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A Reality Check on Initiatives to Reduce Greenhouse Gas Emissions in California, Oregon, the Northeast and in Europe

by
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August 2007

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Executive Summary

Several U.S. states and the European Union have adopted caps on greenhouse gas emissions (GHGs) designed to reduce greenhouse gas emissions by curbing energy use, encouraging the use of renewables and increasing energy efficiency. California has enacted a series of bills to reduce GHGs, including Assembly Bill 32 which requires that emissions be cut to 1990 levels by 2020. Given the state's own projections of growth in population and in baseline GHG emissions, the reduction targets can only be achieved through significant reductions in economic growth and employment. Ten northeastern states formed the Regional Greenhouse Gas Initiative ("RGGI") to reduce carbon dioxide (CO_2) emissions from electric utilities. The evidence suggests that RGGI may be a "paper tiger" because RGGI's initial cap of 121.3 million short tons of carbon dioxide may be higher than actual emissions when the cap applies in 2009. In addition, reports that Portland, Oregon reduced GHG emissions to 10 percent below 1990 levels in 2004 are based on questionable data and one time events like changing landfills and to a slowing economy.

The European Union's mandatory emission trading system (ETS) has not been successful in slowing the growth of GHGs in the EU-15 (the original members like France, Spain, Germany, UK, and Italy). The United States on the other hand, with its voluntary approach, has made steady progress in reducing the amount of energy required to produce a dollar of output. In fact, the U.S. reduced its absolute level of CO_2 emissions by 1.3 percent in 2006 while its economy grew by 3.3 percent.

Climate change policies should continue to strive to reduce energy intensity as the capital stock is replaced over the business cycle, promoting the development of new, cost-effective technologies for alternative energy production and conservation while encouraging the spread of market based reforms in the developing world. This approach is likely to be much more productive than adopting mandatory CO_2 reduction targets that would sacrifice economic well-being and job growth with little or no long-term impact on global GHG emission growth.

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Introduction

Reducing the growth of greenhouse gas emissions (GHGs) is an important environmental policy goal intended to reduce the threat of human-induced climate change. Several U.S. states and the European Union have adopted mandatory caps on GHG emissions designed to reduce greenhouse gas emissions by curbing energy use, encouraging the use of renewables and increasing energy efficiency. This paper provides an overview of what impact current policies in California, Oregon, the Northeastern states and Europe are having on GHG emissions growth. It also examines the potential economic consequences when such policies are implemented. In addition, the paper describes emission trends in the United States and outlines cost-effective policies that can have a substantial impact on slowing global emission growth.

1. California's Greenhouse Gas Emissions: Myths and Reality

In August 2006, the California Legislature enacted a bill requiring the state to sharply reduce its greenhouse gas emissions. Assembly Bill (AB) 32 requires that California reduce its statewide GHG emissions to 1990 levels by 2020. Reductions are scheduled to begin in 2012. The law requires that utilities account for and include the carbon emissions of electricity imported into the State. California law already requires that 20 percent of electricity be produced from renewables by 2017. Achieving AB 32's emission targets will present a difficult challenge for Californians, given current emission trends and population growth.

Economic Analyses of the Impact of AB 32

The California Climate Action Team (CAT) report of March 2006 analyzed the GHG reduction targets adopted in AB 32 (reducing emissions to 1990 emission levels by 2020). While the CAT report stated in its analysis that "command and control" policies to reduce GHGs in California will increase state net income and create new jobs, other analyses suggest the opposite will prove to be the case. Several recent credible analyses conclude that AB 32 is likely to cause net job loss

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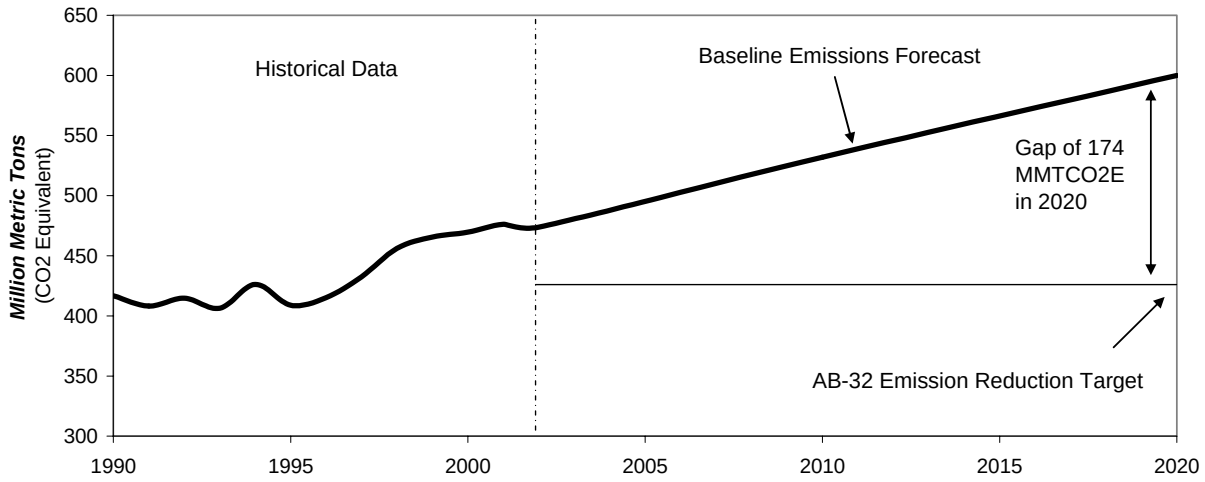
and "leakage" of industry to states and countries which do not have mandatory emission caps, and result in no net GHG reduction.

- **California's Projected Growth in Emissions and Population: Effect on Achievement of AB 32 Targets**

  A major stumbling block to California's meeting the AB 32 targets is its projected increases in emissions and population over the next fourteen years. California's GHG emissions are projected to grow 27 percent between 2000 and 2020 under the baseline forecast, according to estimates in the CAT report. The baseline forecast already includes assumptions about increased energy efficiency. Even so, California's GHG emissions are projected to rise to 600 million metric tons of carbon dioxide ($MMTCO_2$) by 2020, compared to AB 32's required reduction to 426 $MMTCO_2$ **(see Figure 1**).

  The most recent data available from the U.S. Department of Energy's Energy Information Administration indicates California's CO_2 emissions rose by 2 percent from 2002 to 2003. Sharp cutbacks in California's energy use will be necessary to close the 41 percent gap (174/$MMTCO_2$) in 2020 between projected emissions and the AB 32 target. Further complicating California's challenge is projected increase in population from 30 million residents in 1990 to 37 million residents in 2004 and 44 million in 2020. More people means more energy needed to heat and cool homes, fuel job growth and provide transportation.

Figure 1. California Carbon Dioxide Emissions
(Million Metric Tons CO2 Equivalent)



Sources: ***Historical Data***: Gerry Bemis and Jennifer Allen, "Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2002 Update", June 2005.

Baseline Emissions Forecast: Baseline forecast includes the California Energy Commission's projections of anticipated energy efficiency improvements. Source for 2010 and 2020 forecasts is California Environmental Protection Agency, "Climate Action Team Report to Governor Schwarzenegger and the Legislature", March 2006, pg 64.

To illustrate the difficulty of reducing California's emissions to 1990 levels by 2020, consider that over the entire 1990-2000 period, per capita emissions in California fell by only 2.9 percent **(see Table 1 and Figure 2)**. California's projections show that, under its baseline forecast, emissions per capita will decline by 2.3 percent from 2000 to 2010 but will **increase** by 0.9 percent from 2010 to 2020 **(see Table 1).**

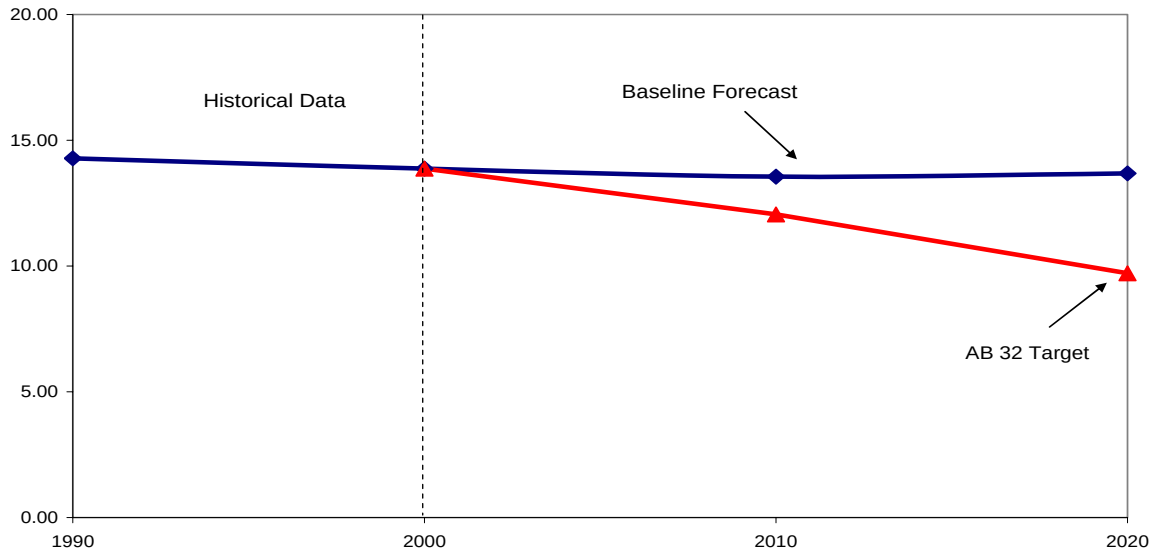
In order to meet the emission reduction target in AB 32, per capita emissions would have to fall by 13.1 percent over the 2000-2010 period and an additional 19.4 percent from 2010 to 2020 **(see Table 1)**. In other words, the required reductions in per capita emissions are 4.5 to 6.5 times greater than what occurred from 1990 to 2000. The technologies simply do not exist to reduce total (and per capita emissions) over the next 14 years by the amounts mandated in AB 32—to say nothing of the time and expense required to replace existing energy using equipment—without severely reducing growth in California's Gross State Product (GSP) and employment.

Table 1. California's Per Capita Emissions Under Baseline Forecast and Decrease Required for AB 32 Target

Year	Emissions (MMTCO2E)	Population (Millions)	Per Capita Emissions	Percentage Change	AB 32 Emissions Target (MMTCO2E)	Required Per Capita Emissions	Percentage Change
1990	426	29.83	14.28				
2000	473	34.10	13.87	-2.9%	473	13.87	
2010	532	39.25	13.56	-2.3%	473*	12.05	-13.1%
2020	600	43.85	13.68	0.9%	426	9.71	-19.4%
			2000-2020	-1.4%			-30%

Source: CalEPA, Climate Action Team Report to Governor Schwarzenegger and the Legislature, March 2006. Table 5-5 Baseline Inventory Estimates (pg 64). * Note that while AB 32 does not contain an emission reduction target for 2010, the CAT report does.

Figure 2. Emissions Per Capita
(Metric Tons CO2 Equivalent per Person)



Source: CalEPA, Climate Action Team Report to Governor Schwarzenegger and the Legislature, March 2006. Table 5-5 Baseline Inventory Estimates (pg 64)

- **Electric Power Research Institute**

A new macroeconomic analysis by the Electric Power Research Institute (June, 2007) analyzes six possible policy scenarios for implementing AB 32 (see report at http://www.epriweb.com/public/000000000001014641.pdf). The EPRI report concludes that while all six scenarios impose costs on California's economy, the policies differ in their cost per ton of GHG emissions avoided. The scenarios that significantly reduce GHGs entail costs to the California economy ranging from $100 to $511 billion through 2050. In addition, for every ton of CO_2 emission reduction in California, there could be an increase of 0.85 tons of electric sector emissions from the rest of the western states (the essence of the "leakage issue") due to "contract shuffling." EPRI's findings are in sharp contrast with those of the CAT report mentioned above.

- **AEI-Brookings Joint Center Report**

Another recent examination of the likely consequences of AB 32 was released by the AEI-Brookings Joint Center for Regulatory Studies in January, 2007 (see http://www.aei.brookings.org/admin/authorpdfs/page.php?id=1358). AEI-Brookings concludes that studies by the Climate Action Team, the Center for Clean Air Policy and by David Roland-Holst who is a professor at Mills College and is also an adjunct professor at the University of California at Berkeley (hereafter the California studies) substantially underestimate the cost of meeting the 2020 target. According to the report, the major flaws of the California analyses include: a) ignoring costs of energy investments to households and business, b.) inaccurate estimates of future saving from reduced energy use, c.) incorrect choice of discount rate to value energy saving, d.) underestimation of costs of policies to reduce emissions, and e.) incorrect estimates of consumer baseline behavior. As a result, the annual costs of AB 32 are understated by billions of dollars. Thus, the California studies do not offer reliable estimates of the cost to Californians of meeting the AB 32 target.

In summary, the costs of AB 32 are likely to be quite high and the benefits quite small. California's emissions were only about 2.5 percent of total global emissions in 2002 and will continue to shrink as a share of total global emissions. But more important, the most recent data indicate that California's emissions are trending upward, not down.

2. The Regional Greenhouse Gas Initiative: Myths and Reality

Ten northeastern states[1] formed the Regional Greenhouse Gas Initiative ("RGGI") in 2004, with the intention of reducing electric utility carbon dioxide emissions. In December 2005, the RGGI states agreed to a Memorandum of Understanding (MOU) limiting utility CO_2 emissions to "current" emission levels. From 2009 to 2014, the cap will be 121 million metric tons of CO_2, followed by a 10 percent reduction to be phased in between 2015 and 2018. Individual RGGI states now are pursuing state legislative and regulatory authority to implement Model Rules required to implement a CO_2 cap-and-trade program under the RGGI agreement.

[1] ME, NH, VT, CT, MA, RI, NY, NJ, DE and MD. Maryland joined RGGI in 2007 as a result of adoption of the Maryland Healthy Air Act in 2006. Pennsylvania served as an observer of the RGGI process, but did not join the RGGI MOU.

Utility CO_2 emissions represent about one-third of total greenhouse gas emissions in the RGGI states. While the RGGI agreement will cap CO_2 emissions from the utility sector, greenhouse gas emissions from transportation and other sectors are projected to increase. Overall, greenhouse gas emissions in the northeast RGGI region will grow, even when the RGGI program is fully operational.

The RGGI region is likely to import substantially greater amounts of power from coal-fueled sources located to their west and south. Several new power transmission projects have been designed to improve electric reliability in the northeast. States such as Connecticut, New Jersey and New York already are confronting serious power supply deficiencies due to the lack of new electric generating capacity construction.

State regulatory analysts estimate that a 3 percent increase in imported power to the RGGI area is sufficient to offset all of the CO_2 reductions projected for the RGGI program (by increasing emissions in neighboring states). The transmission projects now on the drawing board are capable of delivering tens of thousands of megawatts of power to reduce transmission congestion and to improve reliability in the northeast.

However, in March 2007, the RGGI "Imports and Leakage Committee" issued recommendations for studying the emissions impacts of increased power imports from other states and offered several proposals designed to minimize increased carbon emissions associated with such imports. The recommended state regulatory initiatives to tax or otherwise impede increased power imports, by requiring emission "offsets" for example, are suspect on constitutional grounds.

Evidence that RGGI's proposal actually lacks "teeth" is provided by a recent Congressional Research Service report, "Greenhouse Gas Reductions: California Action and the Regional Greenhouse Gas Initiative" (April 2007). CRS reports RGGI's initial cap of 121.3 million short tons of carbon dioxide may be higher than actual emissions when the cap occurs in 2009. Private estimates using data from the U.S. Department of Energy's Energy Information Administration (DOE/EIA) also suggest that most states will not face actual reductions until the middle of the next decade. If that proves to be the case, no GHG reductions will actually be necessary. Thus the vaunted RGGI program may be a "paper tiger" at least until the middle of the next decade.

3. Portland, Oregon: Emissions Myths and Realities

An analysis published in ClimateBiz by Dr. Mark C. Trexler, a noted climate expert with the World Resources Institute, questions whether the city of Portland, Oregon actually has achieved the emission reductions it reported in 2005 (see http://www.climatebiz.com/sections/news_detail.cfm?NewsID=28497). Portland was the first U.S. city (in 1993) to adopt a plan to reduce greenhouse gas emissions. In 2001, Oregon's Multnomah County (within which Portland sits) joined Portland in adopting a county-wide target of reducing GHG emissions by 10 percent below 1990 levels by 2010.

In 2005, Portland and Multnomah County released their *2005 Global Warming Progress Report*. It announced that 2004 emissions already had dipped below 1990 levels. The drop below 1990

emissions admittedly was only 0.1 percent — but it still is a far cry from the seemingly inexorable upward march of emissions across the nation, Dr. Trexler notes. However, in reviewing the numbers after the report's release, the authors discovered a mathematical error that when corrected showed aggregate emissions in 2004 to be above 1990 levels, albeit only marginally so.

Dr. Trexler believes there are several reasons to question Portland's reported emission cuts. First, the estimates are based on high-level approximations. For electricity, for example, aggregate utility estimates of the number of megawatt hours sold to residential, commercial, and industrial users were multiplied by the regional average CO_2 emissions factor. For the transportation sector, emissions were calculated based on fuel sales within Multnomah County rather than any estimate of vehicle miles traveled (VMTs) or any other measure.

Thus, due to the highly aggregated data, it's not easy to discern the real trends. Are VMTs really decreasing (which would be in marked contrast to national trends) or are relatively more people buying gasoline outside the city and county limits into which they commute? Is decreased electricity use being driven by energy conservation measures or by Oregon's economic woes over the last several years?

Overall, Portland's results for 2004 seem particularly affected by three factors:

1. A 56 percent reduction in estimated solid waste-related methane emissions (equivalent to almost 2 percent of total county emissions), attributable to the fact that Portland changed landfills during the decade and the current landfill has a better methane collection system.

2. Gasoline sales, which can bounce around considerably from year to year, were low in 2004 (with the reduction from 2003 being equivalent to almost 2 percent of total county emissions).

3. A dramatic fall in industrial energy use since 2000 (more than 20 percent, and equivalent to almost 5 percent of total county emissions).

Based on these facts, Dr. Trexler concludes that the assertion that 2004 emissions came out close to 1990 emissions appears to be significantly due to one-time events (e.g., changing landfills), overarching economic conditions (a slowed economy), and random factors such as relatively low county gasoline sales in 2004. These three factors are significant because they add up to 9 percent of total county emissions. Thus, he notes, it's not clear that all of these variables will continue to work in Portland's favor in helping it achieve its 2010 emission reduction target. Dr. Trexler concludes that it's not appropriate to point to Portland's and Multnomah County's 1990 vs. 2004 emissions as proof that the nation as a whole could as easily cut its GHG emissions back to 1990 levels.

In fact, recent data (April 2007) on state emissions released by the U.S. Department of Energy's Energy Information Administration indicate Oregon's emissions rose by 0.78 percent from 2002

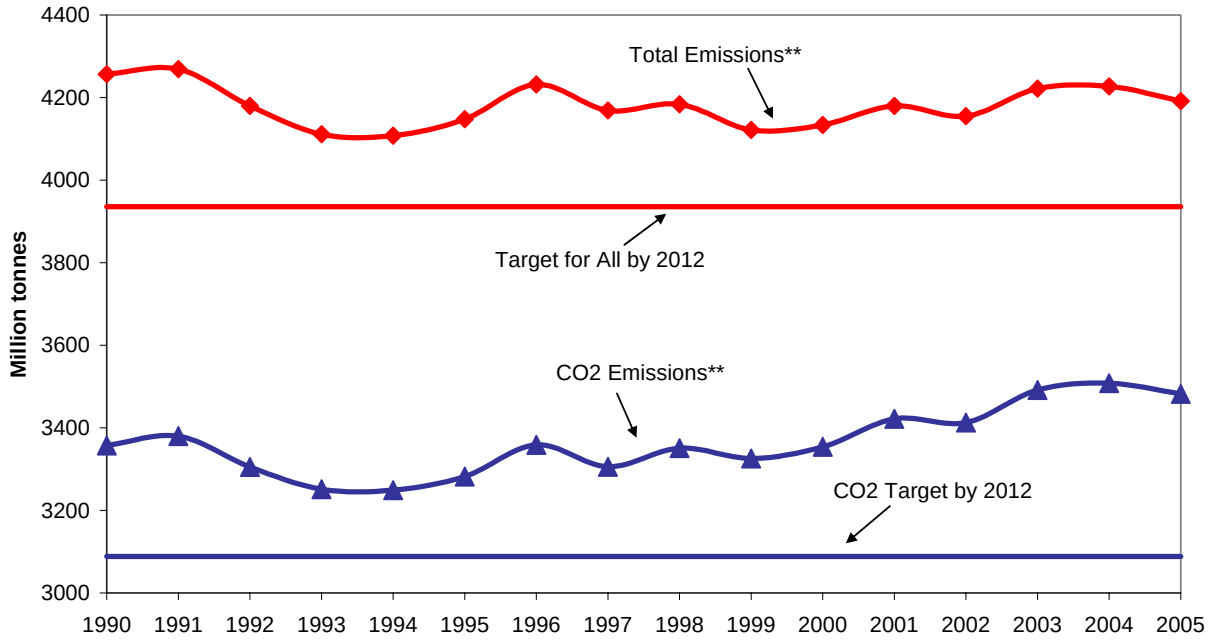
to 2003. This suggests that permanent reductions in Portland will be difficult unless its economy continues to lose industrial and manufacturing jobs

4. European Union Emissions: Myths and Reality

Many policymakers, the media, and public believe that the European Union's Emission Trading System (ETS) has produced reductions in GHG emissions and that the European system could serve as a model for how to reduce growth in GHGs here in the U.S. The ETS was created in 2005; it covers about 12,000 major emitters which produce about 40 percent of EU emissions. The ETS is a market-based, EU-wide system that allows countries to "trade" (i.e., buy and sell) permits to emit CO_2. The EU 15 (the major industrial countries) have a target of achieving an 8 percent reduction in GHGs by 2010.

As shown in **Figure 3**, CO_2 emissions in the EU 15 have risen sharply since 1990. The ETS itself has had little impact in reducing overall emission growth. In fact, overall emissions (including all six of the greenhouse gases) have held constant due to one-time events such as the collapse of industry in East Germany and a switch from coal to gas for electricity generation. As shown in **Figure 3,** in 2005 overall emissions were about 6 percent above the target.

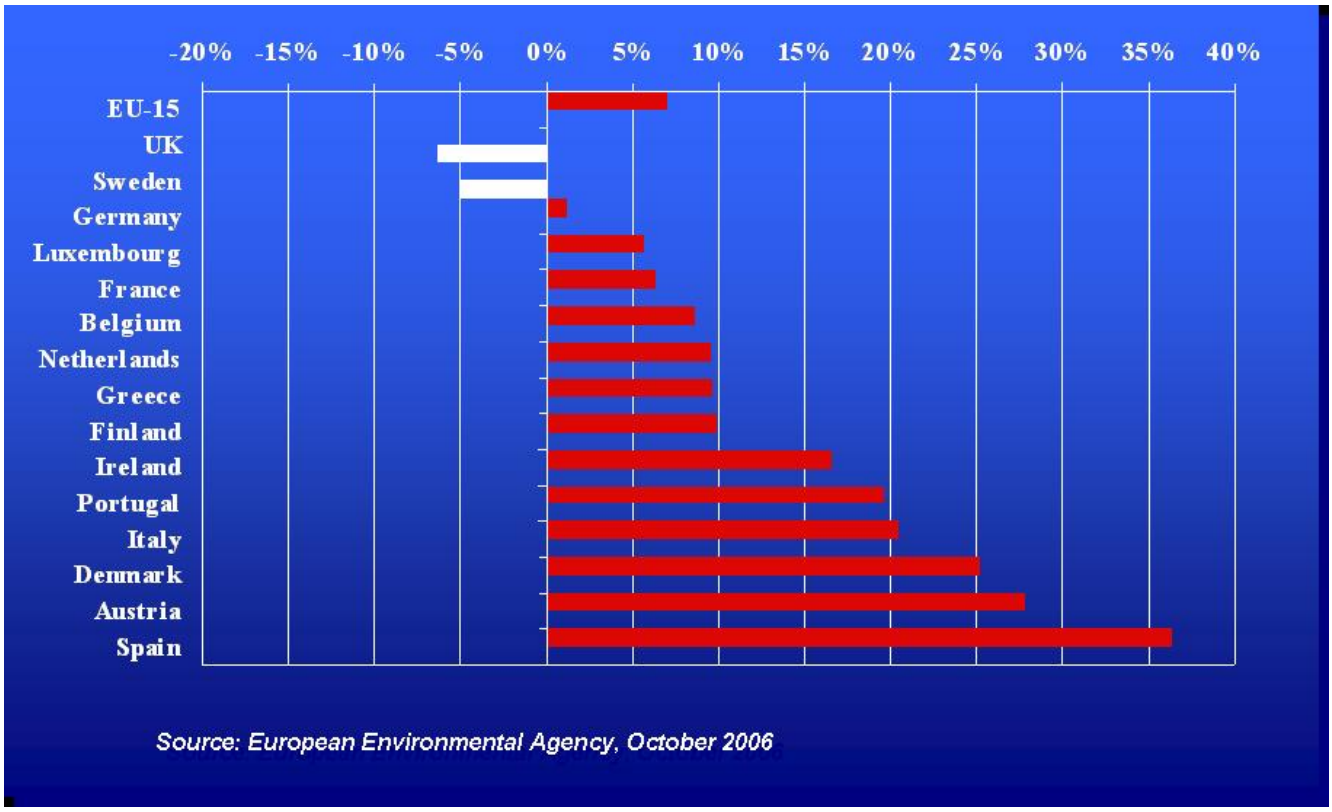
Figure 3. Greenhouse Gas Emissions in the EU-15*



* In CO2 Equivalents
** Excludes land use, land use change and forestry.
Source: "Annual European community Greenhouse Gas Inventory 1990-2005 and Inventory Report 2007", European Environment Agency, version 27 May 2007.

The European Environmental Agency's latest projections (October 2006) for the EU 15 show that without strong new measures, EU 15 emissions will be 7.4 percent *above* 1990 levels in 2010 rather than 8 percent *below* as required by the Kyoto Protocol.**(see Figure 4).**

Figure 4. Greenhouse Gas Emissions in the European Union Projected to Exceed Kyoto Targets in 2010



Now that the ETS has been operational for two years, industry and households are feeling some of the system's effects even though its overall impact on emission growth has been small. As the *Washington Post* reported in "Europe's Problems Color U.S. Plans to Curb Carbon Gases" (April 9, 2007), the ETS has become a bureaucratic morass with a host of unexpected and costly side effects, including a much smaller effect on carbon emissions than planned and many companies complaining that it is unfair. An example is Kollo Holding's factory in the Netherlands which makes silicon carbide, a material used as an industrial abrasive and lining for high-temperature furnaces and kilns. Its managers like to think of their plant as an ecological standout. They use waste gases to generate energy and have installed the latest pollution-control equipment.

But Europe's program has driven electricity prices so high that the facility routinely shuts down for part of the day to save money on power. Although demand for its products is strong, the plant has laid off 40 of its 130 employees and trimmed production. Two customers have turned to cheaper imports from China, which is not covered by Europe's costly regulations, the *Post* reports.

> "It's crazy," said Kusters, the plant director, as he stood among steaming black mounds of petroleum coke and sand in northern Holland. "We not only have the most energy-efficient plant in the world but also the most environmentally friendly."

Of all the effects of the new rules, the rise in the price of power has aroused the most outrage according to the *Washington Post*. Much of the anger of consumers and industries has been aimed at the continent's utility companies. Like other firms, the utilities were given slightly fewer allowances than they needed. But instead of charging customers for the cost of buying allowances to cover the shortfall, utilities in much of Europe charged customers for 100 percent of the tradable allowances they were given—even though the government handed them out free. Electricity rates soared.

> The chief executive of one utility, Vattenfall, which owns a coal plant that is one of the continent's biggest carbon emitters, defended the decision. Lars G. Josefsson, who is also an adviser to German Chancellor Angela Merkel, said higher electricity prices are "the intent of the whole exercise. . . . If there were no effects, why should you have a cap-and-trade system?"

An examination of the actual European emissions data, combined with anecdotal reports like those above on actual operation in the EU, reinforce the idea that the ETS is not having a major impact on emission reductions.

5. Practical Strategies for GHG Reductions

- **The role of economic growth and technology in GHG reduction**

Economic growth can have a positive impact on GHG emission reductions. The U.S., with its dynamic economy and voluntary approach to emission reductions, has cut its energy intensity by 12.2 percent between1997 and 2003 compared to only 7.6 percent in the EU with its mandatory approach (see **Figure 5**).

Technology development and deployment offer the most efficient and effective ways to reduce GHG emissions. A strong economy tends to pull-through capital investment faster. Given the extremely long life of much of the capital stock, the voluntary approach will allow emissions intensity to be reduced in a cost-effective way (see **Figure 6**).

There are only a few basic ways to reduce CO_2 emissions from fossil fuel use: use less fossil fuel or develop technologies to use energy more efficiently, capture emissions or substitute for fossil energy. There is an abundance of economic literature demonstrating the relationship between energy use and economic growth, as well as the negative impacts of curtailing energy use. Long term, new technologies offer the most promise for affecting GHG emission rates and atmospheric GHG concentrations.

Consumers and industry already are responding to market-driven energy prices increases in the past three years by changing their energy use patterns and adopting new, more efficient technologies. For example, gasoline prices increased more than 10 percent a year in each of the

Figure 5. Comparison of EU and US Energy Intensity Reduction 1991-2003

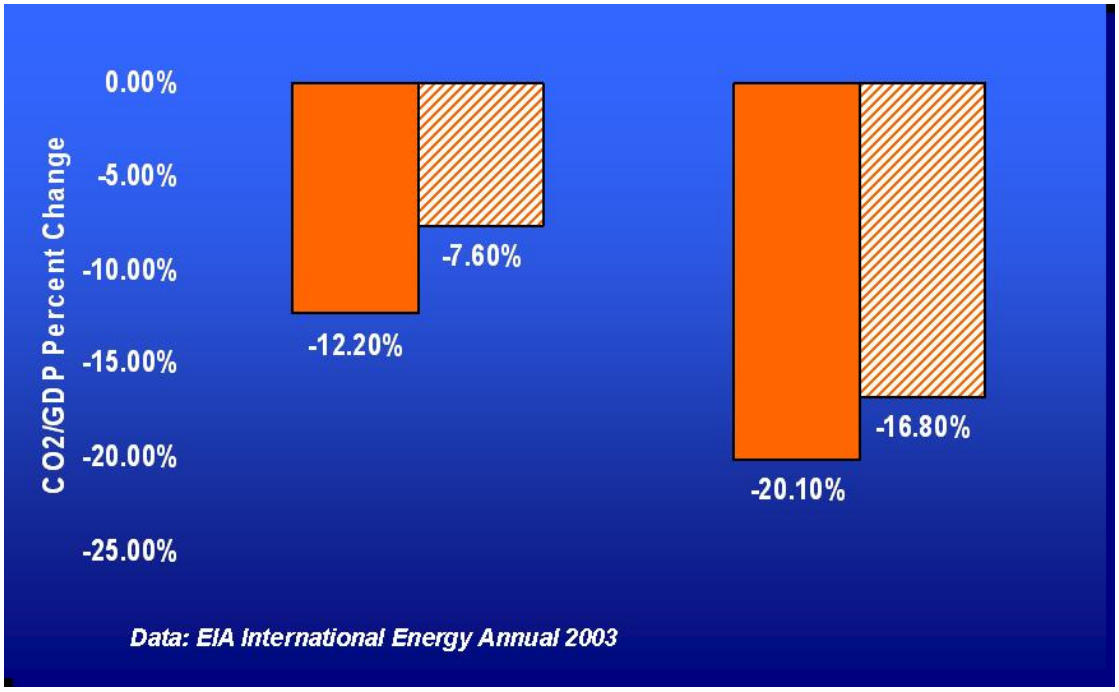
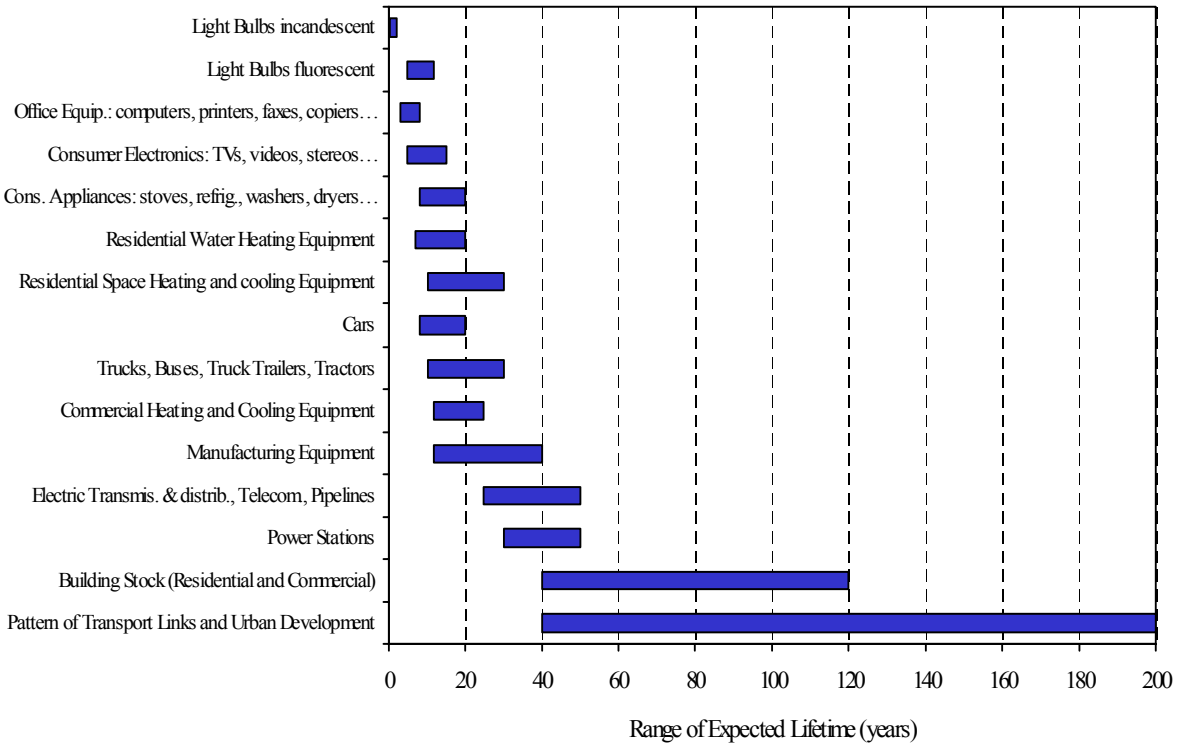


Figure 6. Average Life Spans for Selected Energy-Related Capital Stock



last three years. The impetus of market forces is contributing to the adoption of cost-effective changes in the capital stock and the transportation fleet over the normal capital replacement cycle. According to recent DOE/EIA data, U.S. energy-related CO_2 emissions declined in absolute terms in 2006 by 1.3 percent even though the economy grew by 3.3 percent. In addition, the total carbon intensity of the economy (CO_2 per real dollar of GDP) fell by 4.5 percent in 2006. This is the largest decline since 1990. The market is clearly responding to higher energy prices leading to changes in consumer behavior.

- **Accelerating the uptake of new technology by private as well as nonprofit entities.**

The development of various high technology programs can be accelerated through government programs as well as by encouraging private sector investment. For example, in the electric utility sector, some policies may be of particular help to taxable entities (typically investor-owned utilities or "IOUs" while others would be of more benefit to rural electric cooperatives (which pay no federal income tax.)

One positive step for encouraging the uptake of new technology by IOUs would be to provide more rapid write offs for new investment. Improving the U.S federal tax code to provide more rapid cost recovery through faster depreciation, investment tax credits, and making permanent the 15 percent tax rate on dividends and capital gains received by individuals are positive steps that reduce the cost of capital for investment. U.S. capital cost recovery for energy investments lags that of many of our trading partners. New ACCF research shows that U.S. companies receive only 29 cents after 5 years through depreciation allowances on each dollar of investment in a combined heat and power facility while a company in India gets 56 cents and a Canadian company gets 80 cents back. (see http://www.accf.org/pdf/Energy-Depreciation-Comparison.pdf for full report). Thus, slow capital cost recovery in the U.S. federal tax code places domestic companies at a disadvantage compared to our trading partners and slows the development and installation of new energy-efficient technology.

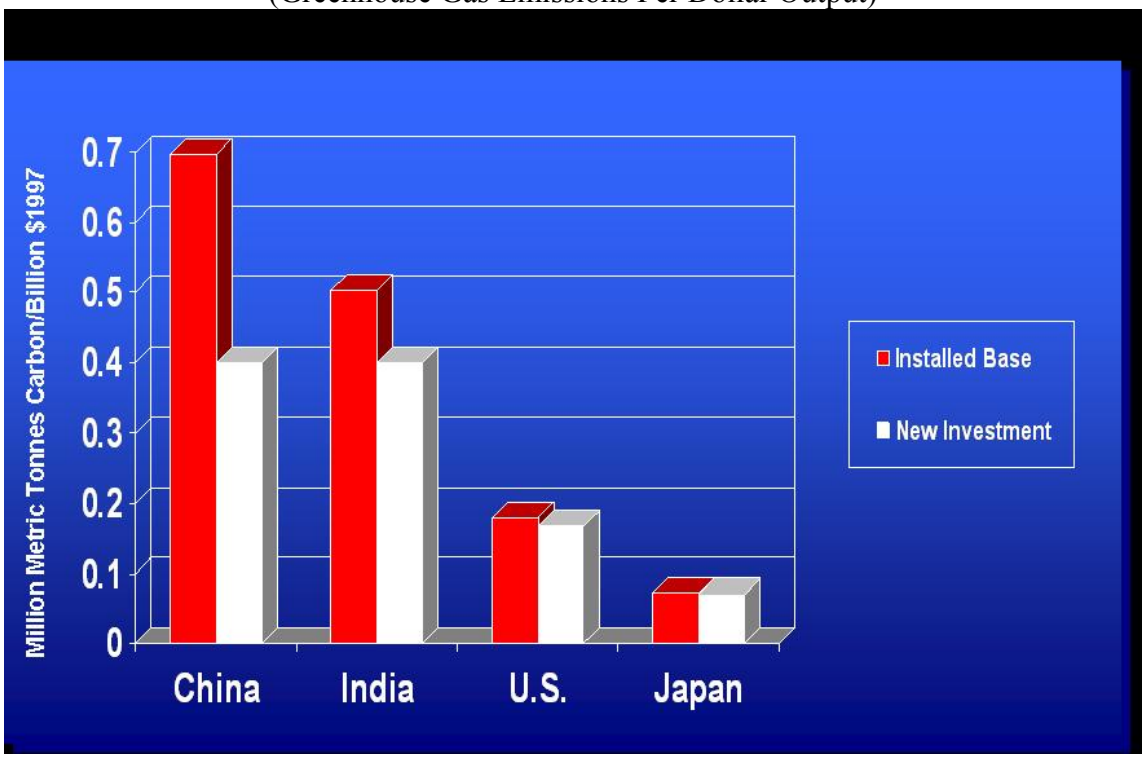
For non-taxable entities such as rural electric cooperatives, encouraging the more rapid adoption of new technologies to reduce emissions could be accelerated by special government bonds, grants or low interest loans. Such policies would ensure that the competitiveness of rural cooperatives is not impaired by tax code reforms which benefit IOUs.

- **International partnerships and technology transfer**

Encouraging the world's top emitters to work together to transfer clean technology is key to global greenhouse gas emission reduction. China's CO_2 emissions surpassed those of the U.S. this year. This fact illustrates how important it is to secure the cooperation and participation of major developing countries to have a real impact on global GHG emissions growth.

Figure 7. Impact of New Technologies on Carbon Emissions

(Greenhouse Gas Emissions Per Dollar Output)



The Asia Pacific Partnership on Clean Development and Climate (APP) — signed in July 2005 between India, China, Korea, Japan, Australia and the United States — is a good start at promoting economic development and the spread of cleaner, less-emitting energy technology. Research by Dr. David Montgomery of CRA International shows that current installed capital equipment in China and India produces almost four times the GHG emissions per dollar of output as U.S capital equipment (see **Figure 7**). Even though China is becoming more energy efficient and is reducing its energy intensity, its new equipment still is far less efficient than that of the United States and Japan. Meanwhile, India is not making much progress in reducing energy intensity. If the APP can encourage the kind of institutional changes in developing countries that help them acquire new and more energy-efficient equipment and production processes it would be a substantial help in reducing the growth of GHGs worldwide. If China and India had access even to current U.S. levels of technology for electricity generation, manufacturing, transportation and building heating and cooling, their carbon emission reductions would be four times larger than those of the EU-15 by 2012 (assuming the EU can meet its Kyoto target).

Conclusions:

Energy use and economic growth go hand-in-hand. Helping the developing world improve its use of its abundant energy resources in ways that are cleaner should be the focus of global climate policies. While climate change is a global issue, reducing emissions in the developed countries should not take priority over maintaining strong economic growth in the United States and other industrial nations as they are the key engines for global economic growth.

Climate change policies should continue to strive to reduce energy intensity as the capital stock is replaced over the business cycle in order to develop new, cost-effective technologies for alternative energy production and conservation, and to encourage the spread of market-based reforms in the developing world. This approach is likely to be much more productive than adopting mandatory CO_2 reduction targets, thereby sacrificing economic well-being and job growth with little or no long-term impact on global GHG emission growth.