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107TH CONGRESS }  
*1st Session*

SENATE

{ REPORT  
107-99

**CLIMATE CHANGE STRATEGY AND  
TECHNOLOGY INNOVATION ACT OF 2001**

**R E P O R T**

OF THE

**COMMITTEE ON GOVERNMENTAL AFFAIRS  
UNITED STATES SENATE**

together with

**ADDITIONAL VIEWS**

TO ACCOMPANY

**S. 1008**

TO AMEND THE ENERGY POLICY ACT OF 1992 TO DEVELOP THE UNITED STATES CLIMATE CHANGE RESPONSE STRATEGY WITH THE GOAL OF STABILIZATION OF GREENHOUSE GAS CONCENTRATIONS IN THE ATMOSPHERE AT A LEVEL THAT WOULD PREVENT DANGEROUS ANTHROPOGENIC INTERFERENCE WITH THE CLIMATE SYSTEM, WHILE MINIMIZING ADVERSE SHORT-TERM AND LONG-TERM ECONOMIC AND SOCIAL IMPACTS, ALIGNING THE STRATEGY WITH UNITED STATES ENERGY POLICY, AND PROMOTING A SOUND NATIONAL ENVIRONMENTAL POLICY, TO ESTABLISH A RESEARCH AND DEVELOPMENT PROGRAM THAT FOCUSES ON BOLD TECHNOLOGICAL BREAKTHROUGHS THAT MAKE SIGNIFICANT PROGRESS TOWARD THE GOAL OF STABILIZATION OF GREENHOUSE GAS CONCENTRATIONS, TO ESTABLISH THE NATIONAL OFFICE OF CLIMATE CHANGE RESPONSE WITHIN THE EXECUTIVE OFFICE OF THE PRESIDENT, AND FOR OTHER PURPOSES



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### CLIMATE CHANGE STRATEGY AND TECHNOLOGY INNOVATION ACT OF 2001

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Mr. LIEBERMAN, from the Committee on Governmental Affairs,  
submitted the following

### R E P O R T

[To accompany S. 1008]

The Committee on Governmental Affairs, to whom was referred the bill (S. 1008) to amend the Energy Policy Act of 1992 to develop the United States Climate Change Response Strategy with the goal of stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, while minimizing adverse short-term and long-term economic and social impacts, aligning the Strategy with United States energy policy, and promoting a sound national environmental policy to establish a research and development program that focuses on bold technological breakthroughs that make significant progress toward the goal of stabilization of greenhouse gas concentrations, to establish the National Office of Climate Change Response within the Executive Office of the President, and for other purposes, having considered the same, report favorably thereon with amendments and recommend that the bill do pass.

#### I. PURPOSE AND SUMMARY

S. 1008, The Climate Change Strategy and Technology Innovation Act of 2001, is a bipartisan bill to forge a national response to the problem of global climate change. The bill would create a White House Office on climate change, charged with constructing a national strategy to stabilize the concentration of greenhouse gases in the atmosphere. It would also provide a new focus for, and authorize funding to promote, breakthrough technologies to address climate change. As stated by the bill's chief sponsor Senator Byrd, "the legislation would establish a regime of responsibility and accountability in the Federal sector for the development of a national

climate change response strategy.”<sup>1</sup> Senator Stevens, the lead co-sponsor, added that “we need better research capabilities to understand global climate change, better planning capabilities to react to climate change impact, and better energy technology infrastructure to keep pace with America’s growing energy needs. Senator Byrd’s bill will create a process for the United States to seriously and responsibly address the climate change issues.”<sup>2</sup> At the Committee’s July 18 hearing on the legislation, Senator Lieberman stated that the bill would “create a focused, comprehensive effort within the executive branch that will provide the leadership and creative work that the problem of global warming requires.”

Climate change is one of the most complex and daunting challenges our nation has faced. While debate continues about the precise causes and scope of climate change, there is increasing evidence that the Earth’s climate is warming and that human activity is responsible for most of the changes. The consequences, particularly if climate change is left unchecked, could be devastating. Already, scientists have reported a warming of the earth’s temperature, thinning of sea ice, shrinking glaciers and other evidence of climatic change due to warming. Scientists predict that further warming could produce rising oceans, more violent weather patterns, loss of forests and other adverse effects.

To halt this trend, the United States and other nations must act decisively to curb emissions of the greenhouse gases that are linked to global warming within the last century. Most greenhouse gas emissions have extremely long life spans in the atmosphere, ranging from decades to thousands of years. Thus, gases emitted today are added to what was emitted during the 20th century. This geometric growth in atmospheric concentrations of greenhouse gases means that once the global atmosphere hits dangerous levels of greenhouse gases, it will be nearly impossible to reverse course. The United States must now begin to develop and implement cost-effective solutions in order to begin the process of addressing global climate change. The weight of scientific evidence suggests that it will be impossible to reverse course in a cost-effective manner two or three decades from today.

S. 1008 does not attempt to dictate a predetermined policy on climate change. Instead, the bill sets out a process by which the Administration must articulate a national strategy on climate change and seeks to ensure that the varied, ongoing efforts of the federal government are coordinated to best effect.

S. 1008 would create a new National Office of Climate Change Response (hereinafter “White House Office”) in the White House. The director would be appointed by the President with advice and consent by the Senate. Within one year of the bill’s enactment, the White House Office would have to produce a national strategy to address the problem of climate change. The strategy must accomplish four key tasks: (1) examine a range of emission mitigation targets and implementation dates that would ultimately stabilize greenhouse gas concentrations in the atmosphere in an economically and environmentally sound manner; (2) address the need for substantially greater private and public investment in innovative,

<sup>1</sup>Remarks of Sen. Robert C. Byrd of West Virginia, Congressional Record, June 8, 2001, at S 6002.

<sup>2</sup>Remarks of Sen. Ted Stevens of Alaska, Congressional Record, June 8, 2001, at S 6003.

next-generation technologies; (3) expand research into climate adaptation; and (4) expand research so as to resolve the remaining scientific and economic uncertainties regarding climate change.

S. 1008 builds on the work of the 1992 United Nations Framework Convention on Climate Change, which established the goal of stabilizing the concentration of greenhouse gases in the atmosphere “at a level that would prevent dangerous anthropogenic interference with the climate system.” The United States has already committed to this goal and S. 1008 accepts it as the focus of a national strategy on climate change. However, the legislation does not dictate precisely what this level is nor prescribe any specific steps that must be taken to achieve stabilization; it only anticipates that the strategy will achieve its objective in an economically and environmentally sound manner. The strategy, and progress toward meeting its goals, would be monitored by an independent review board of experts.

Another critical portion of the bill would boost dramatically the government’s efforts to promote breakthrough technologies that can help reduce or contain greenhouse gas emissions over the long term. The Department of Energy (“DOE”) currently has four line offices for energy research and development: fossil fuels, efficiency and renewables, nuclear energy and basic science. S. 1008 would add a fifth: the Office of Climate Change Technology (“OCCT”). This office would be charged with focusing on innovative technologies that will be needed in future decades, yet that cut across the jurisdictions of the existing research offices. The bill authorizes \$4 billion over 10 years for this office, which is designed to supplement, rather than supplant, the existing research and development efforts within DOE and other agencies. As Senator Stevens stated at the July 18 hearing, “By making necessary research and development efforts now, I think we can inspire a generation of technologies that will enhance America’s chance to be the leader in dealing with global climate change.”

Within the OCCT would be a Center for Strategic Climate Change Response. This Center would provide technical support to the newly created White House Office and is authorized at \$75 million annually. More broadly, it is intended to serve as an innovative think tank on climate change issues, with an interdisciplinary and multi-agency focus.

Finally, Senator Byrd remarked when introducing S.1008, “[t]his legislation is intended to supplement, rather than replace, other complementary proposals to deal with climate change in the near term on both a national and international level.”<sup>3</sup> The Committee recognizes that Congress is currently considering a wide range of additional measures to counter climate change. New initiatives on climate change need not wait for formulation of the national strategy contemplated by S.1008, but should ultimately fit within its framework as components of the overall strategy.

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<sup>3</sup>Statement of Sen. Robert C. Byrd of West Virginia, Congressional Record, June 8, 2001, at S 6001.

## II. BACKGROUND

### THE PROBLEM OF GLOBAL WARMING

Global warming is one of the most complex and comprehensive environmental, economic, scientific, and technical challenges facing the world today. The warming of the global climate within the last century is most likely caused by a number of anthropogenic factors, the precise interplay of which is not yet fully understood.

Despite the continued existence of uncertainties, however, a scientific consensus is coalescing regarding the existence of human-caused climate change. In particular, there is growing agreement within the scientific community that concentrations of greenhouse gases are increasing in the atmosphere, primarily due to human activities, resulting in rising surface air temperatures and subsurface ocean temperatures.<sup>4</sup> Modelling and scientific reasoning also suggest that the changing climate will result in a number of additional negative effects on the planet, including rising sea levels, decreased precipitation in semi-arid regions and increased global frequency of extreme weather events.

A number of scientific studies and reports have been released recently that describe the state of the scientific understanding of climate change. In testimony before the Committee, Thomas Karl, Director of the National Oceanic and Atmospheric Administration's National Climatic Data Center, discussed the science of climate change (hereinafter "Karl testimony").<sup>5</sup> He based his information on two assessments, one carried out internationally, and one nationally. The Committee takes particular note of these two reports: (1) the 2001 Third Assessment Report of the Intergovernmental Panel on Climate Change ("IPCC");<sup>6</sup> and (2) "Climate Change Science; An Analysis of Some Key Questions," a National Academy of Sciences ("NAS") review of the topic, released in 2001 on the heels of the IPCC report and conducted at the request of the White House.<sup>7</sup> Mr. Karl served as a coordinating lead author and panel member on the IPCC and NAS studies, respectively.

### THE IPCC REPORT

The growing scientific consensus on climate change was recently enunciated in the Third Assessment Report of the Intergovernmental Panel on Climate Change. The IPCC was jointly established by the World Meteorological Organization and the United Nations Environment Programme in 1988 to (1) "assess available scientific and socio-economic information on climate change and its impacts and on the options for mitigating climate change and adapting to

<sup>4</sup>See Committee of the Science of Climate Change, Division on Earth and Life Studies, National Research Council, Climate Change Science; An Analysis of Some Key Questions, (2001) (Hereinafter "NAS Report") at 2 ("Human activities are responsible for the increase [in carbon dioxide concentrations].").

<sup>5</sup>Eileen Claussen, President of The Pew Center on Global Climate Change, testifying before the Committee, stated: "As we have recently learned from the Intergovernmental Panel on Climate Change (IPCC), confirmed recently by the National Academy of Sciences (NAS), the scientific consensus is very strong that greenhouse gases are accumulating in the Earth's atmosphere as a result of human activities, causing surface air temperatures and subsurface ocean temperatures to rise." Claussen written testimony at 1.

<sup>6</sup>Intergovernmental Panel on Climate Change, Climate Change 2001, The Scientific Basis, (2001). (Hereinafter "IPCC Report").

<sup>7</sup>Although actually conducted by the National Research Council, which is affiliated with the National Academy of Sciences, this study is known as the National Academy of Sciences or NAS report.



it” and (2) “provide, on request, scientific/technical/socio-economic advice to the Conference of Parties to the United Nations Framework Convention on Climate Change.”<sup>8</sup> Its Third Assessment Report on the scientific basis of climate change was the product of 122 expert scientists serving as lead authors, with assistance from 515 contributing authors. The draft report was submitted to 420 expert reviewers for comment.<sup>9</sup> James Hansen, Head of the NASA Goddard Institute for Space Studies, testified before the Committee: “The IPCC reports produced by hundreds of outstanding scientists, provide an invaluable assessment of the status of scientific understanding of climate change.”<sup>10</sup>

Using observational data from around the world, the IPCC determined that the information illustrated a “collective picture of a warming world.”<sup>11</sup> Specifically, the IPCC based its conclusion on the following data:

- Increases of 0.7 to 1.4 degrees Fahrenheit in land and sea surface temperatures over the past century.
- Weather balloon measurements showing that lower-tropospheric temperatures have been increasing since 1958.
- Decreases in the continental diurnal temperature range that coincide with increases in cloud amount, precipitation, and increases in total water vapor.
- Decreases in mountain glaciers and ice masses nearly worldwide that are consistent with surface temperature increases.
- Decreases in snow cover and shortened seasons of lake and river ice that relate well to increases in Northern Hemisphere surface temperatures.
- The systematic decrease of spring and summer sea-ice extent and thickness in the Arctic that is consistent with increases in temperature over most of the adjacent land and ocean.
- Increases in ocean heat and sea level.
- Increases in total tropospheric water vapor in the last 25 years.<sup>12</sup>

Having evidence of a picture of a warming world, the IPCC also identified its likely cause, finding that “[t]here is new and stronger evidence that most of the warming over the last 50 years is attributable to human activities.”<sup>13</sup> A range of human-caused forcing agents were identified, as indicated in Figure 9 from the IPCC’s technical summary, reproduced here:

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<sup>8</sup>IPCC Report at ii.

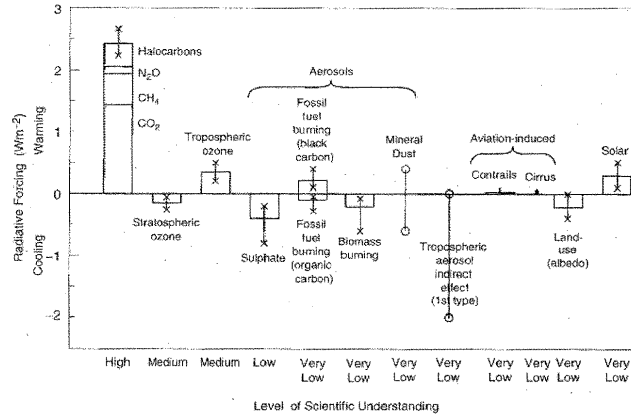
<sup>9</sup>IPCC Report at iii.

<sup>10</sup>Hansen written testimony at 1.

<sup>11</sup>Intergovernmental Panel on Climate Change, “Technical Summary of the Working Group I Report,” contained in *Climate Change 2001, The Scientific Basis*, at 34 (2001). (Hereinafter “IPCC Technical Summary”); See Karl written testimony at 3.

<sup>12</sup>IPCC Technical Summary at 34.

<sup>13</sup>Intergovernmental Panel on Climate Change, “Summary for Policy Makers,” contained in IPCC Report at 10; See Karl written testimony at 4.



In particular, the report identified human-released greenhouse gases such as carbon dioxide, methane, nitrous oxide, and halocarbons as responsible for a majority of the problem; the report noted that the effects of these gases were understood with a high level of scientific understanding.<sup>14</sup> The IPCC also identified other possible forcing agents, such as aerosols like black carbon or soot (a warming agent) and sulphate aerosols (a cooling agent). The IPCC summary chart reproduced here characterized the level of scientific understanding regarding these other agents as “low” or “very low.”<sup>15</sup>

The IPCC found that the levels of the chief greenhouse gases have significantly increased due to human activities. As Table 1 from the IPCC’s technical summary indicates, the level of carbon dioxide has risen about 30 percent from preindustrial levels, the level of methane has risen about 150 percent, the level of nitrous oxide has risen about 16 percent, and the levels of some halocarbons have risen from zero to significant amounts.

Table 1: Examples of greenhouse gases that are affected by human activities. (Based upon Chapter 3 and Table 4.1)

	CO <sub>2</sub> (Carbon Dioxide)	CH <sub>4</sub> (Methane)	N <sub>2</sub> O (Nitrous Oxide)	CFC-11 (Chlorofluoro- carbon-11)	HFC-23 (Hydrofluoro- carbon-23)	CF <sub>4</sub> (Perfluoro- methane)
Pre-industrial concentration	about 280 ppm	about 700 ppb	about 270 ppb	zero	zero	40 ppt
Concentration in 1998	365 ppm	1745 ppb	314 ppb	268 ppt	14 ppt	80 ppt
Rate of concentration change <sup>a</sup>	1.5 ppm/yr <sup>a</sup>	7.0 ppb/yr <sup>a</sup>	0.8 ppb/yr	-1.4 ppt/yr	0.55 ppt/yr	1 ppt/yr
Atmospheric lifetime	5 to 200 yr <sup>c</sup>	12 yr <sup>d</sup>	114 yr <sup>d</sup>	45 yr	260 yr	>50,000 yr

<sup>a</sup> Rate has fluctuated between 0.9 ppm/yr and 2.8 ppm/yr for CO<sub>2</sub> and between 0 and 13 ppb/yr for CH<sub>4</sub> over the period 1980 to 1999.

<sup>b</sup> Rate is calculated over the period 1990 to 1999.

<sup>c</sup> No single lifetime can be defined for CO<sub>2</sub> because of the different rates of uptake by different removal processes.

<sup>d</sup> This lifetime has been defined as an “adjustment time” that takes into account the indirect effect of the gas on its own residence time.

Table 1 also indicates the long period of time many greenhouse gases remain in the atmosphere, a factor the IPCC believed to be “highly policy relevant.”<sup>16</sup> The IPCC stated that “emissions of a greenhouse gas that has a long atmospheric residence time is a quasi-irreversible commitment to sustained radiative forcing over decades, centuries, or millennia, before natural processes can remove the quantities emitted.”<sup>17</sup>

<sup>14</sup> IPCC Technical Summary at 37 (Figure 9).

<sup>15</sup> IPCC Technical Summary at 37 (Figure 9).

<sup>16</sup> IPCC Technical Summary at 38.

<sup>17</sup> IPCC Technical Summary at 38; See Karl written testimony at 4–5.

Additionally, the IPCC found that the Earth's climate would continue to warm. Based on the analysis of 35 alternative scenarios for the future, the IPCC determined that global average temperature is projected to rise between 1.4 and 5.8 degrees Celsius by 2100, with greater warming in particular areas, such as the northern regions of North America and northern and central Asia.<sup>18</sup> Mr. Karl testified that regardless of uncertainties, "such a projected rate of warming would be much larger than the observed 20th century changes and would very likely be without precedent during the last 10,000 years."<sup>19</sup> Among other effects, such warming would likely make precipitation more variable, increase the incidence of extreme weather events, possibly weaken ocean circulation, increase sea level by 4 to 35 feet, and decrease levels of snow cover and sea ice in the Northern Hemisphere.<sup>20</sup>

#### THE NATIONAL ACADEMY OF SCIENCES ("NAS") REPORT

Following the initial release of the IPCC's findings, the White House requested an independent review of the science of climate change from the NAS. In particular, Administration officials requested the NAS' assistance in "identifying the areas in the science of climate where there are the greatest certainties and uncertainties" and the NAS' views on "whether there are any substantive differences between the IPCC reports and the IPCC summaries."<sup>21</sup>

The resulting NAS report largely confirmed the findings of the IPCC. In particular, the NAS stated "[t]he IPCC's conclusion that most of the observed warming of the last 50 years is likely to have been due to the increase in greenhouse gas concentrations accurately reflects the current thinking of the scientific community on this issue."<sup>22</sup> Moreover, the NAS observed that, "[d]espite the uncertainties, there is general agreement that the observed warming is real and particularly strong in the past 20 years."<sup>23</sup>

The NAS also identified carbon dioxide, methane, ozone, nitrous oxide, and chlorofluorocarbons as the "most important" greenhouse

<sup>18</sup> IPCC Technical Summary at 67–69.

<sup>19</sup> Karl written testimony at 4.

<sup>20</sup> IPCC Technical Summary at 71–75; See Karl written testimony at 4.

<sup>21</sup> NAS Report, App. B. In subsequent discussions, White House officials identified the following series of specific questions, all of which were addressed in the NAS report:

- What is the range of natural variability in climate?
- Are concentrations of greenhouse gases and other emissions that contribute to climate change increasing at an accelerating rate, and are different greenhouse gases and other emissions increasing at different rates?
- How long does it take to reduce the buildup of greenhouse gases and other emissions that contribute to climate change?
- What other emissions are contributing factors to climate change (e.g., aerosols, CO, black carbon soot), and what is their relative contribution to climate change?
- Do different greenhouse gases and other emissions have different draw down periods?
- Are greenhouse gases causing climate change?
- Is climate change occurring? If so, how?
- Is human activity the cause of increased concentrations of greenhouse gases and other emissions that contribute to climate change?
- How much of the expected climate change is the consequence of climate feedback processes (e.g., water vapor, clouds, snow packs)?
- By how much will temperatures change over the next 100 years and where?
- What will be the consequences (e.g., extreme weather, health effects) of increases of various magnitudes?
- Has science determined whether there is a "safe" level of concentration of greenhouse gases?
- What are the substantive differences between the IPCC Reports and the Summaries?
- What are the specific areas of science that need to be studied further, in order of priority, to advance our understanding of climate change?

NAS Report at vii.

<sup>22</sup> NAS Report at 3.

<sup>23</sup> NAS Report at 3.

gases.<sup>24</sup> In particular, the NAS stated that carbon dioxide was “probably the most important climate forcing agent today,” with an effect approximately equal to all other greenhouse gases.<sup>25</sup> The NAS also observed that methane carried an effect at least one-third—and possibly one-half—as large as the effect of carbon dioxide.<sup>26</sup>

The NAS also expressed concern that sulphate aerosols, which appear to perform a cooling function by scattering solar radiation back to space, would decrease in the future due to clean air regulation and thereby exacerbate the warming trend.<sup>27</sup> The NAS expressed hope that any warming effect caused by a decrease in sulphates might be at least partially offset by simultaneous reductions in black carbon aerosols (a possible warming agent).<sup>28</sup> The NAS stated, however, that the “relative importance” of black carbon aerosols is “difficult to quantify at this point” due to uncertainty.<sup>29</sup>

With regard to the White House’s questions regarding the quality of the IPCC summaries, the NAS found that “the full IPCC Working Group I . . . report is an admirable summary of research activities in climate science, and the full report is adequately summarized in the Technical Summary.”<sup>30</sup>

### III. DISCUSSION OF LEGISLATION

Given the importance and complexity of global climate change, the federal government needs an aggressive and comprehensive strategy to address the problem. S.1008 would provide that central direction by creating an office on climate change in the White House which would be charged with crafting a national strategy on climate change. The bill would also provide the structure and funding for a dramatic new focus on breakthrough energy technologies to combat global warming.

#### WHITE HOUSE OFFICE

Climate change is not a new issue for the federal government. Programs to combat climate change can be found in nearly every Cabinet-level department or agency in the Executive Branch. According to a recent report to Congress from the White House, the Executive Branch spent about \$3.5 billion on climate programs in Fiscal Year 2000 and was estimated to spend about \$3.9 billion in Fiscal Year 2001.<sup>31</sup>

Even so, the federal government lacks a central office to coordinate these disparate and varied efforts and provide an overarching agenda for the government as a whole. Instead, various agencies have defined their own missions with respect to climate change. Energy production is the largest source of greenhouse gas emissions, and the DOE conducts the lion’s share of federal research on

<sup>24</sup> NAS Report at 2.

<sup>25</sup> NAS Report at 12–13.

<sup>26</sup> See NAS Report at 13.

<sup>27</sup> See NAS Report at 13.

<sup>28</sup> See NAS Report at 13–14.

<sup>29</sup> NAS Report at 2–3.

<sup>30</sup> NAS Report at 4–5.

<sup>31</sup> See Federal Climate Change Expenditures Report To Congress, June 2001 (transmitted to Congress from the White House on June 29, 2001 in accordance with section 566(b) of the Foreign Operations, Export, Financing, and Related Programs Appropriations Act of 2001, PL 106–429), Table 1, p. 3.

technologies that can reduce such emissions. These efforts include ongoing research and development of renewable energy, conservation, nuclear energy and cleaner-burning technologies for fossil fuels. The DOE, however, is hardly the only player in the climate change field. For instance, DOE is working jointly with the Environmental Protection Agency (EPA), the Department of Transportation, the Department of Commerce and the National Science Foundation to develop vehicles that will emit fewer greenhouse gases, such as hybrid and fuel cell vehicles (the Partnership for a New Generation of Vehicles). The Department of Agriculture has research programs to promote converting biomass to energy. EPA, working collaboratively with the Department of Agriculture, has programs to research and promote carbon sequestration (efforts to store carbon in the soil or vegetation to prevent its release into the atmosphere). Ten different agencies, including the National Aeronautics and Space Agency, are involved with the U.S. Global Change Research Program, which seeks to provide a sound scientific understanding of the human and natural forces that influence our climate system.<sup>32</sup>

While each agency has valuable expertise to bring to bear on the climate change issue, this decentralized approach also has drawbacks. There is no overarching framework to ensure that various federal agencies are complementing each other's efforts on climate change, and that critical tasks are not falling between the cracks, ignored by all agencies. As Eileen Claussen, President of the Pew Center on Global Climate Change, testified at the Committee's July 18 hearing on S.1008:

This is a monster of an issue and everyone has a legitimate reason to be involved across the government for variety of different reasons. If you do not have a way to focus the effort and coordinate the effort, you just have everybody doing their own thing based on their own set of objectives and the culture of their own agency. You do not have a coherent policy, and it is extremely hard to do, but I think you have to center it in the White House and you have to put some real effort into making it work.

Currently, there is no specific White House office to address climate change. Rather, policy components of climate change are addressed to some extent by the existing White House Office of Science and Technology Policy (OSTP), the Council on Environmental Quality (CEQ) and the Council of Economic Advisors (CEA).<sup>33</sup>

S. 1008 would address this problem by creating a new National Office of Climate Change Response in the White House. The director would be appointed by the President with advice and consent by the Senate. The office would prepare a national climate change response strategy (discussed below), to be reviewed annually and thoroughly updated every two years. The bill would also establish an interagency task force on climate change response, to be chaired

<sup>32</sup>"U.S. Government Agencies Participating in the USGCRP," found at <http://www.usgcrp.gov/usgcrp/usagency.html>.

<sup>33</sup>In April 1997, President Clinton administratively created a White House task force on climate change, but the task force was disbanded at the conclusion of the Clinton administration.

by the director of the White House climate change office. The bill authorizes \$5 million annually for ten years for this office.

The White House Office is similar in concept and structure to the Office of National Drug Control Policy.<sup>34</sup> Just as the drug “czar” has brought a new visibility to the drug issue generally and the specific policy approach of successive administrations, the director of the climate change office should provide a symbolic and substantive focal point for each administration’s efforts on climate. The director will give the administration an identifiable point person on this critical issue, one with international visibility that will signal the depth of this country’s commitment to tackling climate change.

By creating a new office, S. 1008 also ensures that efforts on climate change receive consistent and high-level attention, and are not subsumed by, or redirected to, other existing White House offices. Without a single-minded focus on the topic, the risk exists that climate change may not receive the attention or resources it needs at already-existing offices, such as CEQ or OSTP. Furthermore, a separate White House office is essential because no existing office has expertise in the many disciplines that are involved in as multifaceted an issue as climate change.

The White House Office should draw heavily upon the assembled expertise of existing federal programs, represented by the inter-agency task force mandated by S.1008. This task force would, at a minimum, include representatives from the following departments or agencies: State, Energy, Commerce, Treasury, Transportation, Agriculture, Environmental Protection Agency, Agency for International Development, U.S. Trade Representative, National Security Advisor, National Economic Council, Council on Environmental Quality, Office of Science and Technology Policy, and the Chairperson of the Subcommittee on Global Change Research. The inter-agency task force should be a meaningful forum for member agencies to contribute to the preparation of the national climate change response strategy and associated reports.

#### NATIONAL STRATEGY

S. 1008 also provides the White House Office with the key mission of preparing a national strategy on climate change with certain substantive elements. As Dale Heydlauff, Senior Vice President for Environmental Affairs of American Electric Power Co., testified at the July 18 hearing, “an administrative structure without a strategy is nothing more than a suite of offices in search of a mission.”

Within one year of the bill’s enactment, the White House Office must produce a national strategy that will achieve the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, as contemplated by the United Nations Framework Convention on Climate Change, done at New York on May 9, 1992.” Specifically, the strategy must include four key elements

<sup>34</sup>The drug control office was created in 1988 and is responsible for establishing policies, objectives and priorities for the national drug control program, and for writing an annual drug control strategy to be submitted to Congress. This White House office provides a central, coordinating presence for the federal government’s many efforts involving drug control—efforts spread across dozens of federal offices, such as the Federal Bureau of Intelligence, the Drug Enforcement Agency, the Immigration and Naturalization Service, Customs, and the Coast Guard.

identified in S. 1008: (1) an examination of a range of emission mitigation targets and implementation dates that would ultimately stabilize greenhouse gas concentrations in the atmosphere in an economically and environmentally sound manner; (2) substantially greater private and public investment in bold technologies; (3) expanded research into climate adaptation; and (4) expanded research to resolve remaining scientific and economic uncertainties regarding climate change.

The United Nations Framework Convention on Climate Change (commonly known as the “Rio Agreement”) was signed on behalf of the United States during the administration of former President George H. W. Bush on June 12, 1992, and ratified by the United States Senate on October 15, 1992. The ultimate objective of the Rio Agreement, as noted above, is the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.” The Rio Agreement also stated in part that “the Parties to the Convention are to implement policies with the aim of returning \* \* \* to their 1990 levels anthropogenic emissions of carbon dioxide and other greenhouse gases.” The Rio Agreement specifies that designated “level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.”<sup>35</sup>

By incorporating this language from the Rio Agreement as the overall objective of the national strategy, S. 1008 ensures that the United States will live up to the commitment it made when it ratified the Rio Agreement nearly a decade ago. S. 1008, however, does not predetermine what level of atmospheric concentration is necessary to prevent dangerous anthropogenic interference with the climate system. Rather, it leaves the determination of the preferred level to the White House Office. In fact, the Committee anticipates that the White House Office may initially wish to look at a range of stabilization levels.

As soon as possible, however, the White House Office should identify a single stabilization level that will prevent dangerous anthropogenic interference with the climate system. The White House Office should report to Congress on how the level represents a specific concentration of greenhouse gases that can be maintained safely over prolonged periods (on the scale of many centuries) without resulting in changes to the climate system that have dangerous or adverse consequences for human health and welfare, for the stability and productivity of agriculture, forestry, and other human systems that interact with the climate, or for the integrity of ecological systems. The identification of a stabilization level also should take into account the finding by the United States Global Climate Research Program, an interagency climate research team, that “climate change will likely magnify the cumulative impacts of other stresses, such as air and water pollution and habitat destruction due to human development patterns.”<sup>36</sup>

The Committee intends that the stabilization level will account for the combined effect of all greenhouse gases referred to in the

<sup>35</sup> United Nations Framework Convention on Climate Change, Article 2.

<sup>36</sup> U.S. Global Climate Change Research Program, Climate Change Impacts on the United States 9 (2000).

proposed Section 1621(6) of the Energy Policy Act (EPACT) and will be expressed in terms of a number of parts per million of carbon dioxide equivalent. The level identified by the Director should reflect consideration of the long atmospheric lifetime of most greenhouse gases and the difficulty of returning to a given carbon dioxide equivalent concentration once such concentration has been exceeded. The level should further reflect consideration of the lag between the time when such level is reached and the time when associated effects (e.g., global average temperature increase; sea level rise; and impacts on public health, ecosystems, wildlife, fisheries, water supplies, and agriculture) are fully manifested. In planning a course of action on greenhouse gases, the strategy should take into account not only an ultimate concentration level that is safe, but also what interim levels reflect a safe rate of change for ecosystems. Finally, the Director should establish a process by which the stabilization goal can be updated, either upward or downward, to reflect progress in our scientific understanding of climate change.

Once the White House Office has identified a stabilization level that will prevent dangerous anthropogenic interference with the climate system, it must consider a range of interim targets and timetables for reductions of emissions that would result in that overall stabilization level. The White House Office should prioritize the development of mitigation targets for the greenhouse gases that were identified by the IPCC and NAS as key warming agents and which have long, irreversible residence times in the atmosphere.<sup>37</sup>

At the same time, the strategy should also specify how the government should resolve the remaining uncertainties regarding climate change. In particular, the Committee believes that research should focus on issues such as those identified by the NAS in the following excerpt from its report:

Predictions of global climate change will require major advances in understanding and modeling of (1) the factors that determine atmospheric concentrations of greenhouse gases and aerosols and (2) the so-called “feedbacks” that determine the sensitivity of the climate system to a prescribed increase in greenhouse gases. Specifically, this will involve reducing uncertainty regarding: (a) future usage of fossil fuels, (b) future emissions of methane, (c) the fraction of the future fossil fuel carbon that will remain in the atmosphere and provide radiative forcing versus exchange with the oceans or net exchange with the land biosphere, (d) the feedbacks in the climate system that determine both the magnitude of the change and the rate of energy uptake by the oceans, which together determine the magnitude and time history of the temperature increases for a given radiative forcing, (e) the details of the regional and local climate change consequent to an overall level of global climate change, (f) the nature and causes of the natural variability of climate and its interactions with forced changes, and (g) the direct and indirect effects of the changing distributions of aerosol.<sup>38</sup>

<sup>37</sup> See IPCC Technical Summary at 36–43; NAS report at 2, 12–14.

<sup>38</sup> NAS Report at 23.



In developing the national strategy, the White House Office should also consider the impacts that may occur or may have already occurred in certain sectors and regions of the United States due to climate change. This is an issue that is often overshadowed when considering climate change but is of vital concern to affected areas. Therefore, it is critical to pursue climate adaptation research as well as economically and environmentally sound options to assist specific regions or sectors that are vulnerable to, or may have been particularly affected by, climate change.

The Committee intends that the White House Office, when developing the strategy, draw upon the analytical capabilities of federal and state agencies with relevant expertise. S. 1008 would create the Center for Climate Change Response within DOE to be one source of analytical support. The White House Office shall also draw upon the resources of other agencies. For example, the Committee expects that the White House Office would make use of the Environmental Protection Agency's analytical expertise in: monitoring U.S. greenhouse gas emissions; implementing voluntary, regulatory, and market based programs including emissions trading; evaluating climate change science; and assessing the environmental and economic impacts of strategies to mitigate environmental threats. Additionally, the Committee urges the White House Office to incorporate the Department of Transportation's expertise in assessing the potential for emission reductions from the transportation sector; the Department of Agriculture's analytical expertise in assessing the potential for carbon sequestration by the agricultural and forestry sectors; and the expertise of the inter-agency United States Global Climate Research Program on climate science.

#### INDEPENDENT REVIEW BOARD

S. 1008 would create an independent review board of 11 scientific and technical experts to oversee the work of the executive branch in developing and implementing the climate change strategy. Board members would be nominated by the NAS, and appointed by the President with advice and consent by the Senate. The review board would be charged with providing Congress and the public with independent and accurate annual reports of the work of the executive branch on climate change. The structure of the proposed board would resemble that of the U.S. Nuclear Waste Technical Review Board, which Congress created in 1987 to review federal scientific and technical work regarding the disposal of spent nuclear fuel from the nation's commercial reactors. The proposed review board is authorized to receive \$3 million annually.

The Committee intends that the independent review board help to ensure that the strategy produced by the White House Office has scientific credibility. The Committee anticipates the review board should consist of neutral experts with no role in the political structure of the Executive Branch. This approach should help ensure that the United States' national strategy on climate change retains continuity and credibility irrespective of any periodic political shifts in power.

In establishing the review board, the Committee expects that the NAS will secure experts with a broad array of expertise, given the vast interdisciplinary nature of the climate question. In particular,

the NAS should, at a minimum, seek experts to cover the relevant “fields of knowledge,” as defined in S. 1008.

#### CREATION OF OFFICE OF CLIMATE CHANGE TECHNOLOGY

There is widespread agreement that new technologies are essential if this country is to reduce greenhouse gas emissions. At the July 18 hearing on S.1008, witnesses voiced strong support for devoting additional money and attention toward the research and development of breakthrough technologies to curb emissions. As James E. Edmonds of Battelle Memorial Institute testified, technology is the key to controlling the cost of efforts to stabilize atmospheric concentrations of greenhouse gases: “Stabilizing the concentration of greenhouse gases in the atmosphere will require a credible commitment to limit cumulative global emissions of CO<sub>2</sub>. Such a limit is unlikely to be achieved without cost, but that cost will, in large measure, be shaped by the character of the technology options available to limit cumulative global emissions of CO<sub>2</sub>.”<sup>39</sup>

According to the findings of the Global Energy Strategy Program, an international public-private study group, technological breakthroughs can reduce the annual cost of stabilizing greenhouse gas concentrations by at least one to two percent of global world product.<sup>40</sup> Professor John Holdren of Harvard University agreed with the importance of new technologies in his July 18 written testimony, which called for transformative changes in energy systems—“changes that can only be achieved in a timely way and at tolerable cost through a substantial acceleration of the pace of energy-technology innovation.”<sup>41</sup>

Technology can both reduce the amount of energy needed to produce something of economic value, and lower the amount of greenhouse gases emitted for each unit of energy produced. The country needs both types of technological innovations if it is to confront the problem of climate change. In fact, the IPCC assumes there will be some technological improvements merely to maintain the current pace of growth in greenhouse gas concentrations rather than face a dramatic escalation.<sup>42</sup> In order to actually stabilize greenhouse gas concentrations, dramatic technological breakthroughs are needed. In seeking these breakthroughs, this legislation does not seek to preclude the use of fossil fuels as an energy source. Rather, the focus is to channel resources into developing the next generation of technologies to reduce greenhouse gas emissions, thereby augmenting our existing energy infrastructure and ensuring our energy diversity.

The development of breakthrough technologies also holds the promise of significant market opportunities for U.S. industries. Energy consumption is projected to soar, primarily in developing countries, in the coming decades.<sup>43</sup> In the next decade, many countries will restructure their energy systems and “lock in” certain policies and technologies. If those systems do not incorporate new efficiencies, it will be nearly impossible to stabilize greenhouse gas

<sup>39</sup>Edmonds written testimony at 3.

<sup>40</sup>Global Energy Technology Strategy; Addressing Climate Change at 54 (2001) (Hereinafter “Global Energy Technology Strategy”).

<sup>41</sup>Holdren written testimony at 2.

<sup>42</sup>Global Energy Technology Strategy at 29.

<sup>43</sup>Global Energy Technology Strategy at 21–27.

concentrations as contemplated by the Rio Agreement. Helping to supply new energy technologies, therefore, is critical toward achieving the goals of the Rio Agreement. Moreover, by working to develop energy efficient technologies, U.S. industries will share in the market opportunities that follow.

Yet, U.S. investment in research and development of advanced energy technologies—both public and private—has been declining rather than increasing.<sup>44</sup> Even more worrisome, this trend is apparently echoed around the globe. Neither the United States nor its allies are conducting this critical investment. This raises the very real fear that the breakthrough technologies that the U.S. and other countries will need to stabilize greenhouse gas emissions will not be developed in the timeframe necessary to address this urgent problem.

Dale Heydlauff, Senior Vice-President for Environmental Affairs at American Electric Power, testified at the July 18 hearing that private industry cannot and will not provide the funding needed for these breakthrough technologies because the commercial returns are too far distant: “One simply cannot afford to spend limited capital to achieve emissions reductions from existing technology and simultaneously develop the bold, breakthrough technologies needed to stabilize atmospheric concentrations of greenhouse gases.” The investment calculations of private industry also do not capture all the public benefits of such technologies, including reduced pollution and decreased reliance on foreign oil. Heydlauff acknowledged that private industry must also do more, however, and said collaborative, cost-shared research initiatives should be developed as some of the technologies move closer to commercialization.<sup>45</sup>

Though many agencies are involved in research concerning climate change and greenhouse gases, most of the advanced technology development in this area is taking place at DOE. DOE currently has four line offices for research and development: fossil fuels, efficiency and renewables, nuclear energy and basic science. S. 1008 would add a fifth: the Office of Climate Change Technology (“OCCT”).

All of the existing line offices conduct research that may be relevant to climate change. However, the work of each is subject to certain structural constraints; specifically, they tend to focus on one fuel source (e.g. fossil fuels, or wind energy) and often are tilted toward near-term, incremental improvements. The bill does not seek to supplant such work, but rather to supplement it with an intensive new effort on breakthrough, perhaps interdisciplinary, technologies that may not be viable for many years. While it is impossible to know exactly what these breakthrough technologies will look like, concepts do exist that merit exploration. One such innovation would be a so-called “photocatalytic” system that could extract the hydrogen atoms from tap water for use in a backyard fuel cell to provide electricity for a home. Such a system would generate no carbon dioxide. Another example would be a facility that could convert biomass to energy, and capture and sequester the resulting carbon dioxide emissions. Such a facility would actually consume

<sup>44</sup> Global Energy Technology Strategy at 49, indicating that U.S. government spending on energy research and development dropped 23 percent from 1985–1998 and that private sector investment in energy research and development dropped 67 percent in real terms over this period.

<sup>45</sup> See Heydlauff written testimony at 5.

carbon dioxide, since biomass absorbs carbon dioxide as it grows. To some extent, the work of the new office will consist of building partnerships between existing DOE programs on basic science and those on applied technologies.

The new office would be “fuel neutral,” without an institutional bias toward any one energy source. The Committee intends the office to focus on the most promising technologies, and foster collaborative research among existing offices in DOE and elsewhere. It should conduct use-directed basic research that bridges the widely acknowledged “valley of death” between traditional basic science and applied programs that could otherwise hinder the development of greenhouse gas management technologies.

The bill authorizes \$4 billion over 10 years for this office to pursue breakthrough technologies to reduce or capture greenhouse gas emissions. This is a significant infusion of new resources, roughly doubling the current effort on advanced energy technologies. Even so, the spending authorized by the bill falls short of some recommendations. As Professor Holdren indicated in his written testimony to the Committee, the President’s Committee of Advisors on Science and Technology (PCAST) urged even larger increases in energy R&D. As early as 1997, PCAST was urging an increase of \$1 billion per year in the Department of Energy’s budget for research and development of applied energy technologies.<sup>46</sup>

S. 1008 establishes a Center for Strategic Climate Change Response (the “Center”) within the new OCCT. The Center would function as a climate change “think tank” to promote the development of advanced climate change technologies and key climate change programs across the federal government.<sup>47</sup> The Committee intends that the Center will provide technical support to the White House Office in preparing the national climate change response strategy. As such, it should maintain core analytical abilities, track progress toward the ultimate goal of stabilizing atmospheric greenhouse gas concentrations, and advance the tools and science for understanding climate change. The Center’s activities should include integrated, inter-disciplinary research on climate change issues; a wide engagement with national and international stakeholders; and education and information-sharing throughout the public and private sectors.

The overall goal of the Center is integration of a wide range of innovative scientific and technological research, including economic and social research that enables exploration and development of sustainable responses to the challenge of climate change. Its research should address both climate change mitigation and adaptation policy objectives with a particular emphasis on integrated assessments. Both domestic and international concerns should also be addressed. The Center should play a key role in analyzing and investigating the potential of flexible, market-based mechanisms to

<sup>46</sup> President’s Committee of Advisors on Science and Technology, Federal Energy Research and Development for the Challenges of the 21st Century (1997), found at <http://www.ostp.gov/energy/index.html>.

<sup>47</sup> The Center would bear some similarity to the newly created Tyndall Centre in the United Kingdom. The UK Government created the Tyndall Centre to integrate scientific, social and technological research to develop a response to global climate change. In spring of 2000, a consortium of universities, led by the University of East Anglia, won the competition to operate the new climate center.

reduce greenhouse gas emissions and aid in the transfer of clean energy technologies.

Although the Center would be under the organizational auspices of the OCCT, it should be considered a multi-agency resource whose responsibilities are not limited to the work of the DOE, or even to the OCCT. The Center would involve other federal and state agencies, academic institutions, industrial partners and the DOE National Laboratory capabilities in order to bring a focus to climate change solutions. If needed, the Center may establish project offices strategically positioned in various parts of the country.

#### IV. LEGISLATIVE HISTORY

S. 1008, “The Climate Change Strategy and Technology Innovation Act of 2001,” was introduced by Sen. Robert C. Byrd of West Virginia and Sen. Ted Stevens of Alaska on June 8, 2001 and referred to the Governmental Affairs Committee.

On July 18, 2001, the committee held a hearing on S. 1008. Eight witnesses appeared: the bill’s chief sponsor, Senator Robert C. Byrd of West Virginia; two leading climate scientists, Thomas Karl, Director of the National Climatic Data Center, and Dr. James E. Hansen, head of NASA’s Goddard Institute for Space Studies; Eileen Claussen, President of the Pew Center on Global Climate Change; Dr. James E. Edmonds, Senior Staff Scientist, Pacific Northwest National Laboratory, Battelle Memorial Institute; Dale E. Heydlauff, Senior Vice-President-Environmental Affairs for American Electric Power Company; Jonathan Lash, President of the World Resources Institute; and Margo Thorning, Senior Vice President and Chief Economist for the American Council for Capital Formation. In addition, the Committee received written testimony from Prof. John Holdren, director of a program on science, technology and public policy at Harvard University’s Kennedy School of Government, and David Hawkins, Director of the Climate Center of the Natural Resources Defense Council.

The testimony was strongly supportive of the legislation. For example, Mr. Heydlauff of American Electric Power—one of the largest greenhouse gas emitters in the United States—testified that S. 1008 “represents one of the single most important legislative initiatives yet introduced in the Congress to deal with climate change.”<sup>48</sup> Mr. Hawkins also supported the bill, stating that it “would take a significant positive step by creating a framework for the United States to develop a comprehensive program to combat global warming over the medium and long term.”<sup>49</sup> Ms. Claussen opined that S. 1008 “if enacted quickly and implemented in a serious manner, will provide an excellent foundation for climate change policy in this country.”<sup>50</sup> Finally, Ms. Thorning, whose testimony was critical of many other efforts to address climate change, stated that “progress on technology proposals such as those in S. 1008 \* \* \* is vitally important.”<sup>51</sup>

The Committee met on August 2, 2001, to consider S. 1008. Two amendments were adopted by voice vote.

<sup>48</sup> Heydlauff written testimony at 6.

<sup>49</sup> Hawkins written testimony at 2.

<sup>50</sup> Claussen written testimony at 4.

<sup>51</sup> Thorning written testimony at 2.

One amendment, offered by Senator Thompson, altered the definition of “greenhouse gas” in the bill to include aerosols that influence climate. Although aerosols are actually fine particles rather than “gases,” they were included in the definition of greenhouse gas to indicate that these particles can properly be considered in assessing climate change and designing a national climate change response strategy under the bill.

Aerosols may play a role in climate change and unquestionably pose other risks to human health. Senator Thompson stated at the August 2 business meeting that certain traditional pollutants that are aerosols—and specifically black soot—are not only contributing to global warming, but are also killing hundreds of thousands of children every year in developing countries. He noted that the Committee heard testimony about this problem from Dr. Hansen, a leading climate change scientist, who discussed studies not only about the climate-forcing effect of black soot, but about its serious mortality impact in the developing world. According to a study cited by Dr. Hansen, approximately 270,000 children die in India each year before reaching age five from particulate air pollution, including black soot. Dr. Hansen testified that pollution levels in China are comparably bad.<sup>52</sup> Senator Thompson noted that we have the technology to do something about black soot emissions right now.

A second amendment, offered by Senator Lieberman, renamed a proposed new research and development office within the Department of Energy. The office had originally been titled the “Office of Carbon Management,” but was renamed the “Office of Climate Change Technology” to reflect that its mission would encompass research and development of technologies to reduce emissions of all greenhouse gases, not only carbon dioxide.

On that same date, the Committee ordered the bill reported by voice vote, with no members present dissenting. Senators present were Levin, Akaka, Torricelli, Carper, Dayton, Thompson, Stevens, Collins, Cochran, and Lieberman.

## V. SECTION BY SECTION SUMMARY

### *Section 1. Short title*

This Act may be cited as the “Climate Change Strategy and Technology Innovation Act of 2001.”

### *Sections 2. and 3. Findings and purposes*

These sections detail the findings and purposes of the Act. Congress finds that there is mounting evidence that an increase of atmospheric greenhouse gas concentrations are contributing to global climate change, and that these emissions continue to increase despite the Rio Agreement—ratified by the U.S. Senate—which set a goal of stabilizing greenhouse gas concentrations at levels that will prevent dangerous human interference with climate. Congress further finds that the United States must define a new paradigm for addressing the risks posed by climate change. This paradigm recognizes four key elements: (1) emissions mitigation measures; (2) technology innovation; (3) climate adaptation research; and (4) ex-

<sup>52</sup> See Hansen written testimony at 4–5.

panded efforts to resolve the remaining scientific and economic uncertainty on climate change. Congress finds that such a paradigm would be scientifically supportable and economically responsible; would incorporate other critical energy, environmental, and other policy goals; and is fundamentally required if the U.S. is to meet the extraordinary challenge posed by climate change.

Some additional findings are as follows:

With respect to technology innovation, energy research and development—by both the public and private sectors—has declined precipitously and has not been focused in a comprehensive strategy to combat climate change. The Act seeks to reverse this trend and, more specifically, to focus new funding on the development of bold, breakthrough technologies with the potential to combat climate change.

Additionally, the international nature of climate change is integral to all four elements of the new strategy. This will require joint research programs and response strategies, assistance to developing countries and countries in transition to develop technical and other capacities to respond to climate change, and efforts to increase public awareness of the issue.

The overarching purpose of the legislation, described in Section 3, is the development of a “national focal point for climate change” through the establishment of the offices and procedures described in the legislation.

#### *Section 4. United States climate change response strategy and technology innovation*

This Act amends the Energy Policy Act (EPACT) of 1992 and creates Subtitle B, Title 16.

##### *Section 1621. Definitions*

This section defines some of the terms used in the act, including the following key definitions:

“Climate-friendly technology”—This phrase is defined to mean “any energy supply or end-use technology that, over the lifetime of the technology and compared to similar technology in commercial use \* \* \* results in reduced emissions of greenhouse gases; may substantially lower emissions of other pollutants; and may generate substantially smaller or less hazardous quantities of solid or liquid waste.” As reflected by the wording, a technology must result in lower greenhouse gas emissions to be considered “climate-friendly technology” under this bill. Additionally, it may lower emissions of other pollutants or generate smaller or less hazardous waste.

“Greenhouse gas”—The bill defines greenhouse gas first as an “anthropogenic gaseous constituent of the atmosphere (including, but not limited to, carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and tropospheric ozone) that absorbs and re-emits infrared radiation and influences climate.” The gases listed are simply known examples of greenhouse gases and the list does not exclude any other gas that meets the definition.

Secondly, the definition includes “an anthropogenic aerosol (including, but not limited to, black soot) that absorbs solar radiation and influences climate.” Although not actually “gases,” aerosols were included in the definition of greenhouse gas to indicate that

these particles should properly be considered in assessing climate change and designing a national climate change response strategy under the bill. To the extent that S. 1008 sets a goal of “stabilizing” greenhouse gas concentrations, the Committee does not intend to endorse a goal of stabilizing aerosols that cause adverse environmental and health effects. Instead, the Committee anticipates that the government will work to reduce or eliminate concentrations of such aerosols, rather than stabilizing them.

“Stabilization of greenhouse gas concentrations” means the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, as specified in the Rio Agreement. The Rio Agreement was signed by then-President Bush and ratified by the Senate. The bill does not specify what this level is, but the Committee intends that the national response strategy determine what this level should be and that such a determination be continually reevaluated and adapted in the course of new scientific knowledge.

“Qualified individual”—This definition specifies the types of persons who should be eligible for nomination and appointment to the independent technical review board. The description is meant to ensure that the board includes representatives with a broad array of analytical abilities and perspectives, and the Committee expects the National Academy of Sciences will consult with relevant technical associations or other groups to assemble a panel with the necessary breadth and depth and interdisciplinary capabilities.

*Section 1622. United States climate change response strategy*

This section initiates the development of a United States Climate Change Response Strategy that encompasses the four key elements—(1) emissions mitigation measures; (2) technology innovation; (3) climate adaptation research; and (4) expanded efforts to resolve the remaining scientific and economic uncertainty. The strategy should consider the totality of all public and private actions which bear upon the ultimate objective of stabilization of greenhouse gases. It should rely on objective, quantitative analysis considering energy, environmental, economic, and social factors in the creation of the strategy, with an appropriate consideration for uncertainties. Specifically, the strategy must be developed on the basis of a broad range of emission reduction targets and implementation dates, including those contemplated by the United Nations Framework Convention on Climate Change, that culminate in the stabilization of greenhouse gas concentrations.

Sections 1622(b)–(d) describe the reporting requirements of the act. The strategy is to be completed and submitted to the President and Congress within twelve months of the enactment of this Act. It must be updated every two years thereafter, and the President would make annual progress reports to Congress.

Section 1622(f) would require the directors of the DOE’s major national laboratories to certify each year whether the federal government’s energy technology research and development programs were on track to meet the directives of the national strategy and the long-term goal of stabilization of greenhouse gas concentrations in the atmosphere. If the directors provide a negative report, they



would be required to submit reasons for that determination and a prescribed course of action to correct the deficiencies.

*Section 1623. National Office of Climate Change Response*

This section establishes a National Office of Climate Change Response (“White House Office”) within the Executive Office of the President. The Director shall be appointed by the President with the advice and consent of the Senate. The Director shall be responsible for establishing policies, objectives, and priorities for a strategy to be submitted to the Congress and for ensuring that the strategy is sharply focused on the ultimate goal of stabilizing atmospheric greenhouse gas concentrations while giving full consideration to the short- and long-term economic and social consequences. The section authorizes \$5 million in new funding for each of the fiscal years 2002–2011 for the White House Office.

*Section 1624. Technology Innovation Program through the Office of Climate Change Technology and the Center for Strategic Climate Change Response*

Directly supporting the second element of the strategy, “technology innovation,” this section establishes an Office of Climate Change Technology (“OCCT”) within the DOE to manage a breakthrough technology research and development program. The DOE Office Director shall be appointed by the Secretary of Energy and shall report directly to the Under Secretary or a higher level official. The DOE Office Director shall place a special focus on climate-related technology research and development that—(1) makes bold, breakthrough advances on technologies critical to the long-term stabilization of greenhouse gas concentrations, which are not significantly addressed by other federal programs at this time; (2) forges fundamentally new research and development partnerships among various DOE programs, particularly between basic science and energy technology programs, which have significant potential to impact our ability to stabilize concentrations at a reduced cost; (3) encourages international research and development partnerships that are in the United States’ interests and make progress on stabilizing concentrations, and (4) makes available, through monitoring, experimentation, and analysis, data and information deemed essential to proving the technical and economic viability of technologies central to addressing climate change.

To help fulfill these functions, the DOE Office Director shall establish a Center for Strategic Climate Change Response (the “Center”). This Center shall maintain core analytical competencies that are necessary to support design of the strategy and track progress toward the ultimate goal of stabilizing atmospheric greenhouse gas concentrations. The Center shall advance the tools and science for understanding these implications and shall be considered a multi-agency resource.

The DOE Office Director shall advise the Secretary regarding necessary changes in organization, management, budgeting, and personnel allocation in the DOE programs involved in climate response activities, if their policies and discretionary programs are not well-aligned, or contributing effectively to, the long-term goal of stabilizing atmospheric greenhouse gas concentrations. The section requires DOE to submit to Congress a ten-year program plan

for the activities of the OCCT and authorizes \$4 billion in total funds for the period covering fiscal years 2002 through 2011 for “breakthrough” science and technology development. For the Center, this Act authorizes \$75 million in annual appropriations for fiscal years 2002 through 2011.

*Section 1625. Additional offices and activities*

This section establishes such additional offices and activities as are necessary to carry out the goals of the strategy. The Committee recognizes that many agencies have ongoing programs to assess or combat global climate change. This legislation is not intended to disrupt such activities; rather, the intent is to provide better coordination of existing activities on climate change and the means to recognize and fill any gaps in the current effort. This section recognizes that, in addition to the structural changes authorized at the DOE, the preparation or implementation of a national climate change response strategy may require the creation of new programs or offices in other agencies. At the same time, the Committee does not intend to sanction or encourage the creation of unnecessarily large or duplicative programs in other agencies.

*Section 1626. United States Climate Change Response Strategy Review Board*

This section establishes an independent, nonpartisan United States Climate Change Response Strategy Review Board comprised of 11 individuals representing a diverse set of scientific and technological disciplines. The NAS and technical societies representing the relevant disciplines shall provide a list of 22 candidate members of the Review Board to the President within 60 days of enactment of this Act. The President shall appoint 11 of these individuals to the Review Board with the advice and consent of the Senate. The Review Board is expected to play a prominent, nonpartisan, and independent role in reviewing the work of the National Office of Climate Change Response, the United States Climate Change Response Strategy, and the work of federal agencies in meeting commitments under the strategy. This Act authorizes \$3 million in new funding for each of the fiscal years 2002–2011 for the Review Board.

As described in Section 3 (“Purposes”) of the Act, the review board is charged with reviewing the strategy and annually assessing progress toward the goal of stabilization of greenhouse gas concentrations. The Board’s duties also include assessing the performance of each federal agency that has responsibilities under the strategy, as well as the adequacy of these agencies’ budgets to fulfill their responsibilities. The Committee notes that this is not meant to encourage or endorse a significant realignment of resources among agencies on the issue of climate change response, but rather to determine whether each agency is being properly funded to fulfill its agreed upon mission.

*Section 1627. Authorization of appropriations*

As detailed above, this Act authorizes a total of \$4,830,000,000 to remain available until September 30, 2011, which shall be considered in addition to existing energy research and development and scientific authorizations.

## VI. EVALUATION OF REGULATORY IMPACT

Paragraph 11(b)(1) of the Standing Rules of the Senate requires that each report accompanying a bill evaluate “the regulatory impact which would be incurred in carrying out this bill.”

The enactment of this legislation will not have significant regulatory impact.

## VII. CBO COST ESTIMATE

U.S. CONGRESS,  
CONGRESSIONAL BUDGET OFFICE,  
*Washington, DC, August 22, 2001.*

Hon. JOSEPH I. LIEBERMAN,  
*Chairman, Committee on Governmental Affairs,  
U.S. Senate, Washington, DC.*

DEAR MR. CHAIRMAN: The Congressional Budget Office has prepared the enclosed cost estimate for S. 1008, the Climate Change Strategy and Technology Innovation Act of 2001.

If you wish further details on this estimate, we will be pleased to provide them. The CBO staff contact is Lisa Cash Driskill.

Sincerely,

DAN L. CRIPPEN, *Director.*

Enclosure.

*S. 1008—Climate Change Strategy and Technology Innovation Act of 2001*

Summary: S. 1008 would authorize the appropriation of \$483 million a year over the 2002–2011 period for research, development, and other activities related to climate change. Specifically, it would establish two new offices within the Department of Energy to conduct research and development on climate change technology. It also would establish an office within the Executive Office of the President that would work with an interagency task force to create a strategy for the United States to manage climate change issues. Last, the bill would establish a review board to monitor the progress of the United States in meeting the goals of the strategy. Assuming appropriation of the authorized amounts, CBO estimates that implementing the bill would cost about \$2 billion over the 2002–2006 period.

According to the Office of Management and Budget, in fiscal year 2001, more than \$1.7 billion was appropriated for the United States Global Change Research Program (USGCRP), a multi-agency program that manages research and other activities related to climate change. Amounts authorized to be appropriated under S. 1008 would be in addition to any appropriations for the USGCRP.

The bill would not affect direct spending or receipts; therefore, pay-as-you-go procedures would not apply. It contains no intergovernmental or private-sector mandates as defined in the Unfunded Mandates Reform Act (UMRA) and would not affect the budgets of state, local, or tribal governments.

Estimated cost to the Federal Government: The estimated budgetary impact of S. 1008 is shown in the following table. The costs of this legislation fall within budget function 270 (energy).

	By fiscal year, in million of dollars—				
	2002	2003	2004	2005	2006
CHANGES IN SPENDING SUBJECT TO APPROPRIATION					
Authorization Level .....	483	483	483	483	483
Estimated Outlays .....	196	388	483	483	483

Basis of estimate: For this estimate, CBO assumes that S. 1008 will be enacted near the beginning of fiscal year 2002. Outlays are estimated using historical spending rates for similar programs.

S. 1008 would establish an Office of Climate Change Technology and a Center for Strategic Climate Change Response within the Department of Energy. The bill would authorize an annual appropriation of \$475 million over the 2002–2011 period for the two offices to carry out several responsibilities, including tracking climate change around the world, and managing a new research and development program focused on creating new technology to mitigate climate change. CBO estimates that implementing these programs would cost almost \$2 billion over the 2002–2006 period, and about \$4 billion over the 2002–2011 period.

S. 1008 also would establish and authorize appropriations for other offices related to climate change. Specifically, the bill would:

- Create a National Office of Climate Change Response within the Executive Office of the President and authorize the appropriation of \$5 million a year over the 2002–2011 period;
- Create a Climate Change Response Strategy Review Board and authorize the appropriation of \$3 million a year over the 2002–2011 period; and
- Establish an interagency task force to assist the National Office in developing the United States Climate Change Response Strategy.

CBO estimates that implementing these other programs would cost \$38 million over the 2002–2006 period and \$78 million over the 2002–2011 period.

Pay-as-you-go considerations: None.

Intergovernmental and private-sector impact: S. 1008 contains no intergovernmental or private-sector mandates as defined in UMRA and would not affect the budgets of State, local, or tribal governments.

Estimate prepared by: Federal costs: Lisa Cash Driskill; impact on State, local, and tribal governments: Elyse Goldman; impact on the private sector: Lauren Marks.

Estimate approved by: Peter H. Fontaine, Deputy Assistant Director for Budget Analysis.

## VIII. ADDITIONAL VIEWS

### ADDITIONAL VIEWS OF RANKING MEMBER FRED THOMPSON

While the Climate Change Strategy and Technology Innovation Act, S. 1008, passed the Committee with a bipartisan voice vote, I believe it important to express additional views not reflected in the main body of the Committee Report.

Despite the United States' investment in climate change science over the past decade, numerous gaps remain in our understanding of climate change. The National Academy of Sciences identified in its report, *Climate Change Science: An Analysis of Some Key Questions* (June 2001), critical uncertainties about the science of climate change including the following:

- Conflict between global atmospheric and "surface" temperature measurements;

- How much carbon is sequestered by oceans and land biosphere and how much remains in the atmosphere;

- The feedbacks in the climate system that determine the magnitude and rate of temperature increases;

- The direct and indirect effects of aerosols;

- The details and impacts of regional climate change resulting from global climate change;

- The nature and causes of the natural variability of climate and its interactions with forced changes; and

- The emissions and usage of fossil fuels and the future emissions of methane.

Although there are many scientific uncertainties about climate change, I want to reiterate my belief that we need to responsibly study, understand and manage, if necessary, its risk. S. 1008 offers an opportunity for progress on this issue by promoting the development of technologies to reduce the risk of climate change. Like many of my colleagues, I support a technology-driven strategy. In my view, S. 1008 is an admirable first step in addressing this complex issue and I appreciate and commend Senators Byrd and Stevens for their efforts in this regard. I do believe that several changes in the legislation could help it accomplish the authors' goals.

At the outset, I believe the bill would have benefitted from more attention by the Committee. S. 1008 authorizes \$4.8 billion in appropriations and makes permanent structural changes to the Executive Branch. Yet we only had one hearing, and it focused more on the general issue of global warming than the details of the bill. Details matter. Some problems with the bill were easily curable. For example, the new Department of Energy office that the bill would establish originally was called the "Office of Carbon Management." But there are many other contributors to climate change beyond

CO<sub>2</sub>. The name of the Office needed to be changed to reflect this reality, and I appreciated that Senator Lieberman offered an amendment at the markup to do so. But that is merely a drafting issue. I am concerned that there are more fundamental problems with the bill.

First, S. 1008 calls for the development of a national strategy that has as its aim the “stabilization of concentrations of greenhouse gases in the atmosphere,” but does not include any programs that would provide for emissions reductions by nations other than the United States. It is a simple scientific fact that cuts in U.S. emissions alone will not lead to stabilization of global atmospheric concentrations of greenhouse gases so long as the developing nations of the world continue to increase their emissions as they grow their economies in the coming decades. In this respect, S. 1008 is similar to the flawed Kyoto Protocol, which does not contain any commitment on the part of developing countries to reduce emissions. An emerging national strategy to address climate change must contain a component that addresses the transfer of advanced energy technologies to developing countries such as the international technology transfer program proposed by Senators Murkowski, Craig, Hagel, and Domenici in S. 1294, the Climate Change Risk Management Act of 2001.

Second, S. 1008 adds new layers to an already overlaid and duplicative government bureaucracy. The Executive Office of the President currently has ample authority to coordinate Federal agency activities. I believe it is sufficient to specifically charge the President with the responsibility of developing and periodically revising a national strategy to address climate change as a roadmap to guide Federal agency activities. This is the approach followed in S. 1294, and it may be worth considering as an alternative to the overlayering produced by this bill.

In addition, S. 1008 would authorize a new \$75 million Center for Strategic Climate Change Response within the Department of Energy which, in my opinion, simply duplicates existing analytical activities already carried out in the Department of Energy and its national laboratories, or in the private sector with the support of the Department.

Also, an independent Climate Change Response Strategy Review Board would be created to oversee the activities of the Executive Office of the President and Federal agencies with respect to climate change and the national strategy. The functions intended to be carried out by this Board could be effectively carried out by the National Academies, who already have the necessary expertise in science, engineering, and medicine to carry out an effective review of any climate change strategy.

Third, the legislation originally focused solely on reductions of gaseous agents such as carbon dioxide. However, the Committee was informed that certain traditional pollutants that are aerosols—and specifically black soot—are not only contributing to global warming, but also are killing hundreds of thousands of children every year in developing countries. At our hearing on S. 1008, we heard testimony about this problem from Dr. Jim Hansen, Director of the NASA Goddard Institute for Space Studies and renowned expert on climate change. Dr. Hansen called to our attention studies

indicating that in India, about 270,000 children die each year from black soot before they reach the age of five. China has comparable mortality rates. The transfer of more efficient technologies could reduce both local and regional air pollution, and mitigate the effects of climate change caused by the release of aerosols from incomplete combustion.

I appreciate that the Committee accepted by voice vote my amendment to include black soot within the scope of the bill. The magnitude of this problem is staggering and I think we would have been seriously remiss if we had failed to do something about a pollutant that not only is a climate warming agent in the developing world but also is literally killing hundreds of thousands of children every year. On top of this, we don't have to wait 20 years for additional research since we have the technology to do something about this right now. Dr. Hansen wrote a strong letter in support of my amendment, a copy of which follows.

In summary, while I support the intent of S. 1008 to promote a long-term, technology-driven approach to addressing climate change, there are several shortcomings in the legislation as approved by the Committee. I look forward to working with my colleagues in the Senate, particularly the authors of S. 1008, Senators Byrd and Stevens, and the authors of S. 1294, Senators Murkowski, Craig, Hagel and Domenici, to enact a truly comprehensive national climate change strategy that tackles this important problem facing the Nation and the world.

FRED THOMPSON.

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NASA GODDARD SPACE FLIGHT CENTER,  
GODDARD INSTITUTE FOR SPACE STUDIES,  
New York, NY, August 1, 2001.

Hon. FRED THOMPSON,  
*Ranking Member, Committee on Governmental Affairs, Dirksen  
Senate Office Building, Washington, DC.*

DEAR SENATOR THOMPSON: I strongly concur with proposed changes to S. 1008, the "Climate Change Strategy and Technology Innovation Act", that Paul Noe of your staff discussed with me today, specifically expanding the scope of the bill to include other anthropogenic climate forcing agents. As I testified before your committee on July 18, black soot is an important source of global warming, causing a forcing one-third to one-half as large as that of carbon dioxide. Moreover, the atmospheric residence time of black soot is small, so, unlike carbon dioxide, if the sources of black soot are reduced the amount in the air will fall quickly. In that sense, black soot is similar to tropospheric ozone, another true pollutant that causes a climate forcing one-third to one-half as large as carbon dioxide. Unfortunately, neither black soot nor tropospheric ozone are included in the Kyoto Protocol.

The global health effects of black soot and tropospheric ozone are truly staggering and warrant attention comparable to that being accorded to carbon dioxide and other climate forcing agents. The particulates (aerosols or fine particles in the air) are especially troublesome. Black soot (arising from burning of diesel, coal and biomass, and, in developing countries, from household burning of

field residue, cow dung and wood) is particularly at fault, as the particles act like tiny sponges that absorb toxic organic bits. When breathed in, these tiny particles penetrate human tissue deeply, some of the smallest entering the blood stream, causing respiratory and cardiac problems. This pollution is particularly deadly in the developing world. A recent paper in the *Proceedings of the National Academy of Sciences* estimated that 270,000 children in India under the age of five die each year of acute respiratory infections caused by this air pollution. The numbers in China are comparable. Globally, the number of premature deaths per year from black soot is approximately one million.

I emphasize that the prospects for pay-off in incorporating these pollutants in the bill are quite large, because the technologies for reducing the pollutants already exist and still further improvements should be encouraged. Further, there is the potential for a large near-term double pay-off, because reducing these constituents both would (1) reduce climate forcing, and (2) improve public health and save countless lives.

If I can clarify any of these topics, I would be glad to provide further information.

Sincerely,

JAMES E. HANSEN, *Director*.



## ADDITIONAL VIEWS OF SENATOR VOINOVICH

I was pleased to support and cosponsor S. 1008 as reported by the Committee. I believe it is important to encourage further research on climate change and to support the development of new breakthrough technologies for greenhouse gas concentrations. However, during the markup of the legislation by the full Committee I raised several issues with the legislation which I believe need to be addressed before any further consideration by the Senate. In addition, I believe that the report filed by the majority for this bill, S. 1008, overstates what is known regarding the state of the science of climate change and downplays the considerable uncertainties.

It is precisely the fact that we know so little about what might cause climate change and what the potential effects might be that convinced me to cosponsor this bill, along with the addition of a key amendment by the ranking member Senator Thompson concerning "black soot carbon". Black soot carbon is the only greenhouse gas which actually causes deaths, killing 270,000 children in India alone each year. One of the many failures of the Kyoto Treaty is the fact that it ignores the black soot carbon issue. In addition, I am concerned that the Majority's Report gives too much credence to some predictions of hypothetical catastrophic effects of climate change by taking these predictions as fact and ignoring the tremendous uncertainties.

I have several concerns with the bill itself which need to be addressed before I can support additional action on the legislation. The bill authorizes almost \$5 billion dollars in new spending and I am not convinced that these funds will be well coordinated with the current research programs. Before Congress authorizes new funding, improvements in the coordination process needs to be addressed. The bill also creates a new Office in the White House and I am afraid that we are just creating a new bureaucracy. Finally, the bill has no meaningful mechanism to transfer technology to developing nations. This is vital if we are to be successful in addressing the most dangerous greenhouse gases such as black soot carbon. I believe the fundamental goals of the legislation of promoting scientific research and new technologies could be hampered by the bureaucratic processes established by the Bill.

Regarding the state of the science, the Majority has ignored many of the key uncertainties regarding climate change. On May 2nd of this year, I chaired a Senate Environment and Public Works Committee hearing on the Science of Climate Change. One of the witnesses at the hearing, Dr. Richard S. Lindzen of MIT and a co-author of the IPCC Report, spoke to the issue of the current uncertainties saying, "the whole issue of consensus and skeptics is a bit of a red herring. If, as the news media regularly report, global warming is the increase in temperature caused by man's emissions

of CO<sub>2</sub> that will give rise to rising sea levels, floods, droughts, weather extremes of all sorts, plagues, species elimination, and so on, then it is safe to say that global warming consists in so many aspects, that widespread agreement on all of them would be suspect *ab initio*. If it truly existed, it would be evidence of a thoroughly debased field. In truth, neither the full text of the IPCC documents nor even the summaries claim any such agreement. Those who insist that the science is settled should be required to state exactly what science they feel is settled. In all likelihood, it will turn out to be something trivial and without policy implications except to those who bizarrely subscribe to the so-called precautionary principle.”

Dr. Lindzen also commented in his testimony on the conflicting findings of the climate models commenting, “Our own research suggests the presence of a major negative feedback involving clouds and water vapor, where models have completely failed to simulate observations (to the point of getting the sign wrong for crucial dependences). If we are right, then models are greatly exaggerating sensitivity to increasing CO<sub>2</sub>. Even if we are not right (which is always possible in science; for example, IPCC estimates of warming trends for the past twenty years were almost immediately acknowledged to be wrong—so too were claims for arctic ice thinning), the failure of models to simulate observations makes it even less likely that models are a reliable tool for predicting climate.”

In concluding his statement before the Environment Committee Dr. Lindzen summed up the need for more scientific research. He said, “The question of where do we go from here is an obvious and important one. From my provincial perspective, an important priority should be given to figuring out how to support and encourage science (and basic science underlying climate in particular) while removing incentives to promote alarmism. The benefits of leaving future generations a better understanding of nature would far outweigh the benefits (if any) of ill thought out attempts to regulate nature in the absence of such understanding. With respect to any policy, the advice given in the 1992 report of the NRC, *Policy Implications of Greenhouse Warming*, remains relevant: carry out only those actions which can be justified independently of any putative anthropogenic global warming.”

The state of the science, contrary to the Majority report, is constantly changing, as evidenced by a report last month by the International Association of Quarternary Research (INQUA). They reported that the connection between heat and rising sea levels is not as simple as the IPCC claims, and that the connection between sea levels and temperature increase had not yet been established. The INQUA stated that the average temperature during the mid-1200s was one degree Celsius warmer than present temperatures and the sea level had remained unchanged.

Even the IPCC has acknowledged in the past the large uncertainties involved in the measurement of climate data, the report states that, “In observed data, any signal of human effects on climate must be distinguished from the background noise of climate fluctuations that are entirely natural in origin. . . . It is difficult to separate a signal from the noise of natural variability in the observations. This is because there are large uncertainties in the evo-

lution and magnitude of both human and natural forces, and in the characteristics of natural internal variability, which translate to uncertainties in relative magnitudes of signal and noise" (Climate Change 1995: The Science of Climate Change, Summary for Policymakers, Accepted by the Intergovernmental Panel on Climate Change, at 41.).

Dr. Benjamin Santer with the Lawrence Livermore National Laboratory, who was a lead author of the Science Section of the United Nations' Intergovernmental Panel on Climate Change's Second Assessment Report, published with ten co-authors an article in the Bulletin of the American Meteorological Society in December 1999 entitled, Detection and Attribution of Recent Climate Change: a Status Report. In it he concludes, "Given the large model uncertainties and limited data, a reliable weighting of the different factors contributing to the observed climate change cannot currently be given. . . . By most estimates the anthropogenic signal is currently comparable in magnitude to the upper limits of the natural climate noise. Such a low signal to noise ratio makes clear attribution statements difficult at this time. . . . In short, the current state of affairs is not satisfactory." This casts doubt into our ability to make definitive statements regarding the scientific data.

Dr. James Hansen, Director of NASA's Goddard Institute who raised the issue of Black Soot Carbon before this Committee, presented the following perspective to the National Academy of Sciences in October of 1998, "The forcings that drive long-term climate change are not known with an accuracy sufficient to define future climate change. . . . The summary implication is a paradigm change for long-term climate projections: uncertainties in climate forcings have supplanted global climate sensitivity as the predominant issue." This statement underscores the importance of more research to better understand the uncertainties surrounding climate change.

I believe this is an important piece of legislation, given some fundamental changes regarding the funding and the affect on the bureaucracy. However, as I have stated above, I believe the Majority Report downplays the vast uncertainties surrounding the climate change issue. These issues need to be more fully explored before we as a country commit to any type of mandatory reduction of CO<sub>2</sub>. I am extremely pleased that black carbon soot was included in this legislation, because the control of this substance will have a more definitive impact on public health than any other measure included in this legislation. I look forward to working with my colleagues on the Committee to address these concerns in the coming days. I am committed to passing a bill that addresses this important issue.

GEORGE V. VOINOVICH.

#### ADDITIONAL VIEWS OF SENATOR BENNETT

While I have some reservations about S. 1008, I commend Senator Byrd and Senator Stevens for bringing a thoughtful piece of legislation before the committee to address climate change.

The purpose of S. 1008 is to develop a climate change strategy in the United States, including the examination of ". . . a range of emission targets and implementation dates that would ultimately

stabilize greenhouse gas concentrations in the atmosphere in an economically and environmentally sound manner.” Environmental policy has been implemented in the past with little consideration, or even understanding, of economic impact. While S. 1008 makes a positive attempt to include some economic considerations, the unanswered scientific questions on the underlying issue of climate change continue to be of concern.

As already noted, the global mean temperature has risen 0.7°F to 1.4°F in the 20th century. However, many scientists point out that global warming is not a uniform occurrence. The contiguous United States, which has the best temperature record keeping in the world, has experienced a cooling of its mean temperature at the same time as the global mean temperatures increased. The tropics show no trend for higher temperatures. Much of the increase in temperature has occurred at higher latitudes, at night and during the winter. While Marrakech, Morocco has had no increase in mean temperature, Novosibirsk, Russia has had an increase in winter temperatures. Siberia’s average winter nighttime temperature has risen from  $-42^{\circ}\text{F}$  to  $-40^{\circ}\text{F}$ . Is this a negative impact that needs to be changed?

Advocates of stabilization targets of greenhouse gases have argued that rising concentrations of these gases will lead to a wide range of dire consequences, i.e. rising sea levels, more violent weather patterns, excessive rain, drought, and loss of forests. However, while the global mean temperature has been rising over the last hundred years, mankind had its most prosperous century ever. Around the world, infant mortality fell, life expectancy rose, and global economic production exploded in the 20th century. The benefits cannot be ascribed to rising global temperatures, but they do demonstrate that catastrophic consequences do not necessarily follow.

While S. 1008 is not the Kyoto Protocol, it similarly seeks to establish targets for stabilizing greenhouse gas emissions. Thus, we can learn something by reviewing the Kyoto Protocol. The Kyoto Protocol has been estimated to reduce the expected global mean temperature in 2100 by 0.76°F. Dr. Bjorn Lomborg, a statistician in Denmark, has demonstrated that without the Kyoto Protocol or any mitigation of greenhouse gases, the expected temperature in 2100 will be reached by the year 2094.

The Energy Information Agency (EIA) at the Department of Energy attempted to quantify the economic cost of greenhouse gas mitigation. EIA produced an estimate of the costs of the Kyoto Protocol and asked six respected economic consulting agencies to provide estimates of these costs.<sup>1</sup> EIA estimates that the cost of Kyoto in 2010 would be 4.2 percent of GDP, which is a large enough reduction to put the United States economy into a severe recession. The range of cost estimates were from the high of 4.2 percent of GDP to a net gain under the Kyoto treaty of 1.0 percent of GDP.<sup>2</sup> Most of the cost estimates were in the magnitude of 2.4 percent loss of GDP. If the majority of these estimates are correct, we could be devoting a substantial portion of our GDP to buy ourselves six

<sup>1</sup>The six were WEFA, Charles River Associates, the Pacific Northwest National Laboratory, MIT, the Electric Power Research Institute (EPRI), and DRI.

<sup>2</sup>EPRI was the only group to predict positive benefits from the Kyoto protocol.

years of slightly lower temperatures. This is comparable to paying a premium of \$1,000 per year for a insurance policy that will provide a \$60 benefit.

I recognize the complexity of the science cannot be captured in five paragraphs, or in a simple insurance analogy. However, I believe we must continue to wrestle with these issues to get as clear a picture of the future as possible. It will be an expensive mistake if we err too much on either side.

Again, I commend my colleagues for their attempt to insert a more balanced approach into what has been a highly charged, and emotional debate. This is a complex issue that needs the added light of sound science. I look forward to working with my colleagues to address this issue in a thoughtful, responsible way.

ROBERT F. BENNETT.

## IX. CHANGES TO EXISTING LAW

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, changes in existing law made by S. 1008 as reported are shown as follows (existing law proposed to be omitted is enclosed in brackets, new matter is printed in italic, and existing law in which no change is proposed is shown in roman):

### UNITED STATES CODE

### TITLE 42—THE PUBLIC HEALTH AND WELFARE

\* \* \* \* \*

#### CHAPTER 134—ENERGY POLICY

\* \* \* \* \*

#### Subchapter VII—Global Climate Change

#### §13381. Report

##### *Subtitle A—General Provisions*

\* \* \* \* \*

##### *Subtitle B—United States Climate Change Strategy and Technology Innovation*

\* \* \* \* \*

#### “SEC. 1621. DEFINITIONS.

*“In this subtitle:*

*“(1) CENTER.—The term ‘Center’ means the Center for Strategic Climate Change Response established by section 1624(e).*

*“(2) CLIMATE-FRIENDLY TECHNOLOGY.—The term ‘climate-friendly technology’ means any energy supply or end-use technology that, over the life of the technology and compared to similar technology in commercial use as of the date of enactment of this subtitle—*

*“(A) results in reduced emissions of greenhouse gases;*

*“(B) may substantially lower emissions of other pollutants; and*

*“(C) may generate substantially smaller or less hazardous quantities of solid or liquid waste.*

*“(3) DEPARTMENT.—The term ‘Department’ means the Department of Energy.*

*“(4) DEPARTMENT OFFICE.—The term ‘Department Office’ means the Office of Climate Change Technology of the Department established by section 1624(a).*

“(5) *FEDERAL AGENCY.*—The term ‘Federal agency’ has the meaning given the term ‘agency’ in section 551 of title 5, United States Code.

“(6) *GREENHOUSE GAS.*—The term ‘greenhouse gas’ means—

“(A) an anthropogenic gaseous constituent of the atmosphere (including, but not limited to, carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and tropospheric ozone) that absorbs and re-emits infrared radiation and influences climate; and

“(B) an anthropogenic aerosol (including, but not limited to, black soot) that absorbs solar radiation and influences climate.

“(7) *INTERAGENCY TASK FORCE.*—The term ‘Interagency Task Force’ means the United States Climate Change Response Interagency Task Force established under section 1623(d).

“(8) *KEY ELEMENT.*—The term ‘key element’, with respect to the Strategy, means—

“(A) definition of interim emission mitigation targets coupled with specific mitigation approaches that cumulatively result in stabilization of greenhouse gas concentrations;

“(B) a national commitment—

“(i) to double energy research and development by the United States public and private sectors; and

“(ii) in carrying out such research and development, to provide a high degree of emphasis on bold, breakthrough technologies that will make possible a profound transformation of the energy, transportation, industrial, agricultural, and building sectors of the United States;

“(C) climate adaptation research that focuses on response actions necessary to adapt to climate change that may have occurred or may occur under any future climate change scenario; and

“(D) research that focuses on resolving the remaining scientific, technical, and economic uncertainties associated with climate change to the extent that those uncertainties bear on strategies to achieve the long-term goal of stabilization of greenhouse gas concentrations.

“(9) *QUALIFIED INDIVIDUAL.*—

“(A) *IN GENERAL.*—The term ‘qualified individual’ means an individual who has demonstrated expertise and leadership skills to draw on other experts in diverse fields of knowledge that are relevant to addressing the climate change response challenge.

“(B) *FIELDS OF KNOWLEDGE.*—The fields of knowledge referred to in subparagraph (A) are—

“(i) the science of primary and secondary climate change impacts;

“(ii) energy and environmental economics;

“(iii) technology transfer and diffusion;

“(iv) the social dimensions of climate change;

“(v) climate change adaptation strategies;

“(vi) fossil, nuclear, and renewable energy technology;

“(vii) energy efficiency and energy conservation;

“(viii) energy systems integration;

“(ix) engineered and terrestrial carbon sequestration;

“(x) transportation, industrial, and building sector concerns;

“(xi) regulatory and market-based mechanisms for addressing climate change;

“(xii) risk and decision analysis;

“(xiii) strategic planning; and

“(xiv) the international implications of climate change response strategies.

“(10) *REVIEW BOARD*.—The term ‘Review Board’ means the United States Climate Change Response Strategy Review Board established by section 1626.

“(11) *SECRETARY*.—The term ‘Secretary’ means the Secretary of Energy.

“(12) *STABILIZATION OF GREENHOUSE GAS CONCENTRATIONS*.—The term ‘stabilization of greenhouse gas concentrations’ means the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, as contemplated by the United Nations Framework Convention on Climate Change, done at New York on May 9, 1992.

“(13) *STRATEGY*.—The term ‘Strategy’ means the United States Climate Change Response Strategy developed under section 1622.

“(14) *WHITE HOUSE OFFICE*.—The term ‘White House Office’ means the National Office of Climate Change Response of the Executive Office of the President established by section 1623(a).

**“SEC. 1622. UNITED STATES CLIMATE CHANGE RESPONSE STRATEGY.**

“(a) *IN GENERAL*.—The Director of the White House Office shall develop the United States Climate Change Response Strategy, which shall—

“(1) have the long-term goal of stabilization of greenhouse gas concentrations;

“(2) build on the 4 key elements;

“(3) be developed on the basis of an examination of a broad range of emission reduction targets and implementation dates (including those contemplated by the United Nations Framework Convention on Climate Change, done at New York on May 9, 1992) that culminate in the stabilization of greenhouse gas concentrations;

“(4) incorporate mitigation approaches to reduce, avoid, and sequester greenhouse gas emissions;

“(5) include an evaluation of whether and how each emission reduction target and implementation date achieves the emission reductions in an economically and environmentally sound manner;

“(6) be consistent with the goals of energy, transportation, industrial, agricultural, forestry, environmental, and other relevant policies of the United States;



*“(7) have a scope that considers the totality of United States public, private, and public-private sector actions that bear on the long-term goal;*

*“(8) be based on an evaluation of a wide range of approaches for achieving the long-term goal, including evaluation of—*

*“(A) a variety of cost-effective Federal and State policies, programs, standards, and incentives;*

*“(B) policies that integrate and promote innovative, market-based solutions in the United States and in foreign countries; and*

*“(C) participation in other international institutions, or in the support of international activities, that are established or conducted to facilitate stabilization of greenhouse gas concentrations;*

*“(9) in the final recommendations of the Strategy, emphasize response strategies that achieve the long-term goal and provide specific recommendations concerning—*

*“(A) measures determined to be appropriate for short-term implementation, giving preference to cost-effective and technologically feasible measures that will—*

*“(i) produce measurable net reductions in United States emissions that lead toward achievement of the long-term goal; and*

*“(ii) minimize any adverse short-term and long-term economic and social impacts on the United States;*

*“(B) the development of technologies that have the potential for long-term implementation—*

*“(i) giving preference to technologies that have the potential to reduce significantly the overall cost of stabilization of greenhouse gas concentrations; and*

*“(ii) considering a full range of energy sources, energy conversion and use technologies, and efficiency options;*

*“(C) such changes in institutional and technology systems as are necessary to adapt to climate change in the short term and the long term;*

*“(D) such review, modification, and enhancement of the scientific, technical, and economic research efforts of the United States, and improvements to the data resulting from research, as are appropriate to improve the accuracy of predictions concerning climate change and the economic and social costs and opportunities relating to climate change; and*

*“(E) changes that should be made to project and grant evaluation criteria under other Federal research and development programs so that those criteria do not inhibit development of climate-friendly technologies;*

*“(10) be developed in a manner that provides for meaningful participation by, and consultation among, Federal, State, tribal, and local government agencies, nongovernmental organizations, academia, scientific bodies, industry, the public, and other interested parties in accordance with subsections (b)(4)(C)(iv)(II) and (d)(3)(B)(iii) of section 1623;*

*“(11) address how the United States should engage State, tribal, and local governments in developing and carrying out a response to climate change;*

*“(12) promote, to the maximum extent practicable, public awareness, outreach, and information-sharing to further the understanding of the full range of climate change-related issues;*

*“(13) include recommendations for legislative and administrative actions necessary to implement the Strategy;*

*“(14) serve as a framework for climate change response actions by all Federal agencies;*

*“(15) recommend which Federal agencies are, or should be, responsible for the various aspects of implementation of the Strategy and any budgetary implications;*

*“(16) address how the United States should engage foreign governments in developing an international response to climate change; and*

*“(17) be subject to review by an independent review board in accordance with section 1626.*

*“(b) SUBMISSION TO CONGRESS.—Not later than 1 year after the date of enactment of this subtitle, the President shall submit to Congress the Strategy.*

*“(c) UPDATING.—Not later than 2 years after the date of submission of the Strategy to Congress under subsection (b), and at the end of each 2-year period thereafter, the President shall submit to Congress an updated version of the Strategy.*

*“(d) PROGRESS REPORTS.—Not later than 1 year after the date of submission of the Strategy to Congress under subsection (b), and at the end of each 1-year period thereafter, the President shall submit to Congress a report that—*

*“(1) describes the progress on implementation of the Strategy; and*

*“(2) provides recommendations for improvement of the Strategy and the implementation of the Strategy.*

*“(e) ALIGNMENT WITH ENERGY, TRANSPORTATION, INDUSTRIAL, AGRICULTURAL, FORESTRY, AND OTHER POLICIES.—The President, the Director of the White House Office, the Secretary, and the other members of the Interagency Task Force shall work together to align the actions carried out under the Strategy and actions associated with the energy, transportation, industrial, agricultural, forestry, and other relevant policies of the United States so that the objectives of both the Strategy and the policies are met without compromising the climate change-related goals of the Strategy or the goals of the policies.*

*“(f) NATIONAL LABORATORY CERTIFICATION.—*

*“(1) IN GENERAL.—The directors of the major national laboratories of the Department specified in paragraph (3) shall annually meet with the President and individually and simultaneously certify whether the energy technology research and development programs of the United States collectively are technically and financially on a trajectory that is consistent with—*

*“(A) the directions and progress outlined in the Strategy; and*

*“(B) the long-term goal of stabilization of greenhouse gas concentrations.*

*“(2) EFFECT OF NEGATIVE CERTIFICATION.—If the certification described in paragraph (1) is in the negative, the directors shall submit to the President a report that—*

*“(A) specifies the reasons why the certification is in the negative; and*

*“(B) describes corrective actions that must be taken so that the certification can be made in the affirmative.*

*“(3) DIRECTORS OF MAJOR NATIONAL LABORATORIES AFFILIATED WITH SCIENCE AND ENERGY PROGRAMS.—The directors of the national laboratories that shall participate in the certification under this subsection are the director of each of—*

*“(A) the Argonne National Laboratory;*

*“(B) the Lawrence Berkeley National Laboratory;*

*“(C) the National Energy Technology Laboratory;*

*“(D) the National Renewable Energy Laboratory;*

*“(E) the Oak Ridge National Laboratory; and*

*“(F) the Pacific Northwest National Laboratory.*

*“(4) COORDINATION.—The director of the National Energy Technology Laboratory shall serve as coordinator of the group of the directors of the national laboratories specified in paragraph (3).*

**“SEC. 1623. NATIONAL OFFICE OF CLIMATE CHANGE RESPONSE OF THE EXECUTIVE OFFICE OF THE PRESIDENT.**

*“(a) ESTABLISHMENT.—*

*“(1) IN GENERAL.—There is established, within the Executive Office of the President, the National Office of Climate Change Response.*

*“(2) FOCUS.—The White House Office shall have the focus of achieving the long-term goal of stabilization of greenhouse gas concentrations while minimizing adverse short-term and long-term economic and social impacts.*

*“(3) DUTIES.—Consistent with paragraph (2), the White House Office shall—*

*“(A) establish policies, objectives, and priorities for the Strategy;*

*“(B) in accordance with subsection (d), establish the Interagency Task Force to serve as the primary mechanism through which the heads of Federal agencies shall assist the Director of the White House Office in developing and implementing the Strategy;*

*“(C) to the maximum extent practicable, ensure that the Strategy is based on objective, quantitative analysis, drawing on the analytical capabilities of Federal and State agencies, especially the Center;*

*“(D) advise the President concerning necessary changes in organization, management, budgeting, and personnel allocation of Federal agencies involved in climate change response activities; and*

*“(E) notify a Federal agency if the policies and discretionary programs of the agency are not well aligned with, or are not contributing effectively to, the long-term goal of stabilization of greenhouse gas concentrations.*

*“(b) DIRECTOR OF THE WHITE HOUSE OFFICE.—*

*“(1) IN GENERAL.—The White House Office shall be headed by a Director, who shall report directly to the President.*

*“(2) APPOINTMENT.—The Director of the White House Office shall be a qualified individual appointed by the President, by and with the advice and consent of the Senate.*

*“(3) TERM; VACANCIES.—*

*“(A) ‘TERM.—The Director of the White House Office shall be appointed for a term of 4 years.*

*“(B) VACANCIES.—A vacancy in the position of Director of the White House Office shall be filled in the same manner as the original appointment was made.*

*“(4) DUTIES OF THE DIRECTOR OF THE WHITE HOUSE OFFICE.—*

*“(A) STRATEGY.—In accordance with section 1622, the Director of the White House Office shall coordinate the development and updating of the Strategy.*

*“(B) INTERAGENCY TASK FORCE.—The Director of the White House Office shall serve as Chairperson of the Interagency Task Force.*

*“(C) ADVISORY DUTIES.—*

*“(i) CLIMATE, ENERGY, TRANSPORTATION, INDUSTRIAL, AGRICULTURAL, BUILDING, FORESTRY, AND OTHER PROGRAMS.—The Director of the White House Office, using an integrated perspective considering the totality of actions in the United States, shall advise the President and the heads of Federal agencies on—*

*“(I) the extent to which United States energy, transportation, industrial, agricultural, forestry, building, and other relevant programs are capable of producing progress on the long-term goal of stabilization of greenhouse gas concentrations; and*

*“(II) the extent to which proposed or newly created energy, transportation, industrial, agricultural, forestry, building, and other relevant programs positively or negatively affect the ability of the United States to achieve the long-term goal of stabilization of greenhouse gas concentrations.*

*“(ii) TAX, TRADE, AND FOREIGN POLICIES.—The Director of the White House Office, using an integrated perspective considering the totality of actions in the United States, shall advise the President and the heads of Federal agencies on—*

*“(I) the extent to which the United States tax policy, trade policy, and foreign policy are capable of producing progress on the long-term goal of stabilization of greenhouse gas concentrations; and*

*“(II) the extent to which proposed or newly created tax policy, trade policy, and foreign policy positively or negatively affect the ability of the United States to achieve the long-term goal of stabilization of greenhouse gas concentrations.*

*“(iii) INTERNATIONAL TREATIES.—The Secretary of State, acting in conjunction with the Interagency Task Force and using the analytical tools available to the*

*White House Office, shall provide to the Director of the White House Office an opinion that—*

*“(I) specifies the economic and environmental costs and benefits of any proposed international treaties or components of treaties that have an influence on greenhouse gas management; and*

*“(II) assesses the extent to which the treaties advance the long-term goal of stabilization of greenhouse gas concentrations, while minimizing adverse short-term and long-term economic and social impacts and considering other impacts.*

*“(iv) CONSULTATION.—*

*“(I) WITH MEMBERS OF INTERAGENCY TASK FORCE.—To the extent practicable and appropriate, the Director of the White House Office shall consult with all members of the Interagency Task Force and other interested parties before providing advice to the President.*

*“(II) WITH OTHER INTERESTED PARTIES.—The Director of the White House Office shall establish a process for obtaining the meaningful participation of Federal, State, tribal, and local government agencies, nongovernmental organizations, academia, scientific bodies, industry, the public, and other interested parties in the formulation of advice to be provided to the President.*

*“(D) PUBLIC EDUCATION, AWARENESS, OUTREACH, AND INFORMATION-SHARING.—The Director of the White House Office, to the maximum extent practicable, shall promote public awareness, outreach, and information-sharing to further the understanding of the full range of climate change-related issues.*

*“(5) ANNUAL REPORTS.—The Director of the White House Office, in consultation with the Interagency Task Force and other interested parties, shall prepare an annual report for submission by the President to Congress that—*

*“(A) assesses progress in implementation of the Strategy;*

*“(B) assesses progress, in the United States and in foreign countries, toward the long-term goal of stabilization of greenhouse gas concentrations;*

*“(C) assesses progress toward meeting climate change-related international obligations;*

*“(D) makes recommendations for actions by the Federal Government designed to close any gap between progress-to-date and the measures that are necessary to achieve the long-term goal of stabilization of greenhouse gas concentrations; and*

*“(E) addresses the totality of actions in the United States that relate to the 4 key elements.*

*(6) ANALYSIS.—During development of the Strategy, preparation of the annual reports submitted under paragraph (5), and provision of advice to the President and the heads of Federal agencies, the Director of the White House Office shall place significant emphasis on the use of objective, quantitative analysis,*

*taking into consideration any uncertainties associated with the analysis.*

*“(c) STAFF.—*

*“(1) IN GENERAL.—The Director of the White House Office shall employ a professional staff of not more than 25 individuals to carry out the duties of the White House Office.*

*“(2) INTERGOVERNMENTAL PERSONNEL AND FELLOWSHIPS.—The Director of the White House Office may use the authority provided by the Intergovernmental Personnel Act of 1970 (42 U.S.C. 4701 et seq.) and subchapter VI of chapter 33 of title 5, United States Code, and fellowships, to obtain staff from academia, scientific bodies, private industry, nongovernmental organizations, other Department programs, other Federal agencies, and national laboratories, for appointments of a limited term.*

*“(d) INTERAGENCY TASK FORCE.—*

*“(1) IN GENERAL.—The Director of the White House Office shall establish the United States Climate Change Response Interagency Task Force.*

*“(2) COMPOSITION.—The Interagency Task Force shall be composed of—*

*“(A) the Director of the White House Office, who shall serve as Chairperson;*

*“(B) the Secretary of State;*

*“(C) the Secretary;*

*“(D) the Secretary of Commerce;*

*“(E) the Secretary of the Treasury;*

*“(F) the Secretary of Transportation;*

*“(G) the Secretary of Agriculture;*

*“(H) the Administrator of the Environmental Protection Agency;*

*“(I) the Administrator of the Agency for International Development;*

*“(J) the United States Trade Representative;*

*“(K) the National Security Advisor;*

*“(L) the Director of the National Economic Council;*

*“(M) the Chairman of the Council on Environmental Quality;*

*“(N) the Director of the Office of Science and Technology Policy;*

*“(O) the Chairperson of the Subcommittee on Global Change Research (which performs the functions of the Committee on Earth and Environmental Sciences established by section 102 of the Global Change Research Act of 1990 (15 U.S.C. 2932)); and*

*“(P) the heads of such other Federal agencies as the Chairperson determines should be members of the Interagency Task Force.*

*“(3) STRATEGY.—*

*“(A) IN GENERAL.—The Interagency Task Force shall serve as the primary forum through which the Federal agencies represented on the Interagency Task Force jointly—*

“(i) assist the Director of the White House Office in developing and updating the Strategy; and

“(ii) assist the Director of the White House Office in preparing annual reports under subsection (b)(5).

“(B) **REQUIRED ELEMENTS.**—In carrying out subparagraph (A), the Interagency Task Force shall—

“(i) take into account the long-term goal and other requirements of the Strategy specified in section 1622(a);

“(ii) give full consideration to the facts and opinions presented by the members of the Interagency Task Force;

“(iii) consult with State, tribal, and local government agencies, nongovernmental organizations, academia, scientific bodies, industry, the public, and other interested parties; and

“(iv) build consensus around a Strategy that is based on strong scientific, technical, and economic analyses.

“(4) **WORKING GROUPS.**—The Chairperson of the Interagency Task Force may establish such topical working groups as are necessary to carry out the duties of the Interagency Task Force.

“(e) **PROVISION OF SUPPORT STAFF.**—In accordance with procedures established by the Chairperson of the Interagency Task Force, the Federal agencies represented on the Interagency Task Force shall provide staff from the agencies to support information, data collection, and analyses required by the Interagency Task Force.

“(f) **HEARINGS.**—On request of the Chairperson, the Interagency Task Force may hold such hearings, meet and act at such times and places, take such testimony, and receive such evidence as the Interagency Task Force considers to be appropriate.

**“SEC. 1624. TECHNOLOGY INNOVATION PROGRAM IMPLEMENTED THROUGH THE OFFICE OF CLIMATE CHANGE TECHNOLOGY OF THE DEPARTMENT OF ENERGY AND THE CENTER FOR STRATEGIC CLIMATE CHANGE RESPONSE.**

“(a) **ESTABLISHMENT OF OFFICE OF CLIMATE CHANGE TECHNOLOGY OF THE DEPARTMENT OF ENERGY.**—

“(1) **IN GENERAL.**—There is established, within the Department, the Office of Climate Change Technology.

“(2) **DUTIES.**—The Department Office shall—

“(A) manage an energy technology research and development program that directly supports the Strategy by—

“(i) focusing on high-risk, bold, breakthrough technologies that—

“(I) are critical to the long-term stabilization of greenhouse gas concentrations;

“(II) are not significantly addressed by other Federal programs; and

“(III) move technology substantially beyond the state of usual innovation;

“(ii) forging fundamentally new research and development partnerships among various Departments, other Federal, and State programs, particularly between basic science and energy technology programs, in cases in which such partnerships have significant potential to affect the ability of the United States to

*achieve stabilization of greenhouse gas concentrations at the lowest possible cost;*

*“(iii) forging international research and development partnerships that are in the interests of the United States and make progress on stabilization of greenhouse gas concentrations;*

*“(iv) making available, through monitoring, experimentation, and analysis, data that are essential to proving the technical and economic viability of technology central to addressing climate change; and*

*“(v) transitioning research and development programs to other program offices of the Department once such a research and development program crosses the threshold of high-risk research and moves into the realm of more conventional technology development;*

*“(B) in accordance with subsection (b)(5)(C), prepare a 10-year program plan for the activities of the Department Office and update the plan biennially;*

*“(C) prepare annual reports in accordance with subsection (b)(6);*

*“(D) identify the total contribution of all Department programs to climate change response;*

*“(E) provide substantial analytical support to the White House Office, particularly support in the development of the Strategy and associated progress reporting; and*

*“(F) advise the Secretary on climate change-related issues, including necessary changes in Department organization, management, budgeting, and personnel allocation in the programs involved in climate change response-related activities.*

*“(b) DIRECTOR OF THE DEPARTMENT OFFICE.—*

*“(1) IN GENERAL.—The Department Office shall be headed by a Director, who shall report directly to the Secretary.*

*“(2) APPOINTMENT.—The Director of the Department Office shall be an employee of the Federal Government who is a qualified individual appointed by the President.*

*“(3) TERM.—The Director of the Department Office shall be appointed for a term of 4 years.*

*“(4) VACANCIES.—A vacancy in the position of the Director of the Department Office shall be filled in the same manner as the original appointment was made.*

*“(5) DUTIES OF THE DIRECTOR OF THE DEPARTMENT OFFICE.—*

*“(A) STRATEGY.—The Director of the Department Office shall support development of the Strategy through the provision of staff and analytical support.*

*“(B) INTERAGENCY TASK FORCE.—Through active participation in the Interagency Task Force, the Director of the Department Office shall—*

*“(i) based on the analytical capabilities of the Department Office and the Center, share analyses of alternative climate change response strategies with other members of the Interagency Task Force to assist all members in understanding—*



*“(I) the scale of the climate change response challenge; and*

*“(II) how the actions of the Federal agencies of the members positively or negatively contribute to climate change solutions; and*

*“(ii) determine how the energy technology research and development program described in subsection (a)(2)(A) can be designed for maximum impact on the long-term goal of stabilization of greenhouse gas concentrations.*

*“(C) 10-YEAR PROGRAM PLAN.—*

*“(i) IN GENERAL.—Not later than 1 year after the date of enactment of this subtitle, the Director of the Department Office shall prepare a 10-year program plan.*

*“(ii) REQUIRED ELEMENTS.—The plan shall—*

*“(I) consider all elements of the Strategy that relate to technology research and development;*

*“(II) become an integral component of the Strategy;*

*“(III) focus the activities of the Department Office on gaps identified by the Strategy;*

*“(IV) emphasize the funding of activities that meet the goals described in clauses (i) through (iv) of subsection (a)(2)(A);*

*“(V) identify creative and innovative approaches for building partnerships and managing research and development that have the potential to result in significant advances of technologies and other innovative actions; and*

*“(VI) place a high level of emphasis on bold, breakthrough research and development programs that can—*

*“(aa) be created with the involvement of 1 or more Federal research and development programs; and*

*“(bb) upon reaching a sufficient level of technological maturity, be transitioned to other program offices of the Department without loss of the creative management approaches and partnerships of the innovative research and development programs.*

*“(iii) SUBMISSION OF PLAN.—The Secretary shall submit the 10-year program plan to Congress and the Director of the White House Office.*

*“(iv) UPDATING.—*

*“(I) IN GENERAL.—The Director of the Department Office shall update the 10-year program plan biennially.*

*“(II) SUBMISSION.—The Secretary shall submit each updated 10-year program plan to Congress and the Director of the White House Office.*

*“(D) CENTER.—*

“(i) *OPERATING MODEL.*—The Director of the Department Office shall establish an operating model for the Center.

“(ii) *DELEGATION OF DEPARTMENT OFFICE FUNCTIONS.*—The Director of the Department Office may choose to delegate selected program management and research and development functions of the Department Office to the Center.

“(iii) *FOCUS.*—

“(I) *IN GENERAL.*—Funds for the Center should be used to build a Center with focused capability that has a limited number of focused offsite locations.

“(II) *INVOLVEMENT OF ORGANIZATIONS.*—Notwithstanding subclause (I), the Director of the Department Office may involve any number of organizations in the operation of the Center.

“(iv) *TOOLS, DATA, AND CAPABILITIES.*—The Director of the Department Office shall foster the development of tools, data, and capabilities at the Center to ensure that—

“(I) the United States has a robust capability for evaluating alternative climate change response scenarios; and

“(II) the Center provides long-term analytical continuity during the terms of service of successive Presidents.

“(E) *ADVISORY DUTIES.*—The Director of the Department Office shall advise the Secretary on all aspects of climate change response.

“(6) *ANNUAL REPORTS.*—The Director of the Department Office shall prepare an annual report for submission by the Secretary to Congress and the White House Office that—

“(A) assesses progress toward meeting the goals of the energy technology research and development program described in subsection (a)(2)(A);

“(B) assesses the activities of the Center;

“(C) assesses the contributions of all energy technology research and development programs of the Department (including science programs) to the long-term goal and other requirements of the Strategy specified in section 1622(a); and

“(D) makes recommendations for actions by the Department and other Federal agencies to address the components of technology development that are necessary to support the Strategy.

“(7) *ANALYSIS.*—During development of the Strategy, the 10-year program plan submitted under paragraph (5)(C), annual reports submitted under paragraph (6), and advice to the Secretary, the Director of the Department Office shall place significant emphasis on the use of objective, quantitative analysis, taking into consideration any associated uncertainties.

“(c) *STAFF.*—The Director of the Department Office shall employ a professional staff of not more than 25 individuals to carry out the duties of the Department Office.

“(d) *INTERGOVERNMENTAL PERSONNEL AND FELLOWSHIPS.*—The Department Office may use the authority provided by the Intergovernmental Personnel Act of 1970 (42 U.S.C. 4701 et seq.) and subchapter VI of chapter 33 of title 5, United States Code, and fellowships, to obtain staff from academia, scientific bodies, private industry, nongovernmental organizations, other Department programs, other Federal agencies, and national laboratories, for appointments of a limited term.

“(e) *CENTER FOR STRATEGIC CLIMATE CHANGE RESPONSE.*—

“(1) *IN GENERAL.*—

“(A) *ESTABLISHMENT.*—There is established the Center for Strategic Climate Change Response, which shall report to the Director of the Department Office.

“(B) *LOCATIONS.*—The Center shall maintain 1 headquarters location and such additional temporary or permanent locations as are necessary to carry out the duties of the Center.

“(C) *CENTER DIRECTOR.*—The Center shall be headed by a Director, who shall be selected by the Director of the Department Office.

“(2) *DUTIES.*—

“(A) *IN GENERAL.*—

“(i) *GOAL.*—The Center shall foster the development and application of advanced computational tools, data, and capabilities that support integrated assessment of alternative climate change response scenarios and implementation of the Strategy.

“(ii) *PARTICIPATION AND SUPPORT.*—The Center may include participation of, and be supported by, each other Federal agency that has a direct or indirect role in the development, commercialization, or transfer of energy, transportation, industrial, agricultural, forestry, or other climate change-related technology.

“(B) *PROGRAMS.*—

“(i) *IN GENERAL.*—The Center shall—

“(I) develop and maintain core analytical competencies and complex, integrated computational modeling capabilities that are necessary to support the design and implementation of the Strategy;

“(II) track United States and international progress toward the long-term goal of stabilization of greenhouse gas concentrations; and

“(III) in support of the Department Office, support the management and implementation of research and development programs.

“(ii) *INTERNATIONAL CARBON DIOXIDE SEQUESTRATION MONITORING AND DATA PROGRAM.*—In consultation with Federal, State, academic, scientific, private sector, nongovernmental, tribal, and international carbon capture and sequestration technology programs, the Center shall design and carry out an international

*carbon dioxide sequestration monitoring and data program to collect, analyze, and make available the technical and economic data to ascertain—*

*“(I) whether engineered sequestration and terrestrial sequestration will be acceptable technologies from regulatory, economic, and international perspectives;*

*“(II) whether carbon dioxide sequestered in geological formations or ocean systems is stable and has inconsequential leakage rates on a geologic time-scale; and*

*“(III) the extent to which forest, agricultural, and other terrestrial systems are suitable carbon sinks.*

*“(C) Areas of expertise.—*

*“(i) IN GENERAL.—The Center shall develop and maintain expertise in integrated assessment, modeling, and related capabilities necessary—*

*“(I) to understand the relationship between natural, agricultural, industrial, energy, and economic systems;*

*“(II) to design effective research and development programs; and*

*“(III) to develop and implement the Strategy.*

*“(ii) TECHNOLOGY TRANSFER AND DIFFUSION.—The expertise described in clause (i) shall include knowledge of technology transfer and technology diffusion in United States markets and foreign markets.*

*“(D) DISSEMINATION OF INFORMATION.—The Center shall ensure, to the maximum extent practicable, that technical and scientific knowledge relating to greenhouse gas emission reduction, avoidance, and sequestration is broadly disseminated through publications, fellowships, and training programs.*

*“(E) ASSESSMENTS.—In a manner consistent with the Strategy, the Center shall conduct assessments of deployment of climate-friendly technology.*

*“(F) USE OF PRIVATE SECTOR FUNDING.—*

*“(i) IN GENERAL.—The Center shall create an operating model that allows for collaboration, division of effort, and cost sharing with industry on individual climate change response projects.*

*“(ii) REQUIREMENTS.—Although cost sharing in some cases may be appropriate, the Center shall focus on long-term high-risk research and development and should not make industrial partnerships or cost sharing a requirement, if such a requirement would bias the activities of the Center toward incremental innovations.*

*“(iii) REEVALUATION ON TRANSITION.—At such time as any bold, breakthrough research and development program reaches a sufficient level of technological maturity such that the program is transitioned to a program office of the Department other than the Depart-*

ment Office, the cost-sharing requirements and criteria applicable to the program should be reevaluated.

“(iv) *PUBLICATION IN FEDERAL REGISTER.*—Each cost-sharing agreement entered into under this subparagraph shall be published in the Federal Register.

“(G) *INTERGOVERNMENTAL PERSONNEL AND FELLOWSHIPS.*—The Director of the Center may use the authority provided by the Intergovernmental Personnel Act of 1970 (42 U.S.C. 4701 et seq.) and subchapter VI of chapter 33 of title 5, United States Code, and fellowships, to obtain staff from academia, scientific bodies, private industry, nongovernmental organizations, other Department programs, other Federal agencies, and national laboratories, for appointments of a limited term.

**“SEC. 1625. ADDITIONAL OFFICES AND ACTIVITIES.**

“The Secretary of Agriculture, the Secretary of Transportation, the Administrator of the Environmental Protection Agency, and the heads of other Federal agencies may establish such offices and carry out such activities, in addition to those established or authorized by this subtitle, as are necessary to carry out this subtitle.

**“SEC. 1626. UNITED STATES CLIMATE CHANGE RESPONSE STRATEGY REVIEW BOARD.**

“(a) *ESTABLISHMENT.*—There is established as an independent establishment within the executive branch the United States Climate Change Response Strategy Review Board.

“(b) *MEMBERSHIP.*—

“(1) *COMPOSITION.*—The Review Board shall consist of 11 members who shall be appointed, not later than 90 days after the date of enactment of this subtitle, by the President by and with the advice and consent of the Senate, from among qualified individuals nominated by the National Academy of Sciences in accordance with paragraph (2).

“(2) *NOMINATIONS.*—Not later than 60 days after the date of enactment of this subtitle, after taking into strong consideration the guidance and recommendations of a broad range of scientific and technical societies that have the capability of recommending qualified individuals, the National Academy of Sciences shall nominate for appointment to the Review Board not fewer than 22 individuals who—

“(A) are—

“(i) qualified individuals; or

“(ii) experts in a field of knowledge specified in section 1621(9)(B); and

“(B) as a group represent broad, balanced expertise.

“(3) *PROHIBITION ON FEDERAL GOVERNMENT EMPLOYMENT.*—A member of the Review Board shall not be an employee of the Federal Government.

“(4) *TERMS; VACANCIES.*—

“(A) *TERMS.*—

“(i) *IN GENERAL.*—Subject to clause (ii), each member of the Review Board shall be appointed for a term of 4 years.

“(ii) *INITIAL TERMS.*—

*“(I) COMMENCEMENT DATE.—The term of each member initially appointed to the Review Board shall commence 120 days after the date of enactment of this subtitle.*

*“(II) TERMINATION DATE.—Of the 11 members initially appointed to the Review Board, 5 members shall be appointed for a term of 2 years and 6 members shall be appointed for a term of 4 years, to be designated by the President at the time of appointment.*

*“(B) VACANCIES.—*

*“(i) IN GENERAL.—A vacancy on the Review Board shall be filled in the manner described in this subparagraph.*

*“(ii) NOMINATIONS BY THE NATIONAL ACADEMY OF SCIENCES.—Not later than 60 days after the date on which a vacancy commences, the National Academy of Sciences shall—*

*“(I) after taking into strong consideration the guidance and recommendations of a broad range of scientific and technical societies that have the capability of recommending qualified individuals, nominate, from among qualified individuals, not fewer than 2 individuals to fill the vacancy; and*

*“(II) submit the names of the nominees to the President.*

*“(iii) SELECTION.—Not later than 30 days after the date on which the nominations under clause (ii) are submitted to the President, the President shall select from among the nominees an individual to fill the vacancy.*

*“(iv) SENATE CONFIRMATION.—An individual appointed to fill a vacancy on the Review Board shall be appointed by and with the advice and consent of the Senate.*

*“(5) DISCLOSURE OF POTENTIAL CONFLICTS OF INTEREST.—*

*“(A) EMPLOYMENT OF NOMINEES.—If a nominee to the Review Board is employed by an entity that receives any funding from the Department or any other Federal agency, the fact of the employment shall be—*

*“(i) disclosed to the President by the National Academy of Sciences at the time of the nomination; and*

*“(ii) publicly disclosed by the nominee as part of the Senate confirmation process of the nominee.*

*“(B) EMPLOYMENT OF MEMBERS.—If, during the period of service of a member on the Review Board, the member is employed by an entity that receives any funding from the Department or any other Federal agency, the fact of the employment shall be publicly disclosed by the Chairperson of the Review Board on a semiannual basis.*

*“(C) FINANCIAL BENEFIT TO MEMBERS.—If, during the period of service of a member on the Review Board, the Review Board makes any written recommendation that may financially benefit a member or an entity that employs the*

member, the fact of that financial benefit shall be publicly disclosed by the Chairperson of the Review Board at the time of the recommendation.

“(D) *APPLICABILITY OF ETHICS IN GOVERNMENT ACT OF 1978.*—A member of the Review Board shall be deemed to be an individual subject to the Ethics in Government Act of 1978 (5 U.S.C. App.).

“(6) *CHAIRPERSON; VICE CHAIRPERSON.*—The members of the Review Board shall select a Chairperson and a Vice Chairperson of the Review Board from among the members of the Review Board.

“(c) *DUTIES.*—

“(1) *IN GENERAL.*—Not later than 180 days after the date of submission of the initial Strategy under section 1622(b), each updated version of the Strategy under section 1622(c), each progress report under section 1622(d), and each national laboratory certification under section 1622(f), the Review Board shall submit to the President, Congress, and the heads of Federal agencies as appropriate a report assessing the adequacy of the Strategy, report, or certification.

“(2) *COMMENTS.*—In reviewing the Strategy, or a report or certification, under paragraph (1), the Review Board shall consider and comment on—

“(A) the adequacy of effort and the appropriateness of focus of the totality of all public, private, and public-private sector actions of the United States with respect to the 4 key elements;

“(B) the extent to which actions of the United States, with respect to climate change, complement or leverage international research and other efforts designed to manage global emissions of greenhouse gases, to further the long-term goal of stabilization of greenhouse gas concentrations;

“(C) the funding implications of any recommendations made by the Review Board; and

“(D)(i) the effectiveness with which each Federal agency is carrying out the responsibilities of the Federal agency with respect to the short-term and long-term greenhouse gas management goals; and

“(ii) the adequacy of the budget of each such Federal agency to carry out those responsibilities.

“(3) *ADDITIONAL RECOMMENDATIONS.*—

“(A) *IN GENERAL.*—Subject to subparagraph (B), the Review Board, at the request of the President or Congress, may provide recommendations on additional climate change-related topics.

“(B) *SECONDARY DUTY.*—The provision of recommendations under subparagraph (A) shall be a secondary duty to the primary duty of the Review Board of providing independent review of the Strategy and the reports and certifications under paragraphs (1) and (2).

“(d) *POWERS.*—

“(1) *Hearings.*—

“(A) *IN GENERAL.*—On request of the Chairperson or a majority of the members of the Review Board, the Review

*Board may hold such hearings, meet and act at such times and places, take such testimony, and receive such evidence as the Review Board considers to be appropriate.*

*“(B) ADMINISTRATION OF OATHS.—Any member of the Review Board may administer an oath or affirmation to any witness that appears before the Review Board.*

*“(2) PRODUCTION OF DOCUMENTS.—*

*“(A) IN GENERAL.—On request of the Chairperson or a majority of the members of the Review Board, and subject to applicable law, the Secretary or head of a Federal agency represented on the Interagency Task Force, or a contractor of such an agency, shall provide the Review Board with such records, files, papers, data, and information as are necessary to respond to any inquiry of the Review Board under this subtitle.*

*“(B) INCLUSION OF WORK IN PROGRESS.—Subject to applicable law, information obtainable under subparagraph (A)—*

*“(i) shall not be limited to final work products; but*

*“(ii) shall include draft work products and documentation of work in progress.*

*“(3) POSTAL SERVICES.—The Review Board may use the United States mails in the same manner and under the same conditions as other agencies of the Federal Government.*

*“(e) COMPENSATION OF MEMBERS.—A member of the Review Board shall be compensated at a rate equal to the daily equivalent of the annual rate of basic pay prescribed for level IV of the Executive Schedule under section 5315 of title 5, United States Code, for each day (including travel time) during which the member is engaged in the performance of the duties of the Review Board.*

*“(f) TRAVEL EXPENSES.—A member of the Review Board shall be allowed travel expenses, including per diem in lieu of subsistence, at rates authorized for an employee of an agency under subchapter I of chapter 57 of title 5, United States Code, while away from the home or regular place of business of the member in the performance of the duties of the Review Board.*

*“(g) STAFF.—*

*“(1) IN GENERAL.—The Chairperson of the Review Board may, without regard to the civil service laws (including regulations), appoint and terminate an executive director and such other additional personnel as are necessary to enable the Review Board to perform the duties of the Review Board.*

*“(2) CONFIRMATION OF EXECUTIVE DIRECTOR.—The employment of an executive director shall be subject to confirmation by the Review Board.*

*“(3) COMPENSATION.—*

*“(A) IN GENERAL.—Except as provided in subparagraph (B), the Chairperson of the Review Board may fix the compensation of the executive director and other personnel without regard to the provisions of chapter 51 and subchapter III of chapter 53 of title 5, United States Code, relating to classification of positions and General Schedule pay rates.*



*“(B) MAXIMUM RATE OF PAY.—The rate of pay for the executive director and other personnel shall not exceed the rate payable for level V of the Executive Schedule under section 5316 of title 5, United States Code.*

*“(h) PROCUREMENT OF TEMPORARY AND INTERMITTENT SERVICES.—The Chairperson of the Review Board may procure temporary and intermittent services in accordance with section 3109(b) of title 5, United States Code, at rates for individuals that do not exceed the daily equivalent of the annual rate of basic pay prescribed for level V of the Executive Schedule under section 5316 of that title.*

**“SEC. 1627. AUTHORIZATION OF APPROPRIATIONS.**

*“(a) WHITE HOUSE OFFICE.—*

*“(1) USE OF AVAILABLE APPROPRIATIONS.—From funds made available to Federal agencies for the fiscal year in which this subtitle is enacted, the President shall provide such sums as are necessary to carry out the duties of the White House Office under this subtitle until the date on which funds are made available under paragraph (2).*

*“(2) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to the White House Office to carry out the duties of the White House Office under this subtitle \$5,000,000 for each of fiscal years 2002 through 2011, to remain available through September 30, 2011.*

*“(b) DEPARTMENT OFFICE.—*

*“(1) USE OF AVAILABLE APPROPRIATIONS.—From funds made available to Federal agencies for the fiscal year in which this subtitle is enacted, the President shall provide such sums as are necessary to carry out the duties of the Department Office under this subtitle until the date on which funds are made available under paragraph (2).*

*“(2) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to the Department Office to carry out the duties of the Department Office under this subtitle \$4,000,000,000 for the period of fiscal years 2002 through 2011, to remain available through September 30, 2011.*

*“(c) CENTER.—*

*“(1) USE OF AVAILABLE APPROPRIATIONS.—From funds made available to Federal agencies for the fiscal year in which this subtitle is enacted, the President shall provide such sums as are necessary to carry out the duties of the Center under this subtitle until the date on which funds are made available under paragraph (2).*

*“(2) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to the Center to carry out the duties of the Center under this subtitle \$75,000,000 for each of fiscal years 2002 through 2011, to remain available through September 30, 2011.*

*“(d) REVIEW OF BOARD.—*

*“(1) USE OF AVAILABLE APPROPRIATIONS.—From funds made available to Federal agencies for the fiscal year in which this subtitle is enacted, the President shall provide such sums as are necessary to carry out the duties of the Review Board under this*

*subtitle until the date on which funds are made available under paragraph (2).*

*“(2) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to the Review Board to carry out the duties of the Review Board under this subtitle \$3,000,000 for each of fiscal years 2002 through 2011, to remain available until expended.*

*“(e) ADDITIONAL AMOUNTS.—Amounts authorized to be appropriated under this section shall be in addition to—*

*“(1) amounts made available to carry out the United States Global Change Research Program under the Global Change Research Act of 1990 (15 U.S.C. 2921 et seq.); and*

*“(2) amounts made available under other provisions of law for energy research and development.’.*

**\$13382. Least-cost energy strategy**

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