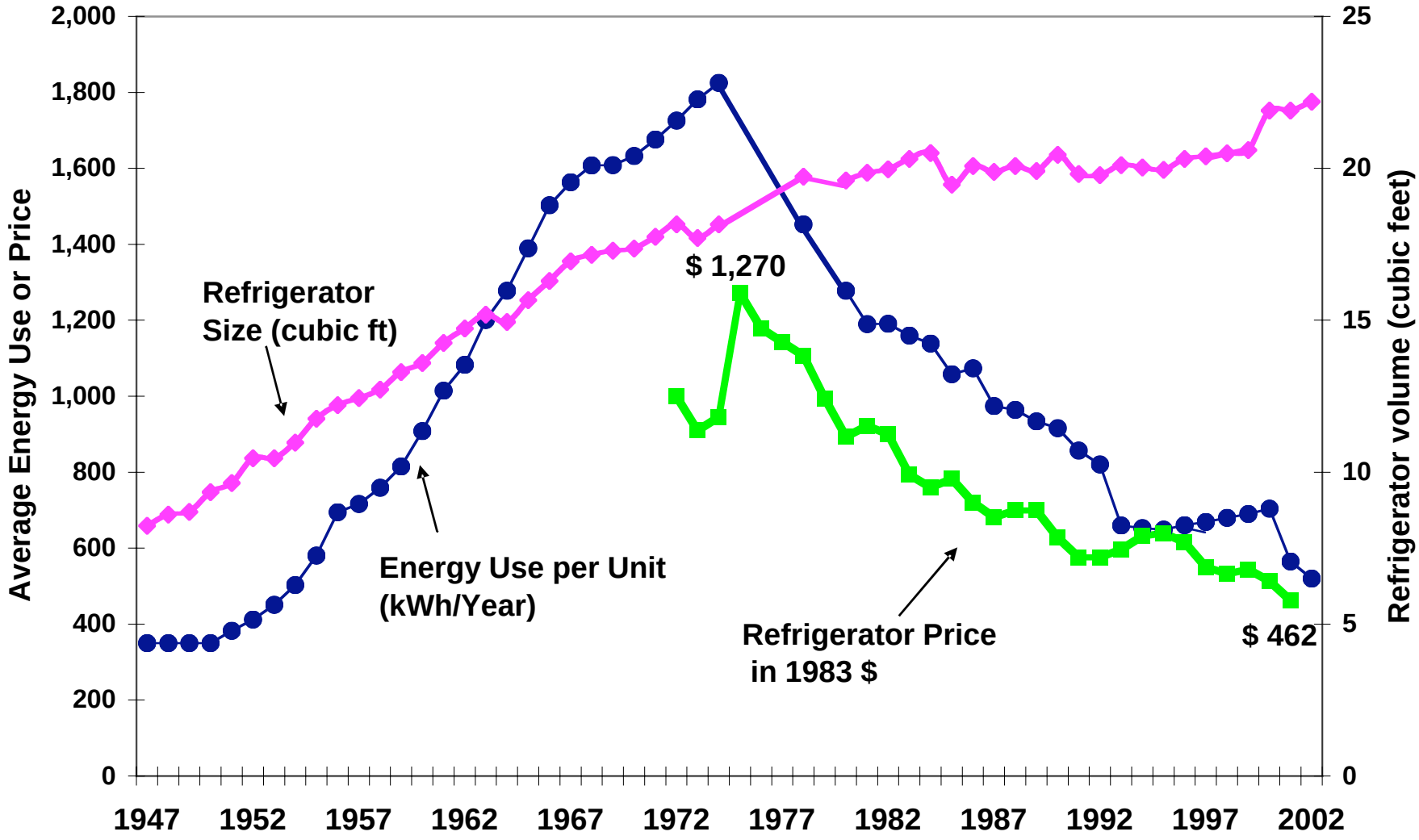


Supply Curve for CO2, Conserved thru Energy Efficiency in Electricity Sector in California - Potential in 2011 at 1 kwh = 0.454 kg of CO2




Per Capita Electricity Sales (not including self-generation)
(kWh/person) (2006 to 2008 are forecast data)
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
United States
California
2005 Differences
= 5,300kWh/yr
= $165/capita
Per Capita Income in Constant 2000 $
1975
2005
% change
US GDP/capita 16,241 31,442 94%
Cal GSP/capita 18,760 33,536 79%
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008

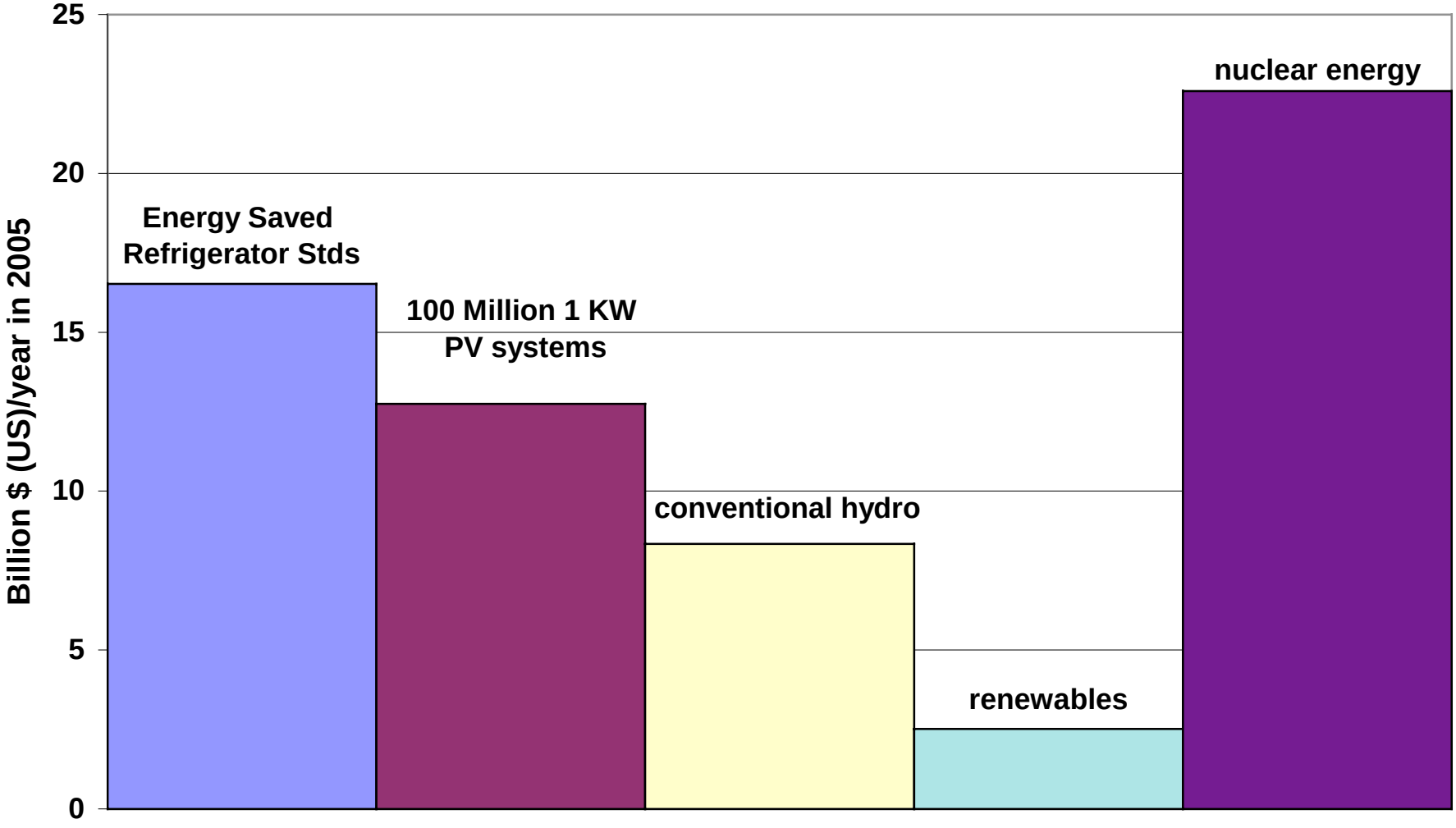
New United States Refrigerator Use v. Time and Retail Prices



Source: David Goldstein

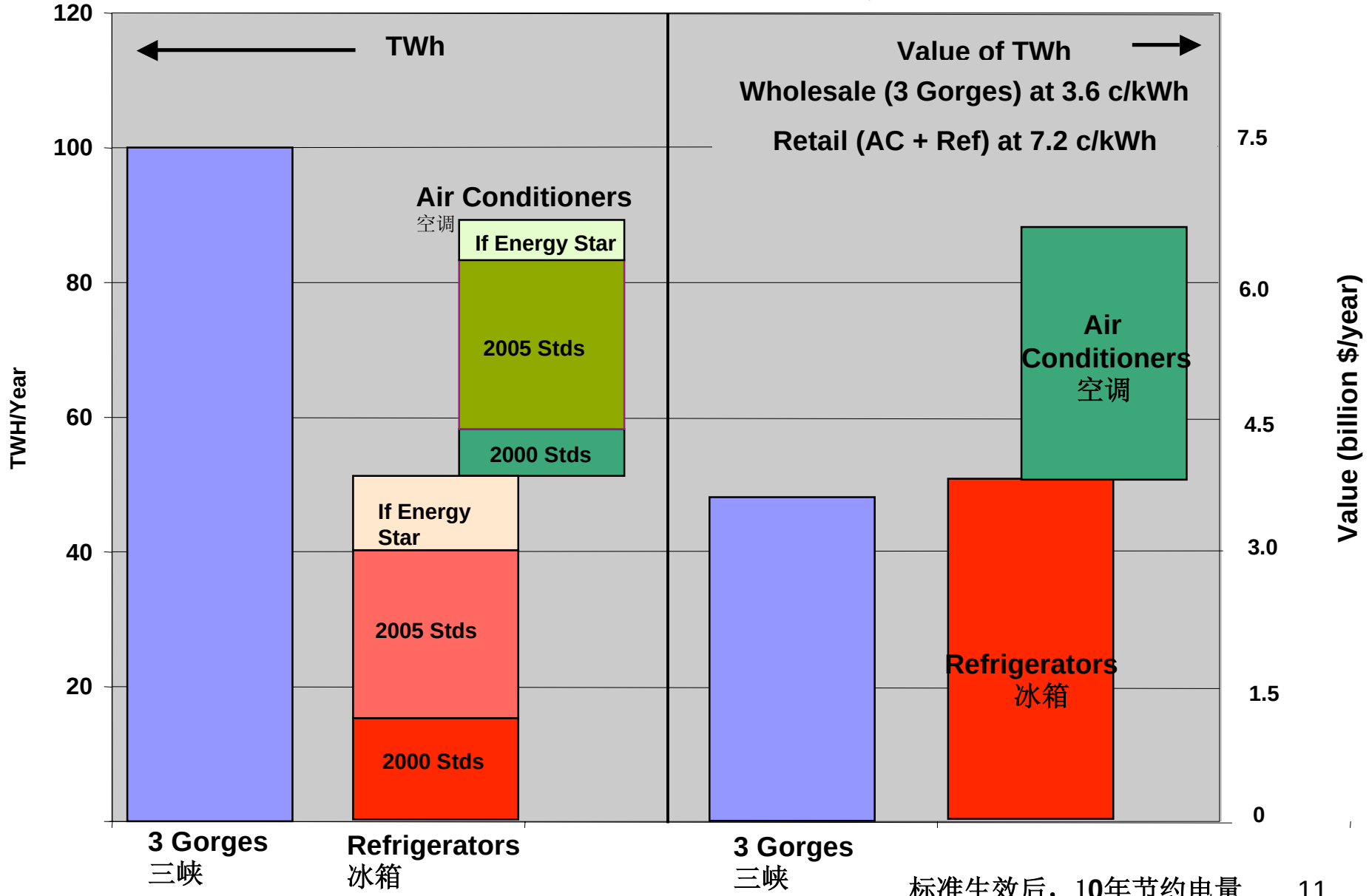
In the United States

Value of Energy to be Saved (at 8.5 cents/kWh, retail price) vs. Several Sources of Supply in 2005 (at 3 cents/kWh, wholesale price)



Comparison of 3 Gorges to Refrigerator and AC Efficiency Improvements

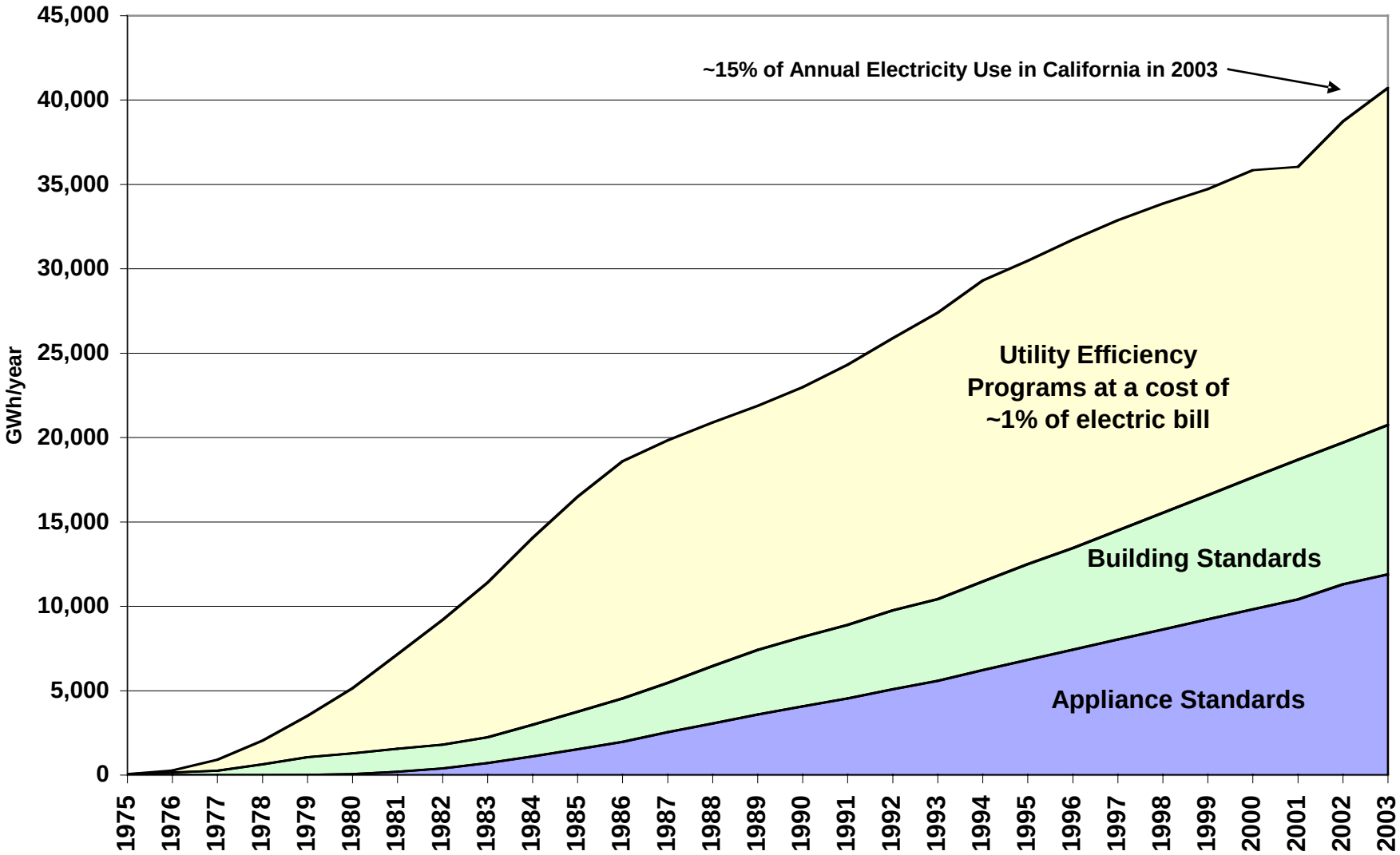
三峡电量与电冰箱、空调能效对比

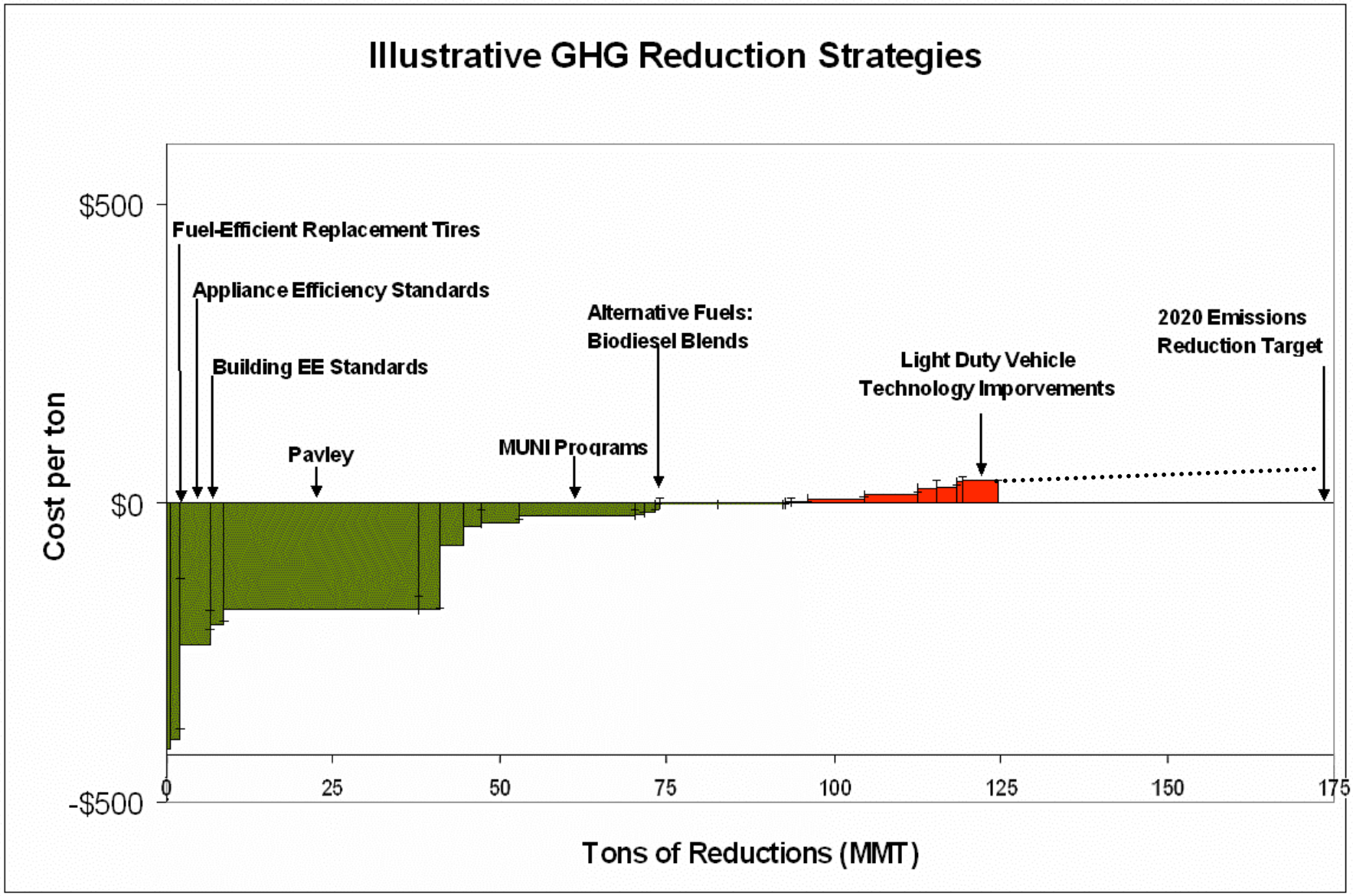


Savings calculated 10 years after standard takes effect. Calculations provided by David Fridley, LBNL

标准生效后，10年节约电量

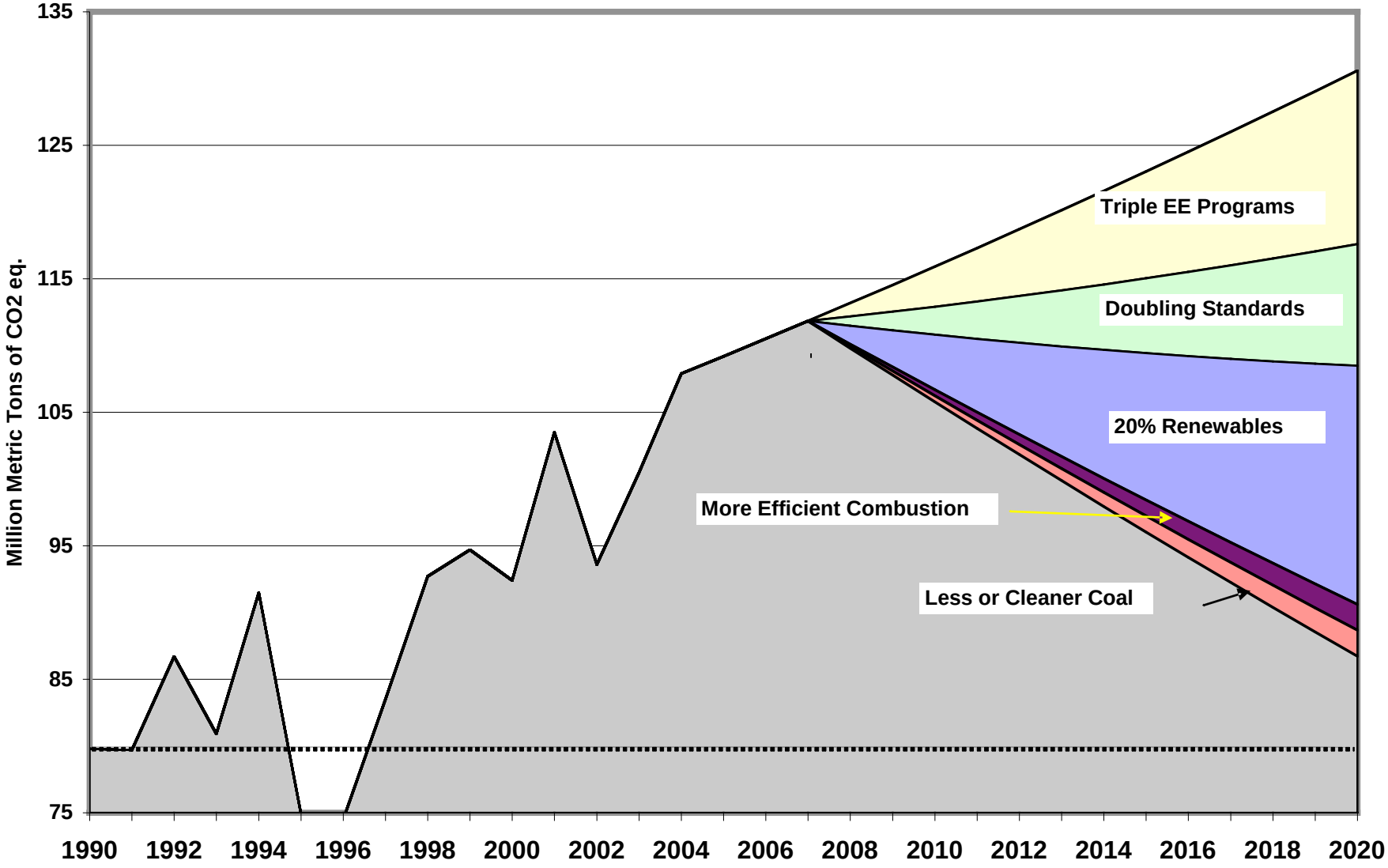
Annual Energy Savings from Efficiency Programs and Standards





Based Upon Exhibit 11: Updated Estimates for 2020 for the Climate Strategies Included in the 2006 CAT Report UPDATED MACROECONOMIC ANALYSIS OF CLIMATE STRATEGIES …

Possible Strategies to Reduce Electricity Sector Carbon Emissions in California, ignoring ramp up times and other implementation issues -- The CARBON Perspective



Source: Pat McAuliffe, pmcaulif@energy.state.ca.us