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1001 Connecticut Ave NW • Suite 1250 • Washington, DC 20036  
202.331.1010 • [www.cei.org](http://www.cei.org)

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## **Kyoto-by-Inches Is Just as Foolish**

**By Marlo Lewis, Jr.\***

All economic pain for no environmental gain! That's what any fair-minded person will conclude who examines the Kyoto Protocol, the McCain-Lieberman Climate Stewardship Act, or Sen. Jeff Bingaman's (D-NM) soon-to-be-introduced climate bill.

**Unscientific.** Science does not support the alarmist claims underpinning Kyoto and kindred schemes to curb industrial emissions of greenhouse gases (GHGs), chiefly carbon dioxide (CO<sub>2</sub>) from fossil energy use.

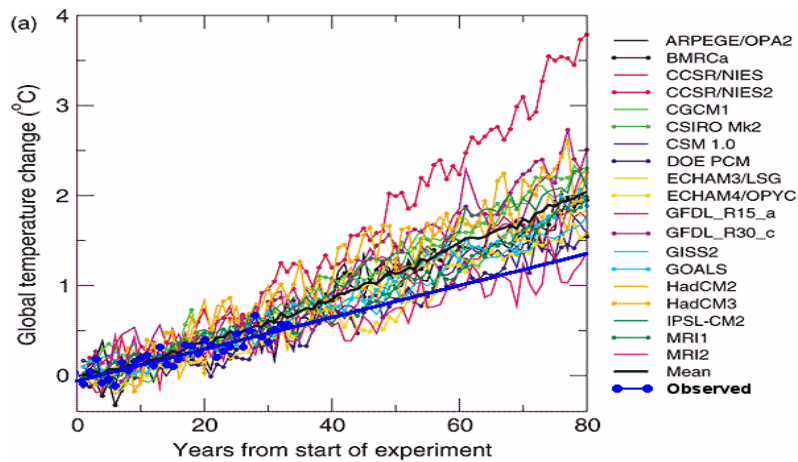
The U.S. Government has spent billions of dollars over the past two decades on computer modeling studies of climate change. What do we have to show for that investment?

With one exception,<sup>1</sup> all climate models predict that, once global warming from GHG emissions starts, it continues at a constant—not an accelerating—rate (see Figure 1).<sup>2</sup> Land- and sea-based instruments indicate that the surface of the planet has warmed by 0.17°C per decade since 1976.<sup>3</sup> Satellites and weather balloons show that the middle atmosphere—where models say most warming should occur—has warmed by 0.08°C per decade since 1979.<sup>4</sup> Even if we assume that all recent warming is due to GHG emissions, with no help from the heat effects of urbanization<sup>5</sup> or natural variability,<sup>6</sup> the linear form of model projections implies that the world will warm between 0.8°C and 1.7°C during the 21<sup>st</sup> century.<sup>7</sup>

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\* *Marlo Lewis, Jr. is a Senior Fellow in Environmental Policy at the Competitive Enterprise Institute*

Figure 1



Source: IPCC, *Climate Change 2001: The Scientific Basis*, p. 537

That is the real “scientific consensus” to emerge from climate modeling studies. Empirical studies also indicate that any future warming from manmade greenhouse gases will likely be close to the low end (1.4°C) of the Intergovernmental Panel on Climate Change’s (IPCC) projections for the next 100 years.<sup>8</sup>

This should all be reassuring. Moderate warming up to 2.5°C, especially when combined with the boost in crop and forest productivity from an atmosphere richer in CO<sub>2</sub>, which nourishes plants, would likely have a small but beneficial impact on the U.S. economy.<sup>9</sup>

But even if global warming were a serious problem—notwithstanding the lack of evidence for that assumption—the Kyoto Protocol would still be a costly exercise in futility.

**No Gain.** Not long after negotiating the Kyoto Protocol in December 1997, Vice President Al Gore asked his top climate advisor, Tom Wigley of the National Center for Atmospheric Research (NCAR), to estimate how much global warming the Kyoto treaty would avert. Kyoto requires industrial nations to reduce their average GHG emissions to 5.2 percent below 1990 levels during 2008-2012.

Wigley published his findings in July 1998.<sup>10</sup> He noted that Kyoto’s potential cooling effects depend chiefly on two factors. One is how “sensitive” (reactive) the climate is to increases in GHG concentrations. Sensitivity is usually expressed as the amount of warming expected to occur from a doubling of CO<sub>2</sub>-equivalent GHG levels over pre-industrial times. Wigley assumed that if the climate were relatively insensitive, an effective CO<sub>2</sub> doubling would yield an additional 1.5°C of global warming by 2100; if moderately sensitive, 2.5°C; and if highly sensitive, 4.5°C.

The other key factor determining Kyoto’s climate impact is how many tons of GHGs the treaty would prevent from being emitted into the atmosphere. Wigley envisioned three possibilities. First, industrial countries could implement Kyoto but make no further

efforts to control emissions after the initial compliance period (2008-2012). In this scenario, although binding constraints cease after 2012, Kyoto puts the industrial world on a lower emissions baseline such that, in every subsequent year through 2100, global GHG emissions are 729 million metric tons carbon equivalent (mmtce) less than they otherwise would be.<sup>11</sup> Second, industrial countries could hold emissions constant at the Kyoto-specified target (5.2 percent below 1990 levels) throughout the 21<sup>st</sup> century. Third, they could make additional efforts beyond Kyoto, reducing emissions by roughly 1 percent a year during the remainder of the century.

Wigley's analysis, as I understand it,<sup>12</sup> may be summarized as follows (see Table 1). If all industrial countries, including the United States, comply with Kyoto on an ongoing or constant basis, they would avoid 50,513 mmtce emissions between 2005 and 2050. Assuming moderate climate sensitivity, this would avert only 0.07°C of global warming by 2050. Such a miniscule change in global temperatures would be too small to detect. Scientists could not distinguish so tiny an effect from the “noise” of inter-annual climate variability.

Table 1	Kyoto Protocol: Cumulative Emissions Reduced (mmtce) Global Warming Avoided (degrees C)			
	GHG Reductions 2050	GW Avoided 2050	GHG Reductions 2100	GW Avoided 2100
No More	32,338	0.04	68,788	0.08
Constant	50,513	0.07	136,525	0.15
-1%	76,382	0.14	249,764	0.28

**All Pain.** In October 1998—not long after Wigley revealed Kyoto's impotence as a climate control program—the U.S. Energy Information Administration (EIA) published a study of Kyoto's economic impacts. EIA modeled five cases, differing chiefly in the extent to which U.S. firms would be able to comply with Kyoto by purchasing surplus emission allowances from other countries rather than by using less energy, switching to lower-carbon and non-carbon fuels, or both.<sup>13</sup> In the least restrictive scenario—in which U.S. firms purchase substantial quantities of emission allowances from abroad, allowing domestic emissions to increase by 24 percent above 1990 levels—Kyoto would reduce U.S. GDP by \$96 billion in 2010.<sup>14</sup> In the most restrictive case—in which firms cut domestic emissions to 7 percent below 1990 levels—Kyoto would reduce U.S. GDP by \$397 billion in 2010.<sup>15</sup>

These GDP-loss estimates may be too low. EIA assumed that Congress would use the revenues from emission permit sales to cut income taxes, thus partially offsetting the economic drag from higher energy costs. However, few if any Kyoto supporters are supply-siders, keen to stimulate growth by cutting taxes. Indeed, Kyoto is the regulatory equivalent of a gigantic energy tax. On the other hand, EIA modeled only reductions in energy-related CO<sub>2</sub> emissions, whereas Kyoto allows countries to comply by reducing non-CO<sub>2</sub> and non-energy-related GHG emissions. This flexibility would tend to lower compliance costs.

**Bipartisan Opposition to Kyoto.** One thing should be clear, however. Green pressure groups are peddling nonsense when they lay on President Bush all the blame (or credit) for keeping America out of Kyoto. U.S. ratification of Kyoto has been politically unthinkable since 1998, thanks to the Wigley and EIA analyses. Most Senators would rather be caught kiting checks than vote for a treaty costing untold billions of dollars to avoid a hypothetical and unverifiable 0.07°C of global warming 50 years hence. President Clinton knew better than to shop so bad a bargain to the U.S. Senate.

Also, in deference to the July 1997 Byrd-Hagel Resolution,<sup>16</sup> Clinton promised not to seek ratification of Kyoto unless U.S. negotiators secured “meaningful participation [i.e., binding emission limitations] from key developing countries.”<sup>17</sup> China, India, and all other developing countries steadfastly refused to discuss proposals to limit their energy use.

For that reason as well, Clinton never submitted the treaty to the Senate for advice and consent to ratification. The Clinton-Gore administration effectively abandoned Kyoto before Bush had anything to say about it.

**Kyoto Lite.** Ever since EIA published its Kyoto analysis, climate alarmists have tried to sell the public and policy makers on scaled-down policies that cost less than Kyoto but that, if adopted, would have the political virtue (in their eyes) of establishing the critical legal precedents and regulatory machinery. All such proposals are camel’s-nose-under-the-tent strategies to align U.S. law and policy with the aims and mechanisms of the Kyoto Protocol.

The seminal Kyoto Lite scheme was the Climate Stewardship Act (S. 139), introduced in January 2003 and also known as McCain-Lieberman, after its sponsors, Sens. John McCain (R-Ariz.) and Joseph Lieberman (D-Conn.). This bill would take effect in two phases. Phase I would require covered entities to reduce emissions to 2000 levels by 2010, while Phase II would require reducing emissions to 1990 levels by 2016. Though not as restrictive as the U.S. Kyoto target of a 7-percent reduction in emissions below 1990 levels during 2008-2012, Phase II is stringent enough to put major U.S. companies in virtual compliance with Kyoto. Once forced to bear Kyoto-like burdens, such firms would have an incentive to lobby for ratification in order to participate fully in the treaty’s emissions trading system.

However, this game plan turned out to be a little too clever. S. 139 bore a marked resemblance to Kyoto, differing from it only in degree, not in kind. Moreover, EIA found that its costs were far from negligible. In 2025, the peak impact year, the bill would increase electricity prices by 46 percent, add 40 cents a gallon to the price of gasoline, eliminate 80 percent of all electric generation from coal, and reduce GDP by \$106 billion.<sup>18</sup>

**Kyoto Extra Lite.** To mollify critics and entice fence sitters, McCain and Lieberman, in October 2003, introduced Senate Amendment 2028, a version of S. 139 that included only Phase I of the original bill. They called S.A. 2028 a “modest step” to address climate

change in a “serious” way. But it was neither modest nor serious. Rather, it was both radical and trivial.

S.A. 2028 would still regulate CO<sub>2</sub> emissions, something the U.S. government has never done—and for good reason. Carbon dioxide is the inescapable byproduct of the carbonaceous fuels—coal, oil, and natural gas—that supply roughly 85 percent of all the energy Americans use. The power to regulate CO<sub>2</sub> is literally the power to ration and restrict the American people’s access to energy—and thus cripple U.S. productivity, competitiveness, and growth. Enacting any cap on CO<sub>2</sub> emissions, however “modest” in magnitude, would constitute a radical break with all previous U.S. law and policy on energy production and use.

McCain and Lieberman surely understood that enacting Phase I would fundamentally redefine the climate policy battle in Washington. Instead of debating *whether* to suppress carbon-based energy—the question that has occupied national policy makers for the past two decades—Congress would instead continually debate *how much* to suppress it. Indeed, during the floor debate, Sen. Lieberman made clear that if the Senate passed Phase I, he and Sen. McCain would reintroduce Phase II.<sup>19</sup>

The text of S.A. 2028 also leaves no doubt about the open-ended character of McCain and Lieberman’s agenda. The bill includes an escalator clause (Sec. 334) requiring the Commerce Department—“no less frequently than biennially”—to reassess whether the bill’s emission caps are adequate to “prevent dangerous anthropogenic interference with the climate system.” In other words, S.A. 2028 would make the Commerce Department a permanent lobbyist, within the executive branch, for ever-tighter restrictions on the use of carbon-based energy.

Furthermore, the bill’s enactment would usher in an era of Kyoto-inspired litigation. For the first time, U.S. law would classify CO<sub>2</sub> as a regulated pollutant. This would strengthen lawsuits to compel compliance with Kyoto-style curbs on fossil energy. For example, a dozen state attorneys general (AGs) and 14 environmental groups are now suing the U.S. Environmental Protection Agency for refusing to regulate CO<sub>2</sub> emissions from motor vehicles.<sup>20</sup> Enact any variant of McCain-Lieberman, and the AGs’ lawsuit would instantly gain legal—though not scientific—merit, setting the stage for litigants to demand CO<sub>2</sub> controls on other sectors and sue energy-intensive U.S. firms for flood- and weather-related damages allegedly caused by global warming.

Yet for all its radicalism, neither version of McCain-Lieberman is a “serious” policy. How could it be, since even the tougher Kyoto Protocol would accomplish no measurable public health or ecological benefit? Based on Wigley’s analysis, S. 139 would avoid an insignificant 0.04°C of global warming in 2050. S.A. 2028 would avoid even less—0.029°C (see Table 2). Such undetectably small reductions in average global temperature would not benefit people or the planet one whit. Yet, according to EIA, S.A. 2028 is no free lunch. In the peak impact year, S.A. 2028 would reduce U.S. GDP by \$76 billion.<sup>21</sup> Fortunately, the Senate rejected S.A. 2028 by 55-43 in October 2003.

However, on May 26, 2005, McCain and Lieberman introduced S. 1151, the Climate Stewardship and Innovation Act, yet another version of Phase I of their original bill. Alas, bad policy ideas never die, they just get recycled.

**Kyoto by Inches.** Now along comes Sen. Bingaman with an even more “modest” proposal to save the planet.

Bingaman’s plan is based on recommendations put forward by a group calling itself the National Commission on Energy Policy (NCEP). Members include Harvard Professor John Holdren, former EPA Administrator William Reilly, and Exelon Corporation Chairman John Rowe. The words “pomp and puffery” come to mind, because nobody is in a position to commission himself, and private foundations—like those sponsoring NCEP<sup>22</sup>—have no authority to set up “national” commissions. NCEP’s official-sounding title is PR hype. This group has received no grant of authority, assignment of duties, or specification of tasks—in short, no *commission*—from the President, Congress, or any governmental body.

Yet last December, Sen. Bingaman asked EIA to analyze the NCEP recommendations’ economic impacts. NCEP advocates a Kyoto-type emissions cap-and-trade program, with two modifications. First, the program would seek to reduce U.S. emissions intensity (emissions per dollar of GDP) by 2.4 percent annually rather than to reduce overall emission levels. In fact, aggregate emissions would continue to increase through 2025, albeit at a slower rate than otherwise projected.<sup>23</sup> Second, to keep compliance costs from spiking unexpectedly, the U.S. Government would commit to sell emission permits on demand at pre-set maximum prices. Under this “safety valve” feature, emission permit prices could not exceed \$6.10 per metric ton of CO<sub>2</sub> in 2010 (\$22 per ton carbon) or \$8.50 per metric ton of CO<sub>2</sub> in 2025 (\$31 per ton carbon).

EIA’s report, published in April, found that the NCEP plan’s macroeconomic impact would be small relative to Kyoto and McCain-Lieberman. The NCEP cap-and-trade proposal, for example, would reduce GDP by \$19 billion (0.14 percent) in 2011 and \$27 billion (0.13 percent) in 2025.<sup>24</sup> According to EIA, the entire package of NCEP policies would “not materially affect average economic growth rates for the 2003 to 2025 period.”<sup>25</sup>

Sen. Bingaman, in a prepared statement, enthused: “This EIA report validates the widely held view that it’s possible to have a meaningful program to reduce greenhouse gas emissions without harming the U.S. economy.”<sup>26</sup>

Not so. All the report shows is that Kyoto-by-Inches is less expensive than Kyoto, Kyoto Lite, or Kyoto Extra Lite. But the costs are still significant. The NCEP plan lowers cumulative GDP by \$588 billion during 2010 to 2025<sup>27</sup>—hardly chump change.<sup>28</sup> The plan would also lead to the loss of 171,000 non-farm jobs in 2025, according to an unofficial estimate not published in the EIA report.

More importantly, as an investment in climate protection, the NCEP plan is *meaningless*, because it would not “materially affect” potential global warming from GHG emissions. The total package of NCEP recommendations would avert only 0.012°C of warming by 2050. Don’t the American people have better things to do with \$588 billion?

Further, according to EIA, one component of the plan—a 36 percent increase in new-car fuel economy standards—would increase the average price of light-duty vehicles by \$1,400 in 2015 and \$1,200 in 2025.<sup>29</sup> If automakers colluded to charge an additional \$1,200-\$1,400 for some new component or system that did so little to enhance consumer safety or environmental quality, Sen. Bingaman and his colleagues might well call on the Federal Trade Commission to investigate.

Dropping the fuel economy standard component and implementing just the cap-and-trade proposal would avoid new-car sticker shock, but the plan would still cost \$331 billion in cumulative GDP losses<sup>30</sup> and avert a mere 8/1000ths of a degree Celsius by 2050<sup>31</sup> (see Table 2).<sup>32</sup>

<b>Table 2</b>	<b>GHG Emissions and Global Warming Avoided</b>	
Scenario	Tons GHG Reduced	GW Avoided 2050
Kyoto Constant	50,513	0.07
S. 139	31,299	0.04
S.A. 2028	21,275	0.029
NCEP Total Package	8,907	0.012
NCEP Cap and Trade	5,830	0.008

Cumulative GHG Reductions in Million Metric Tons Carbon Equivalent; Global Warming Avoided in Degrees C

Another way to see why the NCEP cap-and-trade program is an expensive exercise in futility is to compare the quantity of emissions it would avoid with the projected increase in developing country emissions. During 2010-2025, the NCEP cap-and-trade program would avoid 2,070 million metric tons of CO<sub>2</sub>. During the same period, EIA projects that cumulative developing country CO<sub>2</sub> emissions will increase by 42,825 million metric tons.<sup>33</sup>

**Climate Alarmist Dilemma.** The usual rejoinder to the criticism that Kyoto or any lesser cap-and-trade program is an exercise in futility is that it is just a “first step”—the first of a long series of carbon-reduction policies, each broader and more demanding than its predecessor. Wigley, for example, noting that even Kyoto enhanced by additional emission cuts compounding at 1 percent annually would avert only 0.28°C of warming by 2100, concluded: “The Protocol, therefore, even when extended as here, can be considered as only a first and relatively small step towards stabilizing the climate.”<sup>34</sup> How many more steps would be needed? Wigley’s NCAR colleague Dr. Jerry Mahlman once opined that, “it would take 30 Kyotos over the next century” to do the job.<sup>35</sup> By the same token, the McCain-Lieberman and Bingaman proposals can be considered domestic steps towards the multilateral Kyoto treaty.

The problem with this “small steps” reasoning is that it makes no sense to take the first step unless you are prepared to take all the subsequent steps. Yet, given current and foreseeable technological capabilities, deep cuts in CO<sub>2</sub> emissions would be economically ruinous and, thus, politically unsustainable. We have long known how to reduce atmospheric concentrations of sulfur dioxide, nitrogen oxides, and other air pollutants while increasing GDP, population, vehicle-miles traveled, and energy use.<sup>36</sup> In contrast, we have no idea how to reduce CO<sub>2</sub> concentrations while meeting the world’s energy needs.

Claims that off-the-shelf or soon-to-be-available technologies can support easy, low-cost, and large-scale CO<sub>2</sub> emission reductions are not credible. A study by 18 scholars, published in the journal *Science*, examined several options that might be used in coming decades to stabilize CO<sub>2</sub> concentrations, including wind and solar energy, nuclear fission and fusion, biomass fuels, efficiency improvements, carbon sequestration, and hydrogen fuel cells.<sup>37</sup> The authors, who include Tom Wigley among other Kyoto supporters, found that, “All these approaches currently have severe deficiencies that limit their ability to stabilize global climate.”

The authors specifically took issue with the IPCC’s claim that “known technological options could achieve a broad range of atmospheric CO<sub>2</sub> stabilization levels, such as 550ppm, 450ppm or below over the next 100 years.” As noted in the study, world energy demand could triple by 2050. However, “Energy sources that can produce 100 to 300 percent of present world power consumption without greenhouse gas emissions do not exist operationally or as pilot plants.” The authors conclude: “CO<sub>2</sub> is a combustion product vital to how civilization is powered; it cannot be regulated away.”

Thus, it is not surprising that, despite the European Union’s (EU) high energy taxes, low population growth, and economic stagnation, 12 EU countries are projected in 2010 to exceed the EU’s Kyoto target (8 percent below 1990 levels), by the following amounts: Portugal, 21 percent; Spain, 29 percent; Denmark, 47 percent; Italy 11 to 25 percent; Greece, 11 percent; Ireland, 15 percent; Luxembourg, 67 percent; Finland, 17 percent; France, 9 percent; Austria, 18 percent; Belgium, 15 percent; and the Netherlands, 12 percent.<sup>38</sup> Great Britain and Germany are expected to over-comply, but only because of one-time structural changes: Britain’s switch from coal to natural gas and Germany’s closure of Stalin-era power plants and factories in the former East Germany.

Climate alarmism impales its devotees on the horns of an inescapable dilemma. On the one hand, Kyoto and its lesser offspring are ineffectual—all cost for no benefit. On the other hand, energy-suppression measures strong enough to stabilize CO<sub>2</sub> levels are a prescription for economic disaster—a “cure” worse than the alleged disease. Whichever way alarmists try to slice it—30 Kyotos or Kyoto-by-Inches—regulating the carbon content of fuels or emissions makes no sense. Carbon regulation is bound to do more harm than good. It is bad public policy.

**Questions for Sen. Bingaman.** According to the environmental news service *Greenwire*, two labor unions that oppose McCain-Lieberman—the United Mineworkers and United Steelworkers—said they would support the NCEP plan, because “it would



cause less economic harm than other approaches.”<sup>39</sup> Some endorsement. The unions might as well say they like NCEP because it represents a fraction of a bill that would do nothing except harm the economy. They overlook the key fact: The NCEP plan serves no intelligible purpose except to break the political ice for more aggressive energy-suppression measures that would ultimately cost thousands of mineworkers and steelworkers their jobs.

The unions, journalists, and Sen. Bingaman’s colleagues should be prepared to ask the Senator some tough questions:

- How much global warming would the NCEP plan avert? If it would avert only 0.012°C of warming, or even less, then what is the point of investing any resources in it at all? Is an unverifiable 0.012°C reduction in average global temperatures 45 years from now really worth \$588 billion in cumulative lost GDP, or tens of thousands of lost jobs?
- Since the NCEP plan will have no measurable public health or ecological benefit, is the real objective to establish the legal precedents and regulatory machinery for more costly restrictions on carbon-based energy?
- How much global warming does Sen. Bingaman believe we must ultimately avert—2.5°C, 4.5°C, more? If NCEP accomplishes only about 1/200<sup>th</sup> of the real objective, then how many steps beyond NCEP does he want U.S. firms to take?
- Finally, how much would those subsequent steps cost—in lost GDP, higher consumer energy prices, and lost jobs?

If Sen. Bingaman believes, along with UK Government science advisor Sir David King, that global warming is a more serious threat than terrorism<sup>40</sup> and that Antarctica will be the only inhabitable continent by the end of the century if global warming goes unchecked,<sup>41</sup> then why isn’t he calling for 30 Kyotos? If, on the other hand, he does not believe that the potential risks of global warming justify a “wrenching transformation of society,”<sup>42</sup> then why is he patronizing a Kyoto-by-Inches plan useful only as a launch pad for economy-chilling anti-energy litigation and regulation? His colleagues—and the public—deserve an answer to these questions.

## Notes

<sup>1</sup> The Canadian Climate Center model is the only model to project accelerated warming from GHG emissions. The Clinton-Gore administration relied heavily on the Canadian model to develop its “national assessment” of climate change. See Testimony of Patrick Michaels, *The U.S. National Climate Change Assessment: Do the Climate Models Project a Useful Picture of Regional Climate?* House Energy and Commerce Subcommittee on Oversight and Investigations, July 25, 2002, <http://energycommerce.house.gov/107/hearings/07252002Hearing676/Michaels1146.htm>.

<sup>2</sup> Intergovernmental Panel on Climate Change (hereafter IPCC), *Climate Change 2001: The Scientific Basis*, p. 537.

<sup>3</sup> IPCC, *Climate Change 2001*, p. 115.

<sup>4</sup> Christy, J.R., et al. 2003. Error estimates of Version 5.0 of MSU-AMSU bulk atmospheric temperatures. *Journal of Atmospheric and Oceanic Technology*, 20: 613-629; Angell, J.K. 2003. Global, hemispheric, and zonal temperature deviations derived from radiosonde records. Trends Online: A Compendium of Data

on Global Change. Carbon Dioxide Analysis Center, Oak Ridge Laboratory, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A.

<sup>5</sup> De Laet and Maurellis find “strong observational evidence that the degree of industrialization is correlated with surface temperature,” leading them to conclude that “the observed surface temperature changes might be a result of local surface heating processes and not related to radiative greenhouse gas forcing.” De Laet, A.T.J. and Maurellis, A.N. 2004. Industrial CO<sub>2</sub> emissions as a proxy for anthropogenic influence on lower tropospheric temperature trends. *Geophysical Research Letters* 31:10.1029/2003GL019024.

<sup>6</sup> Much of the observed warming during the past 50 years occurred in just two years: 1976-77. This step-like increase was due to a shift in the Pacific Decadal Oscillation, a natural climate cycle. Bratcher, A. T. and Giese, B.S. 2002. Tropical Pacific decadal variability and global warming. *Geophysical Research Letters* 29: 10.1029/2002GL015191.

<sup>7</sup> Michaels et al. 2002. Revised 21<sup>st</sup>-century temperature projections. *Climate Research* 23:1-9.

<sup>8</sup> Lindzen et al. 2001. Does the Earth Have an Adaptive Infrared Iris? *Bulletin of the American Meteorological Society* 82: 417-32; Douglass, D.H. and Knox, R.S. 2005. Climate forcing by the volcanic eruption of Mount Pinatubo. *Geophysical Research Letters*, Vol. 32. L05710.

<sup>9</sup> Mendelsohn, R. and Neuman, J.E. *The Impact of Climate Change on the United States Economy* (Cambridge, MA: Cambridge University Press, 1999).

<sup>10</sup> Wigley, T.M.L. 1998. The Kyoto Protocol: CO<sub>2</sub>, CH<sub>4</sub> and climate implications. *Geophysical Research Letters*, Vol. 25, No. 13: 2285-88.

<sup>11</sup> This is not realistic. Although there would be some residual lowering of baseline emission trajectories after the compliance period ends, Kyoto’s termination would likely unleash pent up demand from the previous decade of energy rationing and preparation for energy rationing. Further, as time passed and markets adjusted to the new reality of “Kyoto no more,” the treaty’s imprint on industrial country emissions would surely fade. Technologies purchased to comply with Kyoto in 2008-2012 would be retired long before 2100.

<sup>12</sup> Wigley (Table 1, p. 2286) lists emission reductions in 2005, 2010, 2015, 2020, 2025, 2050, 2075, and 2100. I use the implied compound interest rates to calculate reductions in the intervening years and the cumulative reductions to 2050 and 2100.

<sup>13</sup> Energy Information Administration (hereafter EIA). *Impacts of the Kyoto Protocol on U.S. Energy Markets and the Economy*, October 1998, <http://tonto.eia.doe.gov/FTPROOT/service/oiaf9803.pdf>. See especially Table ES-1. Selected Variables in the Carbon Reduction Cases, 1996 and 2010, p. xv.

<sup>14</sup> EIA’s estimate is in 1992 dollars (\$125 billion in 2003 dollars).

<sup>15</sup> EIA’s estimate is in 1992 dollars (\$518 billion in 2003 dollars).

<sup>16</sup> The Senate passed S. Res. 98, the Byrd-Hagel Resolution, by 95-0 on July 25, 1997. Byrd-Hagel advises the U.S. Government not to sign any treaty at the Kyoto conference that does not specify binding emission limits for developing countries. The text is available at <http://www.nationalcenter.org/KyotoSenate.html>.

<sup>17</sup> EPA, Fact Sheet on the Kyoto Protocol, October 1999, [http://yosemite.epa.gov/oar/globalwarming.nsf/webprintview/ResourceCenterPublicationsKyoto\\_99.html](http://yosemite.epa.gov/oar/globalwarming.nsf/webprintview/ResourceCenterPublicationsKyoto_99.html).

<sup>18</sup> EIA, *Analysis of S. 139: The Climate Stewardship Act of 2003*, June 2003, pp. xiv-xv, 124, [http://www.eia.doe.gov/oiaf/servicerpt/ml/pdf/sroiaf\(2003\)02.pdf](http://www.eia.doe.gov/oiaf/servicerpt/ml/pdf/sroiaf(2003)02.pdf). EIA’s estimate is in 1996 dollars (\$119 billion in 2003 dollars).

<sup>19</sup> *Congressional Record*, October 29, 2003, p. S13488.

<sup>20</sup> Plaintiff’s brief is available at <http://www.earthjustice.org/news/documents/6-04/globalwarmingbrief.pdf>. For a critique, see Marlo Lewis, “Crazy on Carbon Dioxide” (Revised), *National Review Online*, April 21, 2005, [http://www.oag.state.ny.us/press/2004/jul/jul21a\\_04\\_attach.pdf](http://www.oag.state.ny.us/press/2004/jul/jul21a_04_attach.pdf).

<sup>21</sup> EIA, *Analysis of Senate Amendment 2028, the Climate Stewardship Act*, May 2004, p. 7, [http://www.eia.doe.gov/oiaf/analysispaper/sacs/pdf/s139amend\\_analysis.pdf](http://www.eia.doe.gov/oiaf/analysispaper/sacs/pdf/s139amend_analysis.pdf). EIA’s estimate is in 1996 dollars (\$86 billion in 2003 dollars).

<sup>22</sup> NCEP is funded by the William and Flora Hewlett Foundation, the Pew Charitable Trusts, the John D. and Catherine T. MacArthur Foundation, the David and Lucile Packard Foundation, and the Energy Foundation.

<sup>23</sup> Under NCEP’s plan, GHG emissions would increase from 6,032 Million Metric Tons of CO<sub>2</sub> Equivalent in 2003 to 7,108 mmtCO<sub>2</sub>e in 2015 and 7,829 mmtCO<sub>2</sub>e in 2025. EIA, *Impacts of Recommendations of the National Commission on Energy Policy*, April 2005, Table 3. Summary of Greenhouse Gas Emission Scenarios, 2015 and 2025, p. 16, [http://www.eia.doe.gov/oiaf/servicerpt/bingaman/pdf/sroiaf\(2005\)02.pdf](http://www.eia.doe.gov/oiaf/servicerpt/bingaman/pdf/sroiaf(2005)02.pdf).

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<sup>24</sup> EIA, *Impact of Recommendations*, p. 41. EIA's estimates are in 2000 dollars.

<sup>25</sup> EIA, *Impacts of Recommendations*, p. xi.

<sup>26</sup> "Modest Greenhouse Gas Reductions Have Little Economic Impact," press release, April 15, 2005, [http://energy.senate.gov/news/dem\\_release.cfm?id=236478](http://energy.senate.gov/news/dem_release.cfm?id=236478).

<sup>27</sup> Author's calculation based on the GDP projections in EIA's NCEP Case and AEO2005 Reference Case, <http://www.eia.doe.gov/oiaf/servicerpt/bingaman/index.html>.

<sup>28</sup> Some may object that future GDP losses should be discounted to reflect the time-value of money. The present value of the NCEP plan's GDP losses is \$322 billion assuming a 7-percent discount rate, and \$260 billion assuming a 10-percent discount rate. Such losses still vastly outweigh any conceivable benefit from a 0.012°C reduction in average global temperatures. Note, also, that if we discount the costs of the NCEP plan, we must correspondingly discount the "benefits" (if any) of the global warming avoided.

<sup>29</sup> EIA, *Impact of Recommendations*, p. xii.

<sup>30</sup> Author's calculation based on EIA Spreadsheet Tables AEO2005 Reference Case and Greenhouse gas policy, with safety valve, <http://www.eia.doe.gov/oiaf/servicerpt/bingaman/index.html>.

<sup>31</sup> Emission reductions from S. 139 and S.A. 2028 during 2003-2025 are available in EIA, *Analysis of Senate Amendment 2028, the Climate Stewardship Act*, Figure Data for Figure 1, <http://www.eia.doe.gov/oiaf/analysispaper/sacs/index.html>. Emission reductions from the NCEP policies during 2003-2025 may be computed from EIA Spreadsheet Tables AEO2005 Reference Case, NCEP Case, and Greenhouse gas policy, with safety valve, <http://www.eia.doe.gov/oiaf/servicerpt/bingaman/index.html>. Here's how I calculate cumulative emission reductions to 2050 for the McCain-Lieberman and NCEP policies. EIA estimates that, from 2003-2025, S. 139 avoids 8,424 mmtce; S.A. 2028, 5,650 mmtce; NCEP total package, 2,331.5 mmtce; and NCEP cap-and-trade, 1,580.1 mmtce. Then, following Wigley, I assume a "No More" scenario for 2026-2050, i.e., whatever reduction is achieved in 2025 recurs as avoided emissions in each subsequent year. In 2025, S. 139 lowers emissions by 915 mmtce; S.A. 2028, 625 mmtce; NCEP total package, 263 mmtce; and NCEP cap-and-trade, 170 mmtce. The "No More" assumption is questionable (see note 11, above) and may inflate substantially the potential warming averted from McCain-Lieberman and NCEP.

<sup>32</sup> If anything, Table 2 probably overestimates the amount of warming averted by the McCain-Lieberman and Bingaman proposals, because it generously assumes (following Wigley's Kyoto analysis) that the final year's emissions reduction from each control regime recurs as avoided emissions in every subsequent year. Under a reasonable alternative assumption that such policies avoid only about as many tons of emissions during the 25 years after they terminate as they did during the 25 years when their caps were in effect, the estimates of averted warming drop considerably. In 2050, S. 139 averts 0.023°C; S.A. 2028, 0.015°C; NCEP total package, 0.006°C; and NCEP cap-and-trade, 0.002°C. Even these estimates of averted warming may be too high if, as the aforementioned empirical studies suggest, the climate is relatively insensitive to increases in atmospheric GHG concentrations.

<sup>33</sup> Author's calculation based on EIA, World Energy-Related Carbon Dioxide Emissions by Region, [http://www.eia.doe.gov/oiaf/ieo/excel/figure\\_18data.xls](http://www.eia.doe.gov/oiaf/ieo/excel/figure_18data.xls).

<sup>34</sup> Wigley, 1998, p. 2288.

<sup>35</sup> David Malokoff, "Climate Change: Thirty Kyotos needed to control warming," *Science*, December 19, 1997.

<sup>36</sup> EPA, *Ozone Report: Measuring Progress through 2003*, <http://www.epa.gov/airtrends/ozone.html>.

<sup>37</sup> Hoffert, M.I., et al. 2002. Advanced Technology Paths to Climate Stability: Energy for a Greenhouse Planet. *Science* 298: 981-987.

<sup>38</sup> Christopher C. Horner, "Broken Promises, Hot Air," *Washington Times*, May 16, 2005, <http://www.cei.org/gencon/019,04548.cfm>.

<sup>39</sup> Brian Stempeck, "McCain to offer climate plan as energy amendment," *Greenwire*, May 18, 2005.

<sup>40</sup> King, D.A. 2004. Climate Change Science: Adapt, Mitigate, or Ignore? *Science* 303: 176-177.

<sup>41</sup> *Cooler Heads*, Vol. VIII, No. 10, March 18, 2004, <http://www.cei.org/gencon/014,04028.cfm>.

<sup>42</sup> The phrase comes from Al Gore, *Earth in the Balance: Ecology and the Human Spirit* (Houghton Mifflin, 1992) p. 374.