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"It's the economy, stupid!" Economics is the fundamental motivation for opposition to U.S. participation in

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the Kyoto Protocol and to adopting mandatory limitations on greenhouse gas emissions. Quite simply, the prospect of the United States reducing its greenhouse gas emissions to 7 percent below its 1990 emission levels has been viewed as just too expensive, with some economists predicting costs of Kyoto compliance to be more than \$300 billion. Many Americans do not believe that greenhouse gas reductions can be achieved without, at the least, significant hardship and reduced economic competitiveness with developing nations. To make matters worse, the Kyoto reductions would have only a small impact on the world's global warming trajectory.

The most comprehensive review ever carried out on the economics of climate change, the just-released *Stern Review on the Economics of Climate Change* (available at www.sternreview.org.uk) suggests that to stabilize the atmosphere at 550 parts per million CO₂ equivalent would require reducing global emissions to about 25 percent below current levels, and, to allow economic growth, reducing emissions per unit of Gross Domestic Product to 75 percent below current rates. These challenges make Kyoto look like an easy warm-up.

Within the United States many perceive these challenges as utterly impossible without destroying our economy. However, the underlying assumption about the cost of reducing greenhouse gas emissions is fundamentally wrong. Most economic models predicting future compliance costs are wrong, and they will always be wrong. The problem with most economic predictions of future compliance costs is that economists do not really trust that this time the market will again innovate and be competitive; the models are flawed because of lack of trust in the marketplace to invent solutions not imagined (because there was no need to imagine) before the mandate was in place.

Until the market is required to innovate to meet a mandate, there is little economic incentive for business to invest in developing or purchasing technology that could meet that mandate. On the other hand, the brilliance of the market, proven time and again, has been that once a mandate is in place, competition to meet that new demand becomes fierce, innovation is rapid, and costs *always* plummet. Removing lead from gasoline, eliminating CFCs to protect stratospheric ozone, reducing sulfur emissions to mitigate acid precipitation, and the near total elimination of organic compounds from the waste streams of our major chemical companies are but a few examples of seemingly unimaginable reductions being achieved, and achieved at remarkably low costs (and sometimes at a net savings to the economy).

Should not predictions be based on the reality of how markets have actually responded, rather than on models that do not trust that markets will respond? If the experience in California is used to measure greenhouse gas emission reductions, then not only is a 30 percent reduction possible, but 45 percent would be relatively easy. Quite simply, if the nation's average per capita greenhouse gas emissions, now 20 tons per person, were at the level of

California's, 11 tons per person, we would today be emitting about 45 percent fewer greenhouse gases than we are now emitting. California trusts this experience and has now begun to reduce emissions an additional 25 percent below its current levels. See California Climate Change Portal, www.climatechange.ca.gov/. And to critics of this idea, who claim that California does not include the greenhouse gases from the electricity it imports from coal-fired power plants in Nevada, Utah, and other states, all I can say is that the claim is untrue. See CALIFORNIA ENERGY COMMISSION, INVENTORY OF CALIFORNIA GREENHOUSE GAS EMISSIONS AND SINKS: 1990 TO 2004 (Draft Staff Report) CEC-600-2006-013-D (Oct. 2006).

Look at the numbers, using national and state CO₂ emission data maintained by World Resources Institute in its Climate Analysis Indicator Tool at <http://cait.wri.org/>. Some states, taken alone, would rank high on the world list of greenhouse gas emissions by country. Texas's total CO₂ emissions would rank it seventh in the world, between Germany and the United Kingdom; California would be twelfth, slightly below Mexico and above France. In fact, the top thirty-three states would rank within the top fifty CO₂ emitters in the world. Even Vermont, the lowest CO₂-emitting state in the United States, would rank one-hundredth in the world. So, state actions to reduce greenhouse gas emissions can have a measurable impact.

Just as importantly, state per capita emissions are strikingly high compared with the rest of the developed world, let alone the developing nations; U.S. states use fossil fuels far less efficiently than their trading competition. For instance, even the most efficient state in the nation, Vermont (10.6 tons of CO₂/person), would still be ranked in the top twenty-five nations of the world in per capita CO₂ emissions, just slightly better than the Russian Federation. The twenty-five countries in the European Union average 8.7 tons per person, far less than the average of the fifty U.S. states, 20 tons per person. The five most inefficient states, in tons per person, Wyoming (130.4), North Dakota (82.9), Alaska (66.8), West Virginia (57.6), and Louisiana (41.3), would rank in inefficiency one to five in the world, above the world's least efficient nations, Qatar (39.9), Kuwait (24.8), United Arab Emirates (UAE) (24.1), and Bahrain (20.9); the United States is fifth (20.0). Twelve states would fit between Qatar and Kuwait, with another two states just below Kuwait, and four between Bahrain and UAE. Not only does Wyoming top the world's per capita emissions list, its per capita emissions are some 3.25 times greater than those of Qatar, the least efficient nation in the world.

These data suggest that states face enormous opportunities to become more efficient. Remarkably, if the U.S. average emissions per capita were the same as California's, total annual U.S. CO₂ emissions would be reduced by 45 percent, a 2.6 billion ton annual reduction. A resident of Wyoming, North Dakota, Alaska, West Virginia, and

Louisiana (379 million tons) emits more than three times the CO₂ than a person in California, a large state with a profound love affair with driving (the California Energy Commission reports that in 2001, more 24.4 million vehicles traveled more than 310 billion vehicle miles in California). At the same time, California's economy grew nicely, from a Gross State Product of \$788 billion in 1990 to \$1.1 trillion in 2000. See California Energy Commission, 2003 Integrated Energy Policy Report (Nov. 12, 2003), www.energy.ca.gov/2003_energypolicy/index.html.

How has California achieved this? By steadily taking small steps over the past twenty years both to improve energy efficiency and to promote renewable energy. Energy efficiency savings have been enormous, with building and appliance standards being the most cost-effective means of achieving significant, durable energy efficiency. As of 2003, California already enjoyed a net savings in electricity and natural gas of more than \$36 billion and projected that its efforts would yield a \$79 billion net savings to California by 2013. As of 2000, the cumulative effect of its energy efficiency programs and standards was a savings of more than 10,000 MW and 35,000 Gwh of electricity—the equivalent to the output of twenty 500-MW power plants.

The specific details of the programs are too long and diverse to review here, but a few examples might be useful. Variable speed chillers in buildings use 40 percent less electricity than typical chillers; compact florescent bulbs that replace incandescent bulbs provide equivalent lumens using 70 percent less electricity and generate much less heat, thereby reducing air conditioning loads; commercial and residential building codes require new construction to meet high energy-efficiency standards. See CEC, INTEGRATED ENERGY POLICY REPORT SUBSIDIARY VOLUME: PUBLIC INTEREST STRATEGIES REPORT, 100-03-012F (Dec. 2003). Continuing along this track will yield even greater reductions, although many challenges remain. If space and time permitted, the same story could be told about New York, whose per capita CO₂ emissions are slightly less than California's.

So, the path toward economically sensible greenhouse gas reductions is visible. Not every state must achieve the lower average as long as the United States as a whole reduces its emissions to 11 tons/person. By setting a national per capita goal, market mechanisms can be adopted to meet the average, further reducing costs. At 11 tons per person, the United States will still be more than 20 percent higher than the European Union average of 8.7. Moreover, the 11-ton-per-person average does not take into account the potential emission-reductions impact of higher gasoline costs and improved motor vehicle mileage standards. The lesson here is that small, steady steps can produce significant results—and those results produce significant net economic benefits. As a nation, we need only follow the lead of California (and New York), who are imagining the unimaginable. 