Testimony of Mike Carey
President, Ohio Coal Association
Select Committee on Energy Independence & Global Warming
The Role of Coal in the New Energy Age
April 14, 2010

Chairman Markey, Ranking Member Sensenbrenner, and Members of the Committee, thank you for inviting me to testify today at this very important hearing on the Role of Coal in the New Energy Age. My name is Mike Carey and I am President of the Ohio Coal Association. In addition, I also serve on the National Coal Council, an advisory Committee for the Secretary of Energy on coal issues.

I'd like to take a moment to thank my fellow witnesses from Arch Coal and Peabody Energy for their continued commitment to coal. Working with these two organizations through various initiatives and trade groups is always a pleasure.

Rio Tinto, on the other hand, has been divesting themselves of their domestic coal operations for years now and I don't believe they represent the future of our coal industry, although they probably represent the desired outcome of the Obama Administration's coal policies.

Given high levels of recoverable coal reserves and an increasing demand for energy, especially in developing nations where low-cost electricity is essential, coal's future global success is assured. However, coal mining and use in the United States is severely jeopardized by a war on coal waged through the legislative process and unprecedented regulatory actions. Our nation has been a leader in coal production, cleanliness and safety – all of which is threatened by actions in the name of climate change.

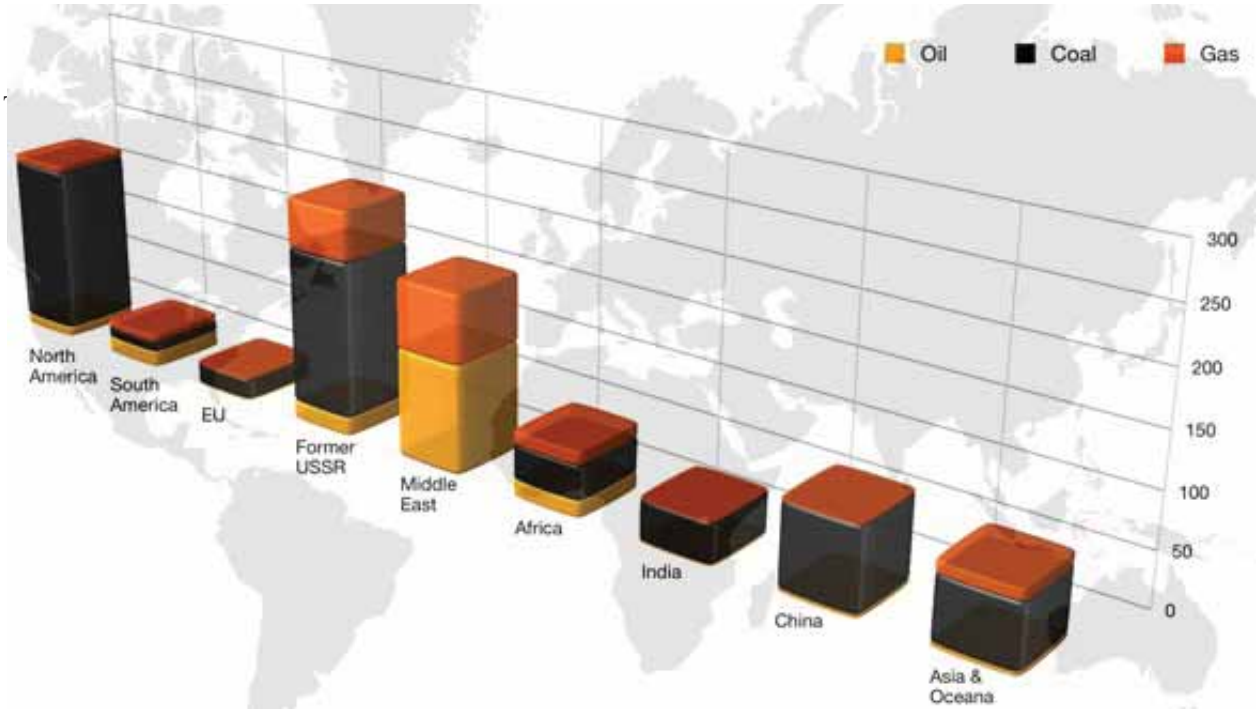
I. Coal Reserves

With 826 billion tons of proven, recoverable coal reserves worldwide, humanity has enough coal to last the world over 130 years at current rates of production and consumption.[1] Seventy countries have access to recoverable coal reserves, and many of these are emerging market economies desperate for cheap, consistent baseload energy.

In the United States, Energy Information Administration (EIA) data shows at least 261.5 billion tons of reserves recoverable using existing mining techniques and an additional of 226.1 billion tons in our demonstrated reserve base. Our recoverable reserves are almost 1/3 of the world's total supply – we have more coal than Saudi has oil and gas.[2]

[1] Energy Information Administration: http://www.eia.doe.gov/fuelcoal.html

[2] "BP Statistical Review of World Energy: June 2009." BP Statistical Review of World Energy. BP, June 2009. <http://www.bp.com/statisticalreview>. The United States has 28.9% of the world's proved coal reserves. By contrast, Saudi Arabia has 21% of the total oil and 4.1% of natural gas. Coal is more abundant; the energy produced by our share of coal is significantly greater than Saudi Arabia's oil and gas.



Source: World Coal Institute

II. Increasing Energy Demand

According to the EIA and International Energy Agency, global energy demand is expected to rise 44% over the next twenty years, most of which will be in developing nations.

- In 2006, the Organization for Economic Co-operation and Development (OECD) countries accounted for 51% of global energy consumption.
- OECD countries' energy consumption will drop to 41% of total global energy consumption by 2030.

The five largest users of coal – China, USA, India, Japan and Russia – account for 72% of global coal use.[3] I'd like to focus on two of these countries for a brief minute, as they have both summarily rejected the idea of binding carbon emissions reductions and the phasing-out of coal use. Instead, both China and India have called for reductions in per capita carbon intensity, an admission that their carbon dioxide emissions will undoubtedly increase as their population rapidly expands. U.S. domestic climate legislation attempting to mitigate the global atmospheric concentrations of carbon dioxide will undoubtedly fail as a result.

Here are some select statistics on projected energy demand in relation to coal:

- China has 115 billion tons of recoverable coal reserves, less than 14% of the world's total.
  - Chinese coal production increased 10% in 2008 to 1.414 billion tons.
  - Chinese coal consumption increased 6.8% in 2008 to 1.406 billion tons.
- India has 59 billion tons of recoverable coal reserves, about 7% of the world's total.
  - Indian coal production increased 7% in 2008 to 194.3 million tons.
  - Indian coal consumption increased 8.4% in 2008 to 231.4 million tons.

[3] http://www.worldcoal.org/coal/uses-of-coal/

- China and India accounted for 10% of the world's total energy consumption in 1990, but in 2006 their combined share grew to 19%.
    - Their energy demands are expected to grow to 28% of the total world energy consumption in 2030.
- The U.S. consumed 21% of the world's energy in 2006.
    - By 2030, U.S. energy demand will only comprise 17% of the world's total.
- Coal has been the fastest-growing fuel source for the past 6 years.
    - From 2007 to 2008, coal consumption increased 3.1%.
    - Coal use is expected to increase by an average 1.7% per year until 2030, accounting for 28% of the total world energy consumption in 2030.

China and India have neither enough domestic oil nor natural gas to power their nations for more than a few months. With no other domestic resource able to provide substantial baseload generation, coal figures prominently into these highly-populated nations' strategic energy plans. They have the opportunity to prevent a reliance on foreign energy sources, and they are seizing the moment by investing in coal. China is constructing a new coal-fired power plant every week, fueled by coal produced in an increasing number of domestic mines. In 2008, China produced more coal than it consumed for the first time. While India's expansion isn't nearly as pronounced, it still dwarfs the U.S. investment rate in coal.

The market for coal and low-cost electricity is there; the question is whether Congress and this Administration allow the United States to be the leader within the global coal market.

III. Regulatory Assault on Coal

Despite then-Senator Obama's commitment to coal on the campaign trail and his pledge on no middle class tax increases, his Administration's actions are greatly hurting the coal industry and he is imposing the Obama Energy Tax by administrative fiat. The Role for Coal in the New Energy Age is greatly hampered by the regulatory assault waged by the Obama Administration and in particular, the Environmental Protection Agency. Through a diverse set of new rules improperly promulgated using the Clean Air Act and other statutes, the domestic coal industry is facing challenges that make it nearly impossible to see a successful domestic future. While President Obama may not directly raise taxes, his Administration is implementing policies designed to increase the energy costs for all American families. This is the Obama Energy Tax, and we are in the process of calculating how much President Obama is costing American families each month in higher energy costs. The following is a list of the current Administration's recent regulations assaulting coal, some of which I will discuss further:

- Endangerment Finding
- Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule under the Clean Air Act
- Reconsideration of "EPA's Interpretation of Regulations that Determine Pollutants Covered by Federal Prevention of Significant Deterioration (PSD) Permit Program"
- Mandatory Greenhouse Gas Reporting Rule

- Proposed rule for Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO2) Geologic Sequestration (GS) Wells
- Memorandum: Improving EPA Review of Appalachian Surface Coal Mining Operations Under the Clean Water Act, National Environmental Policy Act, and the Environmental Justice Executive Order

a) Endangerment Finding

First, I'd like to talk about the Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, more commonly known as the "Endangerment Finding." This document permits the regulation of greenhouse gases under the Clean Air Act as they endanger both public health and public welfare. The Ohio Coal Association is challenging this Endangerment Finding in court, and we will win. We believe that the science underpinning the Endangerment Finding is questionable. In addition, EPA neglected required parts of the economic analysis that make the Findings substantially incomplete.

This document explicitly says, "The Administrator has determined that the body of scientific evidence compellingly supports this finding. The major assessments by the U.S. Global Climate Research Program (USGCRP), the [United Nations] Intergovernmental Panel on Climate Change (IPCC), and the National Research Council (NRC) serve as the primary scientific basis supporting the Administrator's endangerment finding."[4] These three sources all have corrupted data as a result of calculated political decisions what to include in public reports, but I'd like to focus on what we have learned about the UN IPCC since November. This is particularly important, as the IPCC's Fourth Assessment Report (AR4) is referenced 48 times in the Endangerment Finding and 395 times in the accompanying Technical Support Document.

Global warming alarmists say that Climategate does not alter the science behind global warming. I disagree. They have revealed a systematic breakdown of the scientific process, leading to the conclusion that the work done by the UN IPCC, the Hadley CRU and the British MET office should not be considered as true, unbiased science. Climategate has revealed a calculated suppression and discrediting of dissenting viewpoints, the conscious decision to selectively use non peer-reviewed science in support of a predetermined argument, political oppression interfering with science, corrupt data sets used for climate projections which cannot be replicated, and deliberate intent to profit off of international climate accord and other restrictions on fossil energy.

But this academic bias isn't just limited to the involved Climategate scientists; we in the coal industry see it on a daily basis from environmentalists who seize every opportunity to challenge our operations and other facets of coal use. We maintain the right to not accept the scientific theory of anthropogenic global warming because real world observations don't match up to

[4] Endangerment Finding, p.8-9

climate models. Since James Hansen first raised the climate change alarm in 1988, climate models have been consistently wrong in their projections.

Only 52 scientists signed the UN IPCC Fourth Assessment Report. With my testimony, I have attached multiple petitions from scientists refuting the theory of anthropogenic global warming.

- 31,486 American scientists, including 9,029 with PhDs, have signed onto a petition that states, "There is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gasses is causing or will, in the foreseeable future, cause catastrophic heating of the Earth's atmosphere and disruption of the Earth's climate."[5]
- Over 1,100 scientists in 40 countries have signed the Manhattan Declaration on Climate Change, which explicitly states that, "current plans to restrict anthropogenic CO2 emissions are a dangerous misallocation of intellectual capital and resources that should be dedicated to solving humanity's real and serious problems. That there is no convincing evidence that CO2 emissions from modern industrial activity has in the past, is now, or will in the future cause catastrophic climate change."[6]

I realize that many Members of Congress and the Administration continue to say that nothing was wrong with the IPCC report, but it is important to note what we have learned since November:

- The underlying data sets cannot be replicated;
- There was a systematic attempt to keep climate skeptics out of peer-reviewed journals; and.
- The authors and reviewers of the IPCC come from the same incestuous pool of researchers.

Furthermore, we have learned that there is no "scientific consensus" behind the theory of anthropogenic global warming.

b) Clean Air Act

The Clean Air Act is an unsuitable mechanism for regulating greenhouse gases and will greatly jeopardize our nation's supply of low-cost electricity and our manufacturing base. It allows for a plethora of dangerous regulations despite statements from the Clean Air Act Amendments of 1990's authors, such as Dean of the House John Dingell, who said they intended for greenhouse gases not to be covered. The Obama White House is encouraging EPA to use the laws in

[5] Global Warming Petition Project http://www.petitionproject.org/. The Petition Project was organized by a group of physicists and physical chemists who conduct scientific research at several American scientific institutions and is financed by non-tax deductible donations to the Petition Project from private individuals, many of whom are signers of the petition. The project has no financing whatever from industrial sources. Please see attached materials for the 12-page scientific assessment and accompanying petition that 31,486 American scientists have signed.

[6] http://www.climatescienceinternational.org/index.php?option=com_content&task=view&id=37&Itemid=54

unintended ways that will accomplish nothing by way of reducing atmospheric concentrations of GHGs.

The additional permitting process proposed for New Sources and existing sources requiring upgrades is incredibly expensive and delays construction and development for years. It is just another permit for environmentalists to challenge in the courts, amounting to years of time wasted and hundreds of millions of dollars used for legal expenses that should instead be allocated for wages and economic development. Required installation of Maximum Available Control Technology (MACT) without cost-benefit analysis could force power plants to halt construction or even shut down, leaving millions of Americans without access to low-cost electricity in a time of economic downturn. National Ambient Air Quality Standards (NAAQS) set for greenhouse gases, which unlike criteria pollutants can travel across the globe, will be impossible to meet and could result in nonattainment areas losing their Federal highway dollars as the law states. Other provisions of the Clean Air Act are equally unsuitable for GHG regulation and don't allow for market mechanisms to reduce cost and increase efficiency.

c) Clean Water Act

Another assault on the domestic coal industry is coming through new interpretations of, and regulations through, the Clean Water Act. On March 22, 2010, EPA published a Federal Register notice with a November deadline to solicit input on "what considerations EPA should take into account when deciding how to address listing of waters as threatened or impaired for ocean acidification under the 303(d) program. . . . If waters were determined to be threatened or impaired for ocean acidification under 303(d), what issues should EPA and states take into account when considering how to address TMDL development for such waters?" The Center for Biological Diversity, along with other environmentalists, are pushing for to find waters "impaired" by acidification specifically caused by GHG emissions and require first-time total maximum daily load ("TMDL") regulations that could include harsh carbon dioxide curbs. This will result in a roundabout way to further regulate coal in an attempt to change the pH of the Atlantic Ocean. A fool's errand.

In addition, I heard Rep. Nick Rahall defending the Administration after another Member had accused the Administration of waging a regulatory war on coal.[7] The very next day, EPA announced a veto of a surface coal mine permit which had already received approval from the Army Corps of Engineers. While the Clean Water Act gives agency officials the ability to veto proposed permits for surface coal mining, this is the first time in history they have used this

[7] Subcommittee on Energy and Mineral Resources: Oversight Hearing on "The President's Fiscal Year 2011 budget requests for the Minerals Management Service, the Bureau of Land Management, the Office of Surface Mining Reclamation and Enforcement, the United States Geological Survey (excluding the water resources program), and the USDA Forest Service." March 25, 2010. See archived video at http://resourcescommittee.house.gov/index.php?option=com_jcalpro&Itemid=27&extmode=view&extid=329

authority to block an existing permit. This comes after the Administration announced a temporary moratorium on surface coal mining when they took office.

Last week, EPA released Clean Water Act surface mining guidance for Appalachia. While the Administrator's public comments and the Agency's press releases tout significant environmental benefits, this guidance that goes into effect immediately does not rely on peer-reviewed science, applies retroactively to permits under consideration and ignores significant amount of field work showing additional factors affecting water conductivity levels. In short, this egregious mis-use of science to promulgate regulations effective immediately opens the floodgate to new lawsuits halting surface mining. The accompanying non-peer-reviewed "science" documents even links negative environmental effects to slurries and deep mining, a foreshadowing of a potential attempt to extend unfounded restrictions on surface coal mining to underground coal and minerals mining.

d) Endangered Species Act

While Interior Secretary Ken Salazar announced that his Agency would not invoke the Endangered Species Act (ESA) to restrict greenhouse gases threatening the polar bear and its habitat, he acknowledged that the greatest threat to the polar bear "is the melting of Arctic sea ice due to climate change." In fact, data from the U.S. National Snow and Ice Data Center in Colorado shows that Arctic ice is approaching long-term average levels for the first time in years.[8] In addition, the annual summer Arctic ice melt has started later in the calendar year than any time in the NSICD's 31 year history. The UN IPCC models, which predict an ice-free Arctic summer in 2013, cannot account for these real-world empirical observations. Furthermore, Harry Flaherty, Chair of the Nunavut Wildlife Management Board in Canada, says the bear population in the region has doubled in the past 10 years. Dr. Mitchell Taylor, a biologist who has been researching polar bear populations in Canada's Nunavut Territory for 35 years, agrees.[9]

The Interior Department has not given up trying to use ESA to limit coal use: in response to a lawsuit by environmentalists, they announced a study to assess whether the American pika should be listed as threatened because of climate change. In addition, the National Oceanic and Atmospheric Administration (NOAA) is examining whether ringed and bearded seals are endangered by human-caused climate change. In Ohio, mines have faced significant delays and rejected permits due to the declining population of the Indiana bat, a ¼ oz chestnut-colored bat that has been listed as an Endangered Species since 1967. Not once has an Ohio mine in operation discovered any Indiana bats.

Using the Endangered Species Act for climate change action would make the ill-equipped Fish and Wildlife Service (FWS) responsible for policing emissions. I am uncertain as to how FWS

[8] http://www.dailymail.co.uk/sciencetech/article-1263207/Increase-Arctic-ice-confounds-doomsayers.html
[9] http://www.examiner.com/x-32936-Seminole-County-Environmental-News-Examiner~y2010m1d8-Canadas-growing-polar-bear-population-becoming-a-problem-locals-say

could use the ESA to limit greenhouse gases and coal use, but I caution against blaming something as vague as natural variations in climate or evolution for the degradation of a species' habitat. Using the ESA, which requires no analysis of economic consequences, is an improper way to force additional restrictions on the coal and fossil fuel industries.

e) Mandatory Reporting of Greenhouse Gases Rule

To highlight the complexity of regulations going into effect January 2, 2011, less than 9 months away, we should look at the Mandatory GHG Reporting Rule. It has been well over two years since this rule was mandated by law, but EPA still has not finalized the rule for Underground Coal Mines and Suppliers of Coal. While other sources of greenhouse gases must start reporting their emissions, EPA could not adequately respond to the coal industry's concerns over a simple reporting requirement.

EPA's proposed rule wanted coal mining operations to account for their product's carbon content, yet actual emitters are also required to report. This is a blatant attempt to overinflate statistics by double-counting. EPA also proposed a "once-in, always-in" provision that would require even closed coal mines to report on an annual basis, penalizing the coal industry for no action or operation.

Furthermore, EPA adds the significant burden of continual greenhouse gas reporting when this information is already available to the Agency. The Energy Information Agency receives coal data from every power plant in the country generating more than 1 megawatt of electricity. This data includes Btu value, sulfur content and ash content. With heating value conversion to carbon content already established by EPA, this data is already calculable. There is absolutely no reason to add the significant costs already upon the coal industry by forcing expensive monitoring equipment and the creation of non-safety and non-mining personnel, yet EPA chooses to continue with their regulatory assault on every aspect of coal production.

IV. Legislative War on Coal

a) American Clean Energy and Security Act

This Congress is also pursuing policies that endanger the future of coal, low-cost electricity and our nation's economic livelihood. Climate change legislation such as the Waxman-Markey bill destroys the coal industry. It is a misguided attempt to micromanage our country's energy supply. During the floor debate last year, we heard about the legislation's vast wealth transfers, backroom deals with special interests, economic disparities based on regional differences, inability to actually reduce global atmospheric concentrations according to EPA Administrator Jackson and DOE Secretary Chu, jobs lost and lack of provisions that help with long-term adaptation to climate change.

In an attempt to buy off the coal industry, the legislation allocates $10 billion dollars towards carbon capture and sequestration (CCS), but misses the mark in two regards. First, the legislation ignores the realistic timeline of technological development. The legislation requires emissions reductions starting in 2012 and further incorporates restrictive performance standards on coal-fired power plants starting in 2020, completely ignoring what developers of CCS technology are saying: that CCS is at least 15-20 years away from true commercial deployment. The United States Congress simply cannot dictate the timeline of technological development.

Second, the Bill calls merely for a study to report back to Congress with recommendations on issues such as CCS liability, permitting and other environmental considerations. We've seen these mandated studies before in previous laws. Congress will neither examine the report nor act on it. Despite CRS and GAO reports outlining the necessary steps to take, environmentalists have successfully prevented their inclusion into legislative proposals in order to ensure coal's demise. The way the CCS program in the Waxman-Markey bill is structured actually encourages massive fuel-switching to the more expensive natural gas before CCS can be deployed on coal-fired power plants. But even then, the lack of regulatory, legal and liability frameworks will prevent commercial deployment of the technology.

b) Cap-and-dividend

Proposals such as the Cantwell-Collins CLEAR Act are as much a death knell for the coal industry as the ACES bill. Instead of forcing polluters to pay for emissions, this legislative draft makes the coal producer pay for the carbon content of their product without considering the end-use of the coal.

As Members may not be aware, coal is used in far more than just electricity generation. Users of coal include metallurgical refineries, paper manufacturers, the chemical industry and the pharmaceutical industry. Coal byproducts are used to manufacture chemicals such as creosote oil, naphthalene, phenol and benzene. Coal byproducts are also found in aspirin, soaps, solvents, dyes and plastics. Specialized, high-tech products that use coal as an essential ingredient include silicon metal, carbon fiber and activated carbon used in air and water purification as well as kidney dialysis machines. Cap-and-dividend will undoubtedly make these products significantly more expensive.

The CLEAR Act's concept of returning revenues generated to ratepayers is novel; however, in its current form we see the same regional disparities that penalizing Midwestern states such as Ohio, Indiana, West Virginia, Missouri and Kentucky. The legislation states that only ¾ of generated revenues is returned on a per-capita basis, meaning those who purchase coal-fired electricity will indirectly be subsidizing the electricity bills of states like Oregon or Massachusetts that use little coal for electricity. We cannot accept this sort of proposal due to the huge burden borne by the coal mining industry without being able to reimburse our customers and consumers of our

products in fair value. I'd caution Senators Kerry, Graham and Lieberman from using such a mechanism in their forthcoming proposal.

V. Industry Perspective on the Role For Coal

Domestic coal production needs the support of Congress and the Administration. We must increase our utilization of coal to encourage low-cost electricity, alleviating problems associated with our current recession and aiding in the rebuilding of our nation's manufacturing base. Coal mining provides well-above-average salaries, provides countless billions in revenues for local governments and gives towns based around the coal industry a sense of community. In Ohio, our coal workers make just over $64,000 on average,[10] approximately $25,000 more than the State average annual income. It is estimated that Ohio coal companies spend $300 million annually for taxes and fees to local and state agencies, providing crucial revenue for schools and other public works projects.

Furthermore, during the debate over Waxman-Markey, much attention has been given to "American leadership." Our nation's proud history of coal use has given us unparalleled mining efficiency, safety mechanisms, environmental management, transportation systems and technological processes to use coal for a wide variety of purposes. We are the world leaders in the coal industry. However, many people are willing to sacrifice this in order to lead the world in renewable energy technologies. There is absolutely no reason we cannot lead in both coal and renewables. It is time to lead the world and export our knowledge and coal to developing foreign nations. We can help them prevent significant loss of life and minimize environmental impact by helping them develop the environmental permitting processes surrounding coal production. No legislative proposals are helping our domestic industry do so.

Climate change legislation supporters claim the mantle of "moral authority," touting the benefits of "saving the world for future generations." I encourage these people to stand back and take a broad view of where we are today. Over 1.6 billion people lack access to electricity and potable water. Opponents of coal use are the single largest detriment to developing nations and the billions of humans living in poverty. International agreements, such as ones developed in Kyoto and Copenhagen, encourage the "civilized" world to pay poor nations not to develop in the same way that has made our nation the world's superpower. When wind and solar power become cost-effective without massive taxpayer-funded subsidies in 15 or 20 years, these technologies will still be unable to meet the developing world's baseload energy demands. It is time to act now to help these people. We must encourage developing nations to use our low-cost coal to improve the quality of life of their citizens. It is a win-win situation for the U.S. and developing world:

[10] According to the National Mining Association. The average Ohio coal miner earns $64,479. http://www.nma.org/pdf/c_wages_state_industries.pdf. By contrast, the Bureau of Labor Statistics estimates that each nonsupervisory coal miner makes $56,836. However, this does not include shift managers and is a nation-wide estimate. http://www.bls.gov/oco/cg/cgs004.htm

we make great strides in eliminating global poverty while simultaneously improving our own economic growth.

Despite recent events in West Virginia, the U.S. coal mining industry has the best safety record in the world. Mine Safety & Health Administration data shows 18 coal mining fatalities last year amongst 133,000 miners, an improvement of 63% from just three years earlier.[11] By contrast, the BBC estimates that 13 Chinese coal miners die every day.[12] Our safety record is largely due to combined national and state efforts to encourage innovative safety practices. The Ohio Coal Association recently collaborated with the Ohio state legislature to pass a new mine safety bill despite no fatalities in 5 years. Please see our attached summary of the legislation at the end of this testimony.

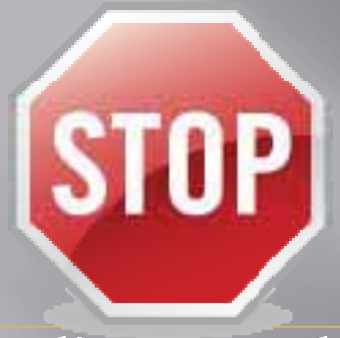
The industry is truly committed to improving mining safety and the lives of all our employees, and we will continue to invest in new safety equipment and explore new safety techniques. As we continue to improve our safety here in the U.S., we believe it is imperative to export our mining safety mechanisms and equipment to the 70 coal-producing nations that lack such advanced safeguards.

The coal industry knows what Congress and the Administration is doing. Every day our miners and support industry workers ask what we are doing to ensure their economic livelihood. These workers and communities won't soon forget the increased taxes and restrictions forced upon us. Congressional and Administration support for clean coal can be a valuable export that will improve the safety and environmental impact of coal worldwide.

I thank you for this opportunity to testify. The coal industry will continue to oppose misguided climate change legislation and costly regulations that hurt not just our own nation, but the rest of the world as well. We stand by our principles and our country, as we always have and as we always will.

[11] http://www.msha.gov/MSHAINFO/FactSheets/MSHAFCT10.HTM
[12] http://news.bbc.co.uk/2/hi/asia-pacific/7132017.stm

Regulatory Assault on Coal



Finalized Regulations

1. Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act
2. Mandatory Reporting of Greenhouse Gases
3. Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NSR): Inclusion of Fugitive Emissions
4. Standards of Performance for Fossil-Fuel-Fired Steam Generators, Electric Utility Steam Generating and Industrial-Commercial-Institutional Steam Generating Units
5. Standards of Performance for Coal Preparation and Processing Plants
6. Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NSR): Aggregation
7. Primary National Ambient Air Quality Standards for Nitrogen Dioxide
8. Reconsideration of Interpretation of Regulations that Determine Pollutants Covered by the Federal PSD Permit Program

Pending Regulations

1. National Ambient Air Quality Standards for Ozone
2. Definition of Solid Waste
3. Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule
4. Implementation of the New Source Review (NSR) Program for Particulate Matter Less than 2.5 Micrometers
5. Withdrawal of the Emission-Comparable Fuel Exclusion under RCRA
6. Primary National Ambient Air Quality Standard for Sulfur Dioxide

Ideas and Policies Under Consideration

1. Hazardous Waste Management Systems: Identification and Listing of Hazardous Waste: Carbon Dioxide (CO2) Injectate in Geological Sequestration Activities
2. Clean Water Act regulations
3. Endangered Species Act
4. Executive Orders reducing GHGs
5. Natural Gas as BACT
6. GHGs as Hazardous Air Pollutants and regulations through Sec. 112 of CAA
7. National Ambient Air Quality Standards for GHGs
8. Invoking Sec. 115 of CAA for International Pollution
9. Mandatory retirement of old coal-fired power plants
10. Additional criteria pollutant restrictions for stationary sources
11. Coal ash defined as hazardous waste

Ohio Mine Safety Bill

This bill passed in 2008 granted money to be transferred from the BWC to create a Mine safety fund that built a state of the art mine safety training facility as well as funds the mine safety division of the Ohio Department of Natural Resources and provides training to mine rescue teams in Ohio. This was a bipartisan bill that revolutionized Ohio's mine safety laws.

Am. S.B. 323

127th General Assembly
(As Passed by the General Assembly)

Sens. Niehaus, Wilson, Harris, Carey, Schuler, Padgett, Seitz, Spada, Mumper, Schaffer, Morano, Boccieri, Cafaro, Fedor, Goodman, Grendell, Kearney, D. Miller, R. Miller, Sawyer, Smith, Stivers, Cates, Amstutz, Faber, Mason, Wagoner, Austria

Reps. Sayre, Yates, Domenick, Gibbs, Batchelder, Bolon, Book, Budish, Celeste, Chandler, Collier, Combs, Driehaus, Dyer, Evans, Flowers, Foley, Gardner, Garrison, Gerberry, Goyal, J. Hagan, Harwood, Hite, Hottinger, Hughes, Luckie, Lundy, J. McGregor, Mecklenborg, Oelslager, Patton, Schlichter, Schneider, Skindell, Slesnick, D. Stewart, J. Stewart, Strahorn, Szollosi, Uecker, B. Williams, Yuko
Effective date: Emergency, June 11, 2008

ACT SUMMARY

- Creates the Mine Safety Fund to be used for specified mine safety purposes, and authorizes the Administrator of Workers' Compensation to transfer a portion of the interest money from the continuing Coal-Workers Pneumoconiosis Fund to the Mine Safety Fund.
- Requires applicants for examination for certification as mine forepersons or forepersons of gaseous or nongaseous mines to pay a fee established in rules adopted by the Chief of the Division of Mineral Resources Management in the Department of Natural Resources under the act rather than a $10 fee established in former law.
- Requires a person who has been certified as a mine foreperson or foreperson of a gaseous mine or nongaseous coal mine and who has not worked in an underground coal mine for more than two years to be recertified, requires such a previously certified person who has not worked in an underground coal mine for at least one year to successfully complete a retraining course, and requires the Chief to adopt rules governing recertification and retraining.
- Generally, establishes immunity for mine rescue crew members, employers of crew members, and employees of the Division of Mineral Resources Management from liability in any civil action that arises for damage or injury caused in the performance of rescue work at an underground coal mine.
- Allows the operator of an underground coal mine to provide a mine medical responder at the mine in order to comply with the continuing requirement that an emergency medical technician be on duty at the mine when miners are working, requires the Chief to adopt rules governing mine medical responder training, continuing training, examination, and an examination fee, and defines "mine medical responder" as a person who has satisfied the requirements established in rules.
- Requires the operator of an underground coal mine to provide tag lines or tie-off lines for each miner at the mine, requires mine employees to use tag lines or tie-off lines, and requires the Chief to adopt rules governing tag line and tie-off line use.
- Requires the operator of an underground coal mine to install fire detection devices on each conveyor belt that is used in the mine, and requires the Chief to adopt rules governing the use of such fire detection devices.
- Delays by one day the date by which the Administrator of Workers' Compensation must transition from use of the Micro Insurance Reserve Analysis System.
- Declares an emergency.

Environmental Effects of Increased Atmospheric Carbon Dioxide

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ABSTRACT A review of the research literature concerning the environmental consequences of increased levels of atmospheric carbon dioxide leads to the conclusion that increases during the 20th and early 21st centuries have produced no deleterious effects upon Earth's weather and climate. Increased carbon dioxide has, however, markedly increased plant growth. Predictions of harmful climatic effects due to future increases in hydrocarbon use and minor greenhouse gases like CO_2 do not conform to current experimental knowledge. The environmental effects of rapid expansion of the nuclear and hydrocarbon energy industries are discussed.

SUMMARY

Political leaders gathered in Kyoto, Japan, in December 1997 to consider a world treaty restricting human production of "greenhouse gases," chiefly carbon dioxide (CO_2). They feared that CO_2 would result in "human-caused global warming" – hypothetical severe increases in Earth's temperatures, with disastrous environmental consequences. During the past 10 years, many political efforts have been made to force worldwide agreement to the Kyoto treaty.

When we reviewed this subject in 1998 (1,2), existing satellite records were short and were centered on a period of changing intermediate temperature trends. Additional experimental data have now been obtained, so better answers to the questions raised by the hypothesis of "human-caused global warming" are now available.

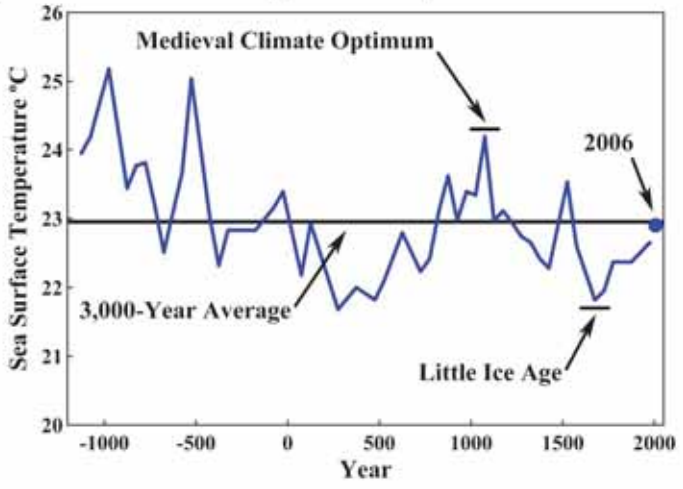

Figure 1: Surface temperatures in the Sargasso Sea, a 2 million square mile region of the Atlantic Ocean, with time resolution of 50 to 100 years and ending in 1975, as determined by isotope ratios of marine organism remains in sediment at the bottom of the sea (3). The horizontal line is the average temperature for this 3,000-year period. The Little Ice Age and Medieval Climate Optimum were naturally occurring, extended intervals of climate departures from the mean. A value of 0.25 °C, which is the change in Sargasso Sea temperature between 1975 and 2006, has been added to the 1975 data in order to provide a 2006 temperature value.

The average temperature of the Earth has varied within a range of about 3°C during the past 3,000 years. It is currently increasing as the Earth recovers from a period that is known as the Little Ice Age, as shown in Figure 1. George Washington and his army were at Valley Forge during the coldest era in 1,500 years, but even then the temperature was only about 1° Centigrade below the 3,000-year average.

The most recent part of this warming period is reflected by shortening of world glaciers, as shown in Figure 2. Glaciers regularly lengthen and shorten in delayed correlation with cooling and warming trends. Shortening lags temperature by about 20 years, so the current warming trend began in about 1800.

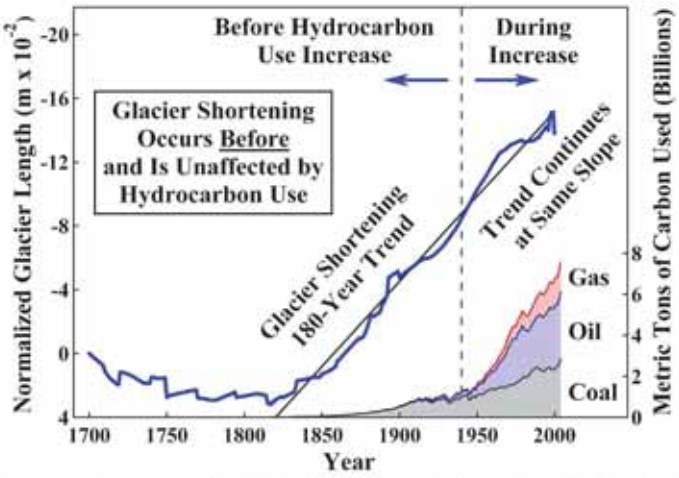

Figure 2: Average length of 169 glaciers from 1700 to 2000 (4). The principal source of melt energy is solar radiation. Variations in glacier mass and length are primarily due to temperature and precipitation (5,6). This melting trend lags the temperature increase by about 20 years, so it predates the 6-fold increase in hydrocarbon use (7) even more than shown in the figure. Hydrocarbon use could not have caused this shortening trend.

Atmospheric temperature is regulated by the sun, which fluctuates in activity as shown in Figure 3; by the greenhouse effect, largely caused by atmospheric water vapor (H_2O); and by other phenomena that are more poorly understood. While major greenhouse gas H_2O substantially warms the Earth, minor greenhouse gases such as CO_2

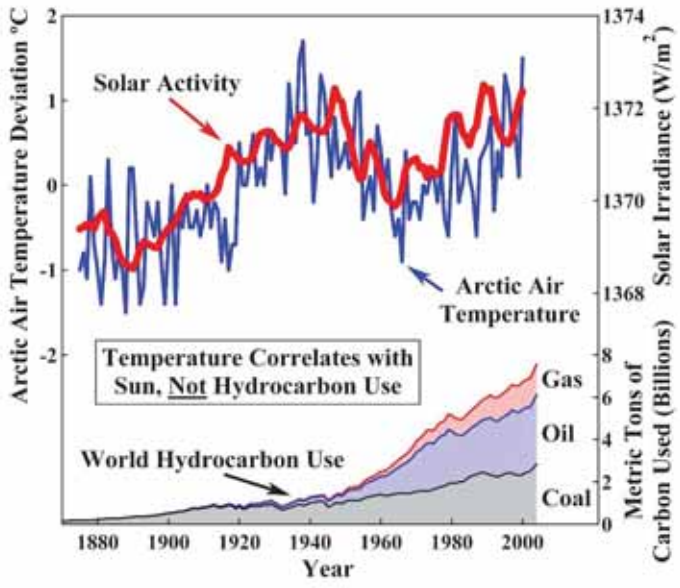

Figure 3: Arctic surface air temperature compared with total solar irradiance as measured by sunspot cycle amplitude, sunspot cycle length, solar equatorial rotation rate, fraction of penumbral spots, and decay rate of the 11-year sunspot cycle (8,9). Solar irradiance correlates well with Arctic temperature, while hydrocarbon use (7) does not correlate.

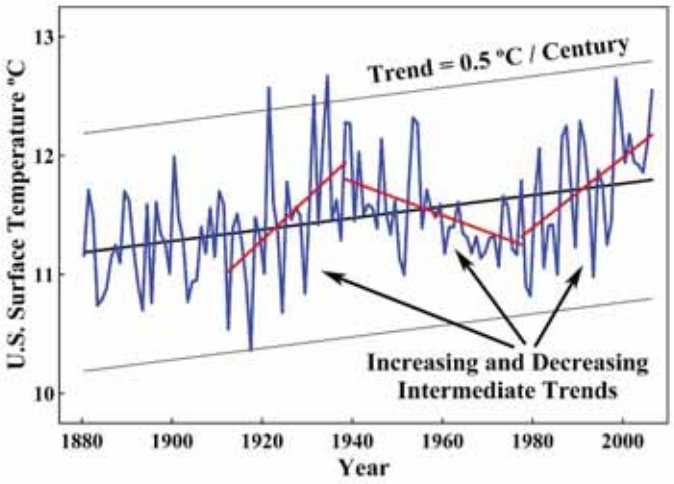

Figure 4: Annual mean surface temperatures in the contiguous United States between 1880 and 2006 (10). The slope of the least-squares trend line for this 127-year record is 0.5 °C per century.

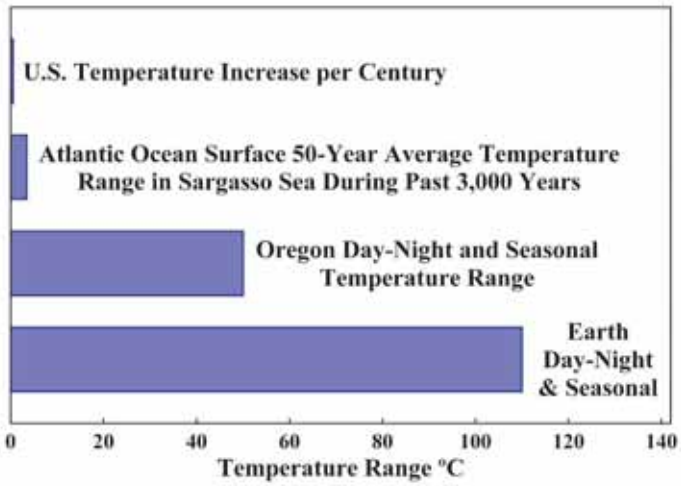

Figure 6: Comparison between the current U.S. temperature change per century, the 3,000-year temperature range in Figure 1, seasonal and diurnal range in Oregon, and seasonal and diurnal range throughout the Earth.

have little effect, as shown in Figures 2 and 3. The 6-fold increase in hydrocarbon use since 1940 has had no noticeable effect on atmospheric temperature or on the trend in glacier length.

While Figure 1 is illustrative of most geographical locations, there is great variability of temperature records with location and regional climate. Comprehensive surveys of published temperature records confirm the principal features of Figure 1, including the fact that the current Earth temperature is approximately 1 °C lower than that during the Medieval Climate Optimum 1,000 years ago (11,12).

Surface temperatures in the United States during the past century reflect this natural warming trend and its correlation with solar activity, as shown in Figures 4 and 5. Compiled U.S. surface temperatures have increased about 0.5 °C per century, which is consistent with other historical values of 0.4 to 0.5 °C per century during the recovery from the Little Ice Age (13-17). This temperature change is slight as compared with other natural variations, as shown in Figure 6. Three intermediate trends are evident, including the decreasing trend used to justify fears of "global cooling" in the 1970s.

Between 1900 and 2000, on absolute scales of solar irradiance and degrees Kelvin, solar activity increased 0.19%, while a 0.5 °C temperature change is 0.21%. This is in good agreement with estimates that Earth's temperature would be reduced by 0.6 °C through particulate blocking of the sun by 0.2% (18).

Solar activity and U.S. surface temperature are closely correlated, as shown in Figure 5, but U.S. surface temperature and world hydrocarbon use are not correlated, as shown in Figure 13.

The U.S. temperature trend is so slight that, were the temperature change which has taken place during the 20th and 21st centuries to occur in an ordinary room, most of the people in the room would be unaware of it.

During the current period of recovery from the Little Ice Age, the U.S. climate has improved somewhat, with more rainfall, fewer tornados, and no increase in hurricane activity, as illustrated in Figures 7 to 10. Sea level has trended upward for the past 150 years at a rate of 7 inches per century, with 3 intermediate uptrends and 2 periods of no increase as shown in Figure 11. These features are confirmed by the glacier record as shown in Figure 12. If this trend continues as

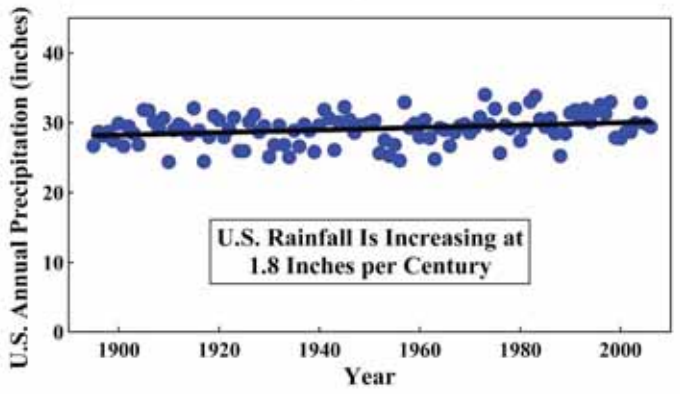

Figure 7: Annual precipitation in the contiguous 48 United States between 1895 and 2006. U.S. National Climatic Data Center, U.S. Department of Commerce 2006 Climate Review (20). The trend shows an increase in rainfall of 1.8 inches per century – approximately 6% per century.

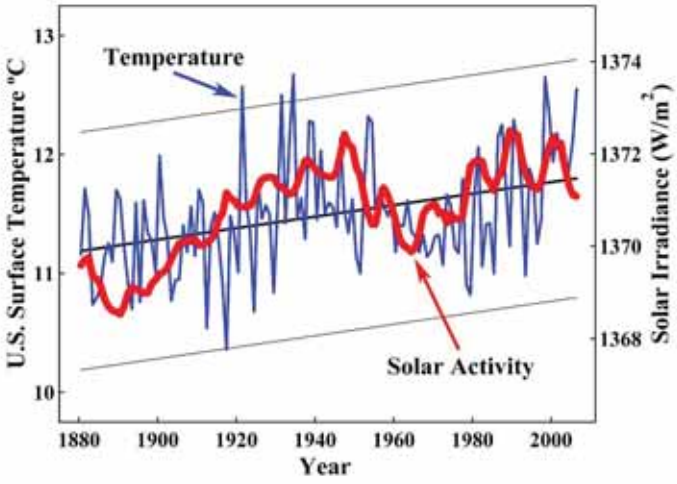

Figure 5: U.S. surface temperature from Figure 4 as compared with total solar irradiance (19) from Figure 3.

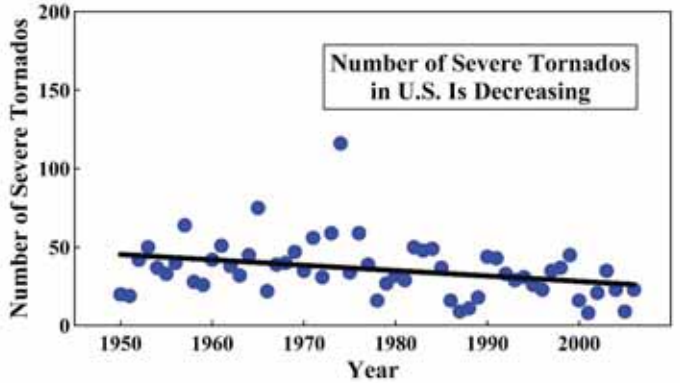

Figure 8: Annual number of strong-to-violent category F3 to F5 tornados during the March-to-August tornado season in the U.S. between 1950 and 2006. U.S. National Climatic Data Center, U.S. Department of Commerce 2006 Climate Review (20). During this period, world hydrocarbon use increased 6-fold, while violent tornado frequency decreased by 43%.

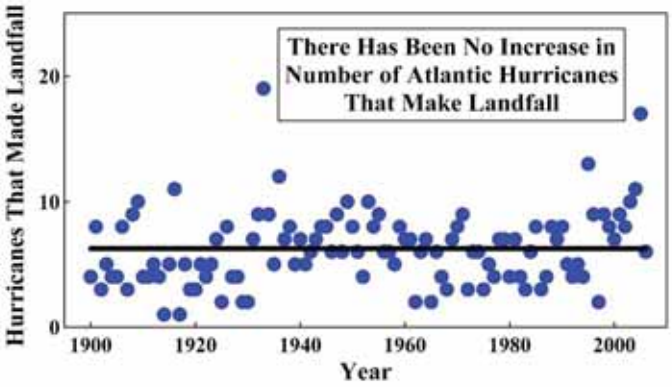

Figure 9: Annual number of Atlantic hurricanes that made landfall between 1900 and 2006 (21). Line is drawn at mean value.

did that prior to the Medieval Climate Optimum, sea level would be expected to rise about 1 foot during the next 200 years.

As shown in Figures 2, 11, and 12, the trends in glacier shortening and sea level rise began a century ***before*** the 60-year 6-fold increase in hydrocarbon use, and have not changed during that increase. Hydrocarbon use could not have caused these trends.

During the past 50 years, atmospheric CO_2 has increased by 22%. Much of that CO_2 increase is attributable to the 6-fold increase in human use of hydrocarbon energy. Figures 2, 3, 11, 12, and 13 show, however, that human use of hydrocarbons has not caused the observed increases in temperature.

The increase in atmospheric carbon dioxide has, however, had a substantial environmental effect. Atmospheric CO_2 fertilizes plants. Higher CO_2 enables plants to grow faster and larger and to live in drier climates. Plants provide food for animals, which are thereby also enhanced. The extent and diversity of plant and animal life have both increased substantially during the past half-century. Increased temperature has also mildly stimulated plant growth.

Does a catastrophic amplification of these trends with damaging climatological consequences lie ahead? There are no experimental data that suggest this. There is also no experimentally validated theoretical evidence of such an amplification.

Predictions of catastrophic global warming are based on computer climate modeling, a branch of science still in its infancy. The empirical evidence – actual measurements of Earth's temperature and climate – shows no man-made warming trend. Indeed, during four of the seven decades since 1940 when average CO_2 levels steadily increased, U.S. average temperatures were actually decreasing.

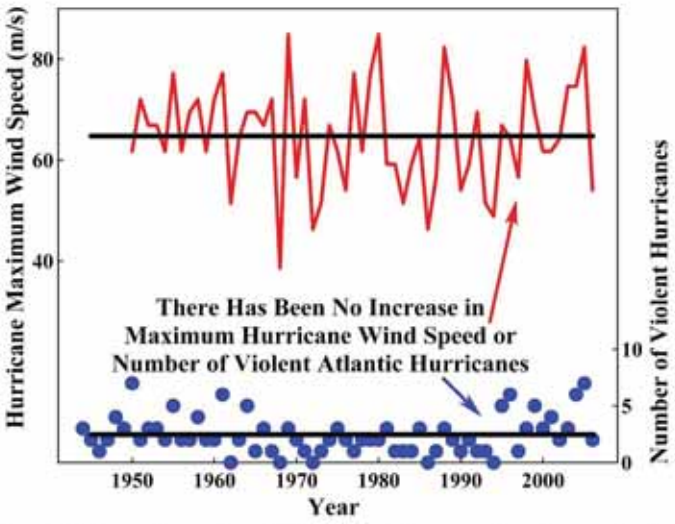

Figure 10: Annual number of violent hurricanes and maximum attained wind speed during those hurricanes in the Atlantic Ocean between 1944 and 2006 (22,23). There is no upward trend in either of these records. During this period, world hydrocarbon use increased 6-fold. Lines are mean values.

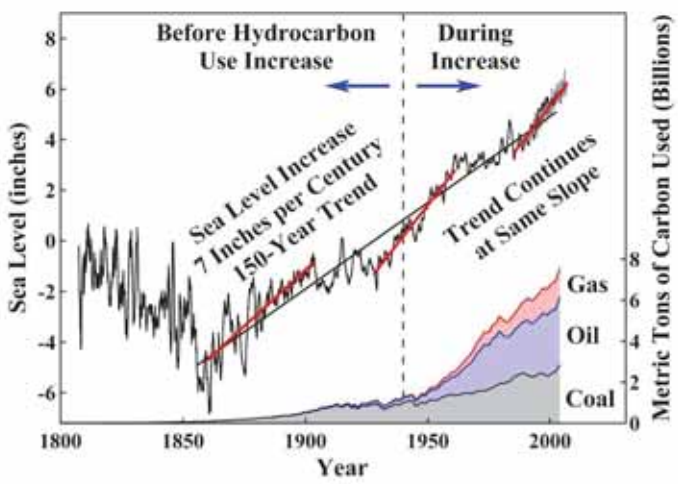

Figure 11: Global sea level measured by surface gauges between 1807 and 2002 (24) and by satellite between 1993 and 2006 (25). Satellite measurements are shown in gray and agree with tide gauge measurements. The overall trend is an increase of 7 inches per century. Intermediate trends are 9, 0, 12, 0, and 12 inches per century, respectively. This trend lags the temperature increase, so it predates the increase in hydrocarbon use even more than is shown. It is unaffected by the very large increase in hydrocarbon use.

While CO_2 levels have increased substantially and are expected to continue doing so and humans have been responsible for part of this increase, the effect on the environment has been benign.

There is, however, one very dangerous possibility.

Our industrial and technological civilization depends upon abundant, low-cost energy. This civilization has already brought unprecedented prosperity to the people of the more developed nations. Billions of people in the less developed nations are now lifting themselves from poverty by adopting this technology.

Hydrocarbons are essential sources of energy to sustain and extend prosperity. This is especially true of the developing nations, where available capital and technology are insufficient to meet rapidly increasing energy needs without extensive use of hydrocarbon fuels. If, through misunderstanding of the underlying science and through misguided public fear and hysteria, mankind significantly rations and restricts the use of hydrocarbons, the worldwide increase in prosperity will stop. The result would be vast human suffering and the loss of hundreds of millions of human lives. Moreover, the prosperity of those in the developed countries would be greatly reduced.

Mild ordinary natural increases in the Earth's temperature have occurred during the past two to three centuries. These have resulted in some improvements in overall climate and also some changes in

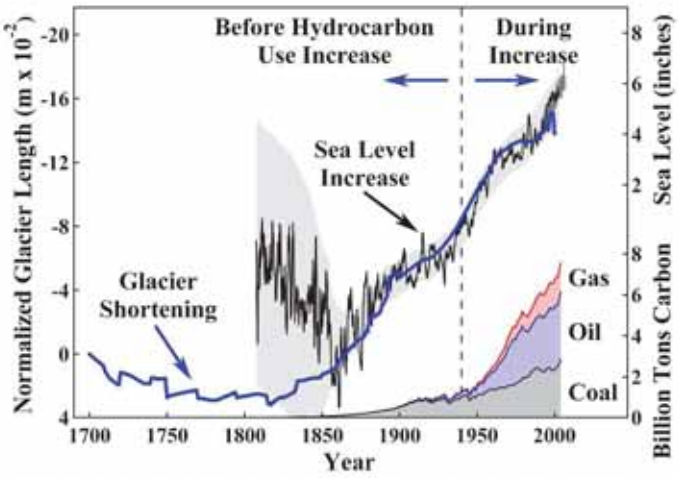

Figure 12: Glacier shortening (4) and sea level rise (24,25). Gray area designates estimated range of error in the sea level record. These measurements lag air temperature increases by about 20 years. So, the trends began more than a century before increases in hydrocarbon use.

the landscape, such as a reduction in glacier lengths and increased vegetation in colder areas. Far greater changes have occurred during the time that all current species of animals and plants have been on the Earth. The relative population sizes of the species and their geographical distributions vary as they adapt to changing conditions.

The temperature of the Earth is continuing its process of fluctuation in correlation with variations in natural phenomena. Mankind, meanwhile, is moving some of the carbon in coal, oil, and natural gas from below ground to the atmosphere and surface, where it is available for conversion into living things. We are living in an increasingly lush environment of plants and animals as a result. This is an unexpected and wonderful gift from the Industrial Revolution.

ATMOSPHERIC AND SURFACE TEMPERATURES

Atmospheric and surface temperatures have been recovering from an unusually cold period. During the time between 200 and 500 years ago, the Earth was experiencing the "Little Ice Age." It had descended into this relatively cool period from a warm interval about 1,000 years ago known as the "Medieval Climate Optimum." This is shown in Figure 1 for the Sargasso Sea.

During the Medieval Climate Optimum, temperatures were warm enough to allow the colonization of Greenland. These colonies were abandoned after the onset of colder temperatures. For the past 200 to 300 years, Earth temperatures have been gradually recovering (26). Sargasso Sea temperatures are now approximately equal to the average for the previous 3,000 years.

The historical record does not contain any report of "global warming" catastrophes, even though temperatures have been higher than they are now during much of the last three millennia.

The 3,000-year range of temperatures in the Sargasso Sea is typical of most places. Temperature records vary widely with geographical location as a result of climatological characteristics unique to those specific regions, so an "average" Earth temperature is less meaningful than individual records (27). So called "global" or "hemispheric" averages contain errors created by averaging systematically different aspects of unique geographical regions and by inclusion of regions where temperature records are unreliable.

Three key features of the temperature record – the Medieval Climate Optimum, the Little Ice Age, and the Not-Unusual-Temperature of the 20th century – have been verified by a review of local temperature and temperature-correlated records throughout the world (11), as summarized in Table 1. Each record was scored with respect to those queries to which it applied. The experimental and historical literature definitively confirms the primary features of Figure 1.

Most geographical locations experienced both the Medieval Climate Optimum and the Little Ice Age – and most locations did not

Table 1: Query	Yes	No	Yes/No	Two-Tailed Probability
Warm Climatic Anomaly 800-1300 A.D.?	88	2	7	> 99.99
Cold Climatic Anomaly 1300-1900 A.D.?	105	2	2	> 99.99
20th Century Warmest in Individual Record?	7	64	14	< 0.0001

Table 1: Comprehensive review of all instances in which temperature or temperature-correlated records from localities throughout the world permit answers to queries concerning the existence of the Medieval Climate Optimum, the Little Ice Age, and an unusually warm anomaly in the 20th century (11). The compiled and tabulated answers confirm the three principal features of the Sargasso Sea record shown in Figure 1. The probability that the answer to the query in column 1 is "yes" is given in column 5.

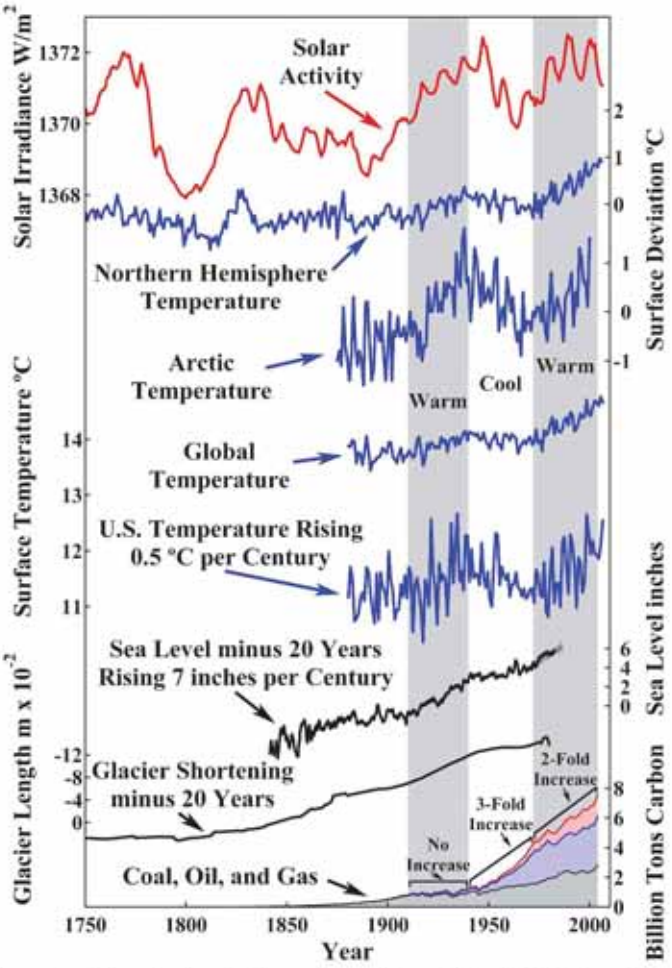

Figure 13: Seven independent records – solar activity (9); Northern Hemisphere, (13), Arctic (28), global (10), and U.S. (10) annual surface air temperatures; sea level (24,25); and glacier length (4) – all qualitatively confirm each other by exhibiting three intermediate trends – warmer, cooler, and warmer. Sea level and glacier length are shown minus 20 years, correcting for their 20-year lag of atmospheric temperature. Solar activity, Northern Hemisphere temperature, and glacier lengths show a low in about 1800.

Hydrocarbon use (7) is uncorrelated with temperature. Temperature rose for a century before significant hydrocarbon use. Temperature rose between 1910 and 1940, while hydrocarbon use was almost unchanged. Temperature then fell between 1940 and 1972, while hydrocarbon use rose by 330%. Also, the 150 to 200-year slopes of the sea level and glacier trends were unchanged by the very large increase in hydrocarbon use after 1940.

experience temperatures that were unusually warm during the 20th century. A review of 23 quantitative records has demonstrated that mean and median world temperatures in 2006 were, on average, approximately 1 °C or 2 °F cooler than in the Medieval Period (12).

World glacier length (4) and world sea level (24,25) measurements provide records of the recent cycle of recovery. Warmer temperatures diminish glaciers and cause sea level to rise because of decreased ocean water density and other factors.

These measurements show that the trend of 7 inches per century increase in sea level and the shortening trend in average glacier length both began a century before 1940, yet 84% of total human annual hydrocarbon use occurred only after 1940. Moreover, neither of these trends has accelerated during the period between 1940 and 2007, while hydrocarbon use increased 6-fold. Sea level and glacier records are offset by about 20 years because of the delay between temperature rise and glacier and sea level change.

If the natural trend in sea level increase continues for another two centuries as did the temperature rise in the Sargasso Sea as the Earth entered the Medieval Warm Period, sea level would be expected to rise about 1 foot between the years 2000 and 2200. Both the sea level and glacier trends – and the temperature trend that they reflect – are

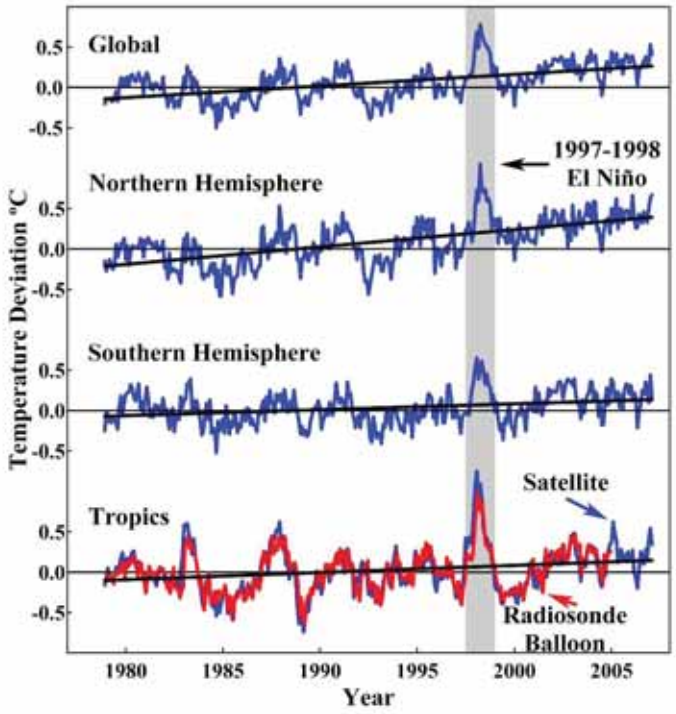

Figure 14: Satellite microwave sounding unit (blue) measurements of tropospheric temperatures in the Northern Hemisphere between 0 and 82.5 N, Southern Hemisphere between 0 and 82.5 S, tropics between 20S and 20N, and the globe between 82.5N and 82.5S between 1979 and 2007 (29), and radiosonde balloon (red) measurements in the tropics (29). The balloon measurements confirm the satellite technique (29-31). The warming anomaly in 1997-1998 (gray) was caused by El Niño, which, like the overall trends, is unrelated to CO_2 (32).

unrelated to hydrocarbon use. A further doubling of world hydrocarbon use would not change these trends.

Figure 12 shows the close correlation between the sea level and glacier records, which further validates both records and the duration and character of the temperature change that gave rise to them.

Figure 4 shows the annual temperature in the United States during the past 127 years. This record has an upward trend of 0.5 °C per century. Global and Northern Hemisphere surface temperature records shown in Figure 13 trend upward at 0.6 °C per century. These records are, however, biased toward higher temperatures in several ways. For example, they preferentially use data near populated areas (33), where heat island effects are prevalent, as illustrated in Figure 15. A trend of 0.5 °C per century is more representative (13-17).

The U.S. temperature record has two intermediate uptrends of comparable magnitude, one occurring before the 6-fold increase in hydrocarbon use and one during it. Between these two is an intermediate temperature downtrend, which led in the 1970s to fears of an impending new ice age. This decrease in temperature occurred during a period in which hydrocarbon use increased 3-fold.

Seven independent records – solar irradiance; Arctic, Northern Hemisphere, global, and U.S. annual average surface air temperatures; sea level; and glacier length – all exhibit these three intermediate trends, as shown in Figure 13. These trends confirm one another. Solar irradiance correlates with them. Hydrocarbon use does not.

The intermediate uptrend in temperature between 1980 and 2006 shown in Figure 13 is similar to that shown in Figure 14 for balloon and satellite tropospheric measurements. This trend is more pronounced in the Northern Hemisphere than in the Southern. Contrary to the CO_2 warming climate models, however, tropospheric temperatures are not rising faster than surface temperatures.

Figure 6 illustrates the magnitudes of these temperature changes by comparing the 0.5 °C per century temperature change as the Earth recovers from the Little Ice Age, the range of 50-year averaged Atlantic ocean surface temperatures in the Sargasso Sea over the past 3,000 years, the range of day-night and seasonal variation on average in Oregon, and the range of day-night and seasonal variation over the whole Earth. The two-century-long temperature change is small.

Tropospheric temperatures measured by satellite give comprehensive geographic coverage. Even the satellite measurements, however, contain short and medium-term fluctuations greater than the slight warming trends calculated from them. The calculated trends vary significantly as a function of the most recent fluctuations and the lengths of the data sets, which are short.

Figure 3 shows the latter part of the period of warming from the Little Ice Age in greater detail by means of Arctic air temperature as compared with solar irradiance, as does Figure 5 for U.S. surface temperature. There is a close correlation between solar activity and temperature and none between hydrocarbon use and temperature. Several other studies over a wide variety of time intervals have found similar correlations between climate and solar activity (15, 34-39).

Figure 3 also illustrates the uncertainties introduced by limited time records. If the Arctic air temperature data before 1920 were not available, essentially no uptrend would be observed.

This observed variation in solar activity is typical of stars close in size and age to the sun (40). The current warming trends on Mars (41), Jupiter (42), Neptune (43,44), Neptune's moon Triton (45), and Pluto (46-48) may result, in part, from similar relations to the sun and its activity – like those that are warming the Earth.

Hydrocarbon use and atmospheric CO_2 do not correlate with the observed temperatures. Solar activity correlates quite well. Correlation does not prove causality, but non-correlation proves non-causality. Human hydrocarbon use is not measurably warming the earth. Moreover, there is a robust theoretical and empirical model for solar warming and cooling of the Earth (8,19,49,50). The experimental data do not prove that solar activity is the only phenomenon responsible for substantial Earth temperature fluctuations, but they do show that human hydrocarbon use is not among those phenomena.

The overall experimental record is self-consistent. The Earth has been warming as it recovers from the Little Ice Age at an average rate of about 0.5 °C per century. Fluctuations within this temperature trend include periods of more rapid increase and also periods of temperature decrease. These fluctuations correlate well with concomitant fluctuations in the activity of the sun. Neither the trends nor the fluctuations within the trends correlate with hydrocarbon use. Sea level and glacier length reveal three intermediate uptrends and two downtrends since 1800, as does solar activity. These trends are climatically benign and result from natural processes.

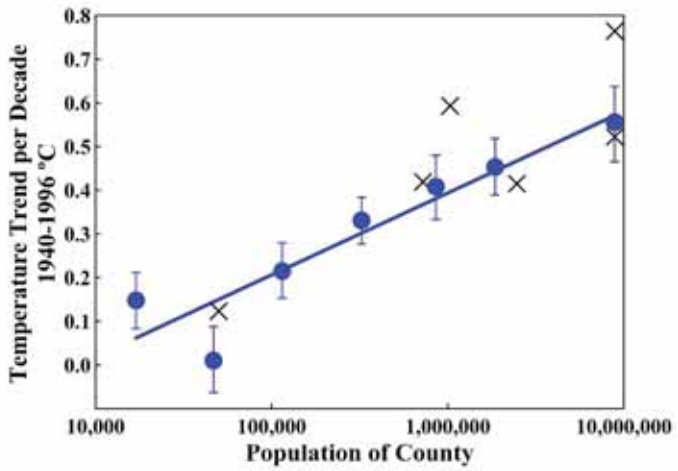

Figure 15: Surface temperature trends for 1940 to 1996 from 107 measuring stations in 49 California counties (51,52). The trends were combined for counties of similar population and plotted with the standard errors of their means. The six measuring stations in Los Angeles County were used to calculate the standard error of that county, which is plotted at a population of 8.9 million. The "urban heat island effect" on surface measurements is evident. The straight line is a least-squares fit to the closed circles. The points marked "X" are the six unadjusted station records selected by NASA GISS (53-55) for use in their estimate of global surface temperatures. Such selections make NASA GISS temperatures too high.

ATMOSPHERIC CARBON DIOXIDE

The concentration of CO_2 in Earth's atmosphere has increased during the past century, as shown in Figure 17. The magnitude of this atmospheric increase is currently about 4 gigatons (Gt C) of carbon per year. Total human industrial CO_2 production, primarily from use of coal, oil, and natural gas and the production of cement, is currently about 8 Gt C per year (7,56,57). Humans also exhale about 0.6 Gt C per year, which has been sequestered by plants from atmospheric CO_2. Office air concentrations often exceed 1,000 ppm CO_2.

To put these figures in perspective, it is estimated that the atmosphere contains 780 Gt C; the surface ocean contains 1,000 Gt C; vegetation, soils, and detritus contain 2,000 Gt C; and the intermediate and deep oceans contain 38,000 Gt C, as CO_2 or CO_2 hydration products. Each year, the surface ocean and atmosphere exchange an estimated 90 Gt C; vegetation and the atmosphere, 100 Gt C; marine biota and the surface ocean, 50 Gt C; and the surface ocean and the intermediate and deep oceans, 40 Gt C (56,57).

So great are the magnitudes of these reservoirs, the rates of exchange between them, and the uncertainties of these estimated numbers that the sources of the recent rise in atmospheric CO_2 have not been determined with certainty (58,59). Atmospheric concentrations of CO_2 are reported to have varied widely over geological time, with peaks, according to some estimates, some 20-fold higher than at present and lows at approximately 200 ppm (60-62).

Ice-core records are reported to show seven extended periods during 650,000 years in which CO_2, methane (CH_4), and temperature increased and then decreased (63-65). Ice-core records contain substantial uncertainties (58), so these correlations are imprecise.

In all seven glacial and interglacial cycles, the reported changes in CO_2 and CH_4 lagged the temperature changes and could not, therefore, have caused them (66). These fluctuations probably involved temperature-caused changes in oceanic and terrestrial CO_2 and CH_4 content. More recent CO_2 fluctuations also lag temperature (67,68).

In 1957, Revelle and Seuss (69) estimated that temperature-caused out-gassing of ocean CO_2 would increase atmospheric

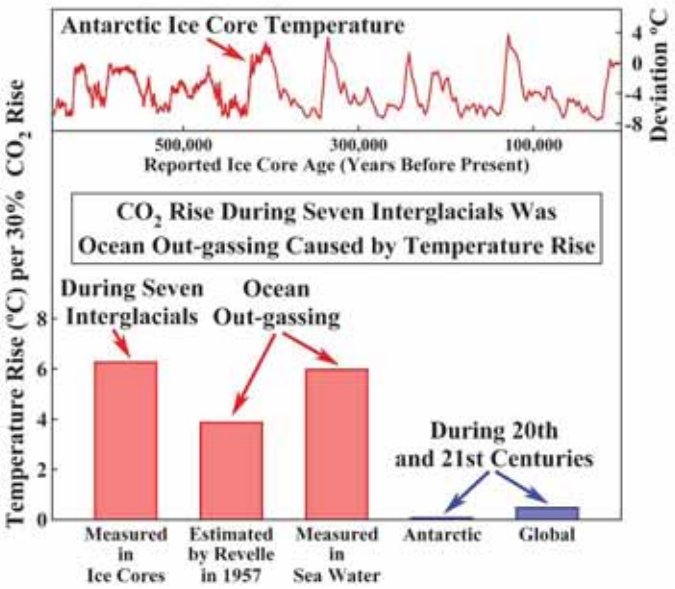

Figure 16: Temperature rise versus CO_2 rise from seven ice-core measured interglacial periods (63-65); from calculations (69) and measurements (70) of sea water out-gassing; and as measured during the 20th and 21st centuries (10,72). The interglacial temperature increases caused the CO_2 rises through release of ocean CO_2. The CO_2 rises did not cause the temperature rises.

In addition to the agreement between the out-gassing estimates and measurements, this conclusion is also verified by the small temperature rise during the 20th and 21st centuries. If the CO_2 versus temperature correlation during the seven interglacials had been caused by CO_2 greenhouse warming, then the temperature rise per CO_2 rise would have been as high during the 20th and 21st centuries as it was during the seven interglacial periods.

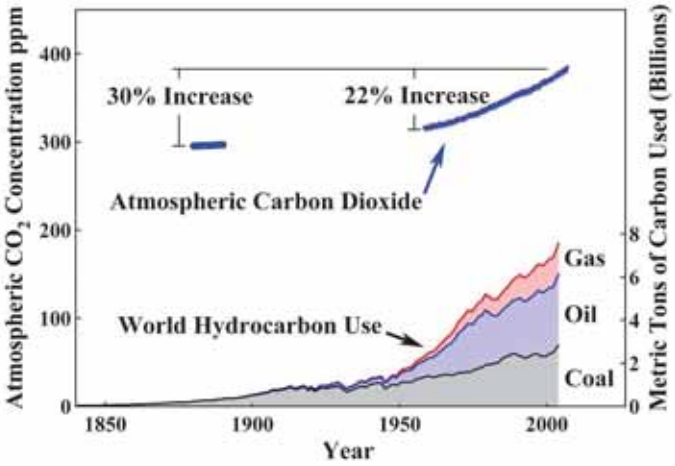

Figure 17: Atmospheric CO_2 concentrations in parts per million by volume, ppm, measured spectrophotometrically at Mauna Loa, Hawaii, between 1958 and 2007. These measurements agree well with those at other locations (71). Data before 1958 are from ice cores and chemical analyses, which have substantial experimental uncertainties. We have used 295 ppm for the period 1880 to 1890, which is an average of the available estimates. About 0.6 Gt C of CO_2 is produced annually by human respiration and often leads to concentrations exceeding 1,000 ppm in public buildings. Atmospheric CO_2 has increased 22% since 1958 and about 30% since 1880.

CO_2 by about 7% per °C temperature rise. The reported change during the seven interglacials of the 650,000-year ice core record is about 5% per °C (63), which agrees with the out-gassing calculation.

Between 1900 and 2006, Antarctic CO_2 increased 30% per 0.1 °C temperature change (72), and world CO_2 increased 30% per 0.5 °C. In addition to ocean out-gassing, CO_2 from human use of hydrocarbons is a new source. Neither this new source nor the older natural CO_2 sources are causing atmospheric temperature to change.

The hypothesis that the CO_2 rise during the interglacials caused the temperature to rise requires an increase of about 6 °C per 30% rise in CO_2 as seen in the ice core record. If this hypothesis were correct, Earth temperatures would have risen about 6 °C between 1900 and 2006, rather than the rise of between 0.1 °C and 0.5 °C, which actually occurred. This difference is illustrated in Figure 16.

The 650,000-year ice-core record does not, therefore, agree with the hypothesis of "human-caused global warming," and, in fact, provides empirical evidence that invalidates this hypothesis.

Carbon dioxide has a very short residence time in the atmosphere. Beginning with the 7 to 10-year half-time of CO_2 in the atmosphere estimated by Revelle and Seuss (69), there were 36 estimates of the atmospheric CO_2 half-time based upon experimental measurements published between 1957 and 1992 (59). These range between 2 and 25 years, with a mean of 7.5, a median of 7.6, and an upper range average of about 10. Of the 36 values, 33 are 10 years or less.

Many of these estimates are from the decrease in atmospheric carbon 14 after cessation of atmospheric nuclear weapons testing, which provides a reliable half-time. There is no experimental evidence to support computer model estimates (73) of a CO_2 atmospheric "lifetime" of 300 years or more.

Human production of 8 Gt C per year of CO_2 is negligible as compared with the 40,000 Gt C residing in the oceans and biosphere. At ultimate equilibrium, human-produced CO_2 will have an insignificant effect on the amounts in the various reservoirs. The rates of approach to equilibrium are, however, slow enough that human use creates a transient atmospheric increase.

In any case, the sources and amounts of CO_2 in the atmosphere are of secondary importance to the hypothesis of "human-caused global warming." It is human burning of coal, oil, and natural gas that is at issue. CO_2 is merely an intermediate in a hypothetical mechanism by which this "human-caused global warming" is said to take place. The amount of atmospheric CO_2 does have profound environmental effects on plant and animal populations (74) and diversity, as is discussed below.

CLIMATE CHANGE

While the average temperature change taking place as the Earth recovers from the Little Ice Age is so slight that it is difficult to discern, its environmental effects are measurable. Glacier shortening and the 7 inches per century rise in sea level are examples. There are additional climate changes that are correlated with this rise in temperature and may be caused by it.

Greenland, for example, is beginning to turn green again, as it was 1,000 years ago during the Medieval Climate Optimum (11). Arctic sea ice is decreasing somewhat (75), but Antarctic ice is not decreasing and may be increasing, due to increased snow (76-79).

In the United States, rainfall is increasing at about 1.8 inches per century, and the number of severe tornados is decreasing, as shown in Figures 7 and 8. If world temperatures continue to rise at the current rate, they will reach those of the Medieval Climate Optimum about 2 centuries from now. Historical reports of that period record the growing of warm weather crops in localities too cold for that purpose today, so it is to be expected that the area of more temperate climate will expand as it did then. This is already being observed, as studies at higher altitudes have reported increases in amount and diversity of plant and animal life by more than 50% (12,80).

Atmospheric temperature is increasing more in the Northern Hemisphere than in the Southern, with intermediate periods of increase and decrease in the overall trends.

There has been no increase in frequency or severity of Atlantic hurricanes during the period of 6-fold increase in hydrocarbon use, as is illustrated in Figures 9 and 10. Numbers of violent hurricanes vary greatly from year to year and are no greater now than they were 50 years ago. Similarly, maximum wind speeds have not increased.

All of the observed climate changes are gradual, moderate, and entirely within the bounds of ordinary natural changes that have occurred during the benign period of the past few thousand years.

There is no indication whatever in the experimental data that an abrupt or remarkable change in any of the ordinary natural climate variables is beginning or will begin to take place.

GLOBAL WARMING HYPOTHESIS

The greenhouse effect amplifies solar warming of the earth. Greenhouse gases such as H_2O, CO_2, and CH_4 in the Earth's atmosphere, through combined convective readjustments and the radiative blanketing effect, essentially decrease the net escape of terrestrial thermal infrared radiation. Increasing CO_2, therefore, effectively increases radiative energy input to the Earth's atmosphere. The path of this radiative input is complex. It is redistributed, both vertically and horizontally, by various physical processes, including advection, convection, and diffusion in the atmosphere and ocean.

When an increase in CO_2 increases the radiative input to the atmosphere, how and in which direction does the atmosphere respond? Hypotheses about this response differ and are schematically shown in Figure 18. Without the water-vapor greenhouse effect, the Earth would be about 14 ℃ cooler (81). The radiative contribution of doubling atmospheric CO_2 is minor, but this radiative greenhouse effect is treated quite differently by different climate hypotheses. The hypotheses that the IPCC (82,83) has chosen to adopt predict that the effect of CO_2 is amplified by the atmosphere, especially by water vapor, to produce a large temperature increase. Other hypotheses, shown as hypothesis 2, predict the opposite – that the atmospheric response will counteract the CO_2 increase and result in insignificant changes in global temperature (81,84,85,91,92). The experimental evidence, as described above, favors hypothesis 2. While CO_2 has increased substantially, its effect on temperature has been so slight that it has not been experimentally detected.

The computer climate models upon which "human-caused global warming" is based have substantial uncertainties and are markedly unreliable. This is not surprising, since the climate is a coupled,

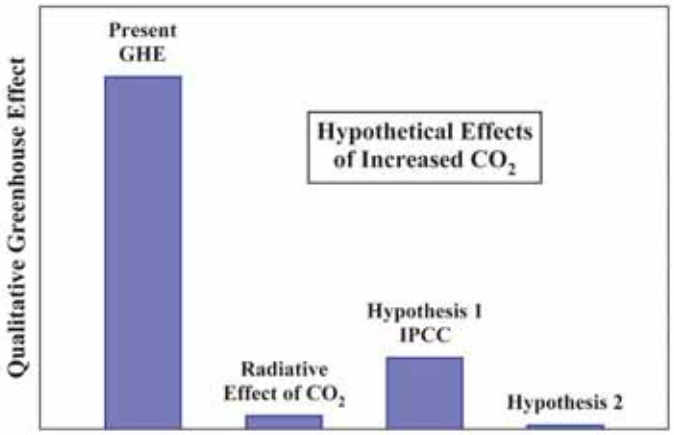

Figure 18: Qualitative illustration of greenhouse warming. "Present GHE" is the current greenhouse effect from all atmospheric phenomena. "Radiative effect of CO_2" is the added greenhouse radiative effect from doubling CO_2 without consideration of other atmospheric components. "Hypothesis 1 IPCC" is the hypothetical amplification effect assumed by IPCC. "Hypothesis 2" is the hypothetical moderation effect.

non-linear dynamical system. It is very complex. Figure 19 illustrates the difficulties by comparing the radiative CO_2 greenhouse effect with correction factors and uncertainties in some of the parameters in the computer climate calculations. Other factors, too, such as the chemical and climatic influence of volcanoes, cannot now be reliably computer modeled.

In effect, an experiment has been performed on the Earth during the past half-century – an experiment that includes all of the complex factors and feedback effects that determine the Earth's temperature and climate. Since 1940, hydrocarbon use has risen 6-fold. Yet, this rise has had no effect on the temperature trends, which have continued their cycle of recovery from the Little Ice Age in close correlation with increasing solar activity.

Not only has the global warming hypothesis failed experimental tests, it is theoretically flawed as well. It can reasonably be argued that cooling from negative physical and biological feedbacks to greenhouse gases nullifies the slight initial temperature rise (84,86).

The reasons for this failure of the computer climate models are subjects of scientific debate (87). For example, water vapor is the largest contributor to the overall greenhouse effect (88). It has been suggested that the climate models treat feedbacks from clouds, water vapor, and related hydrology incorrectly (85,89-92).

The global warming hypothesis with respect to CO_2 is not based upon the radiative properties of CO_2 itself, which is a very weak greenhouse gas. It is based upon a small initial increase in temperature caused by CO_2 and a large theoretical amplification of that temperature increase, primarily through increased evaporation of H_2O, a

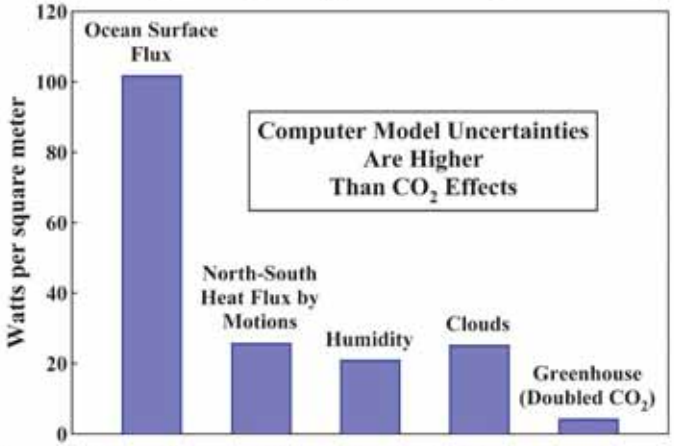

Figure 19: The radiative greenhouse effect of doubling the concentration of atmospheric CO_2 (right bar) as compared with four of the uncertainties in the computer climate models (87,93).

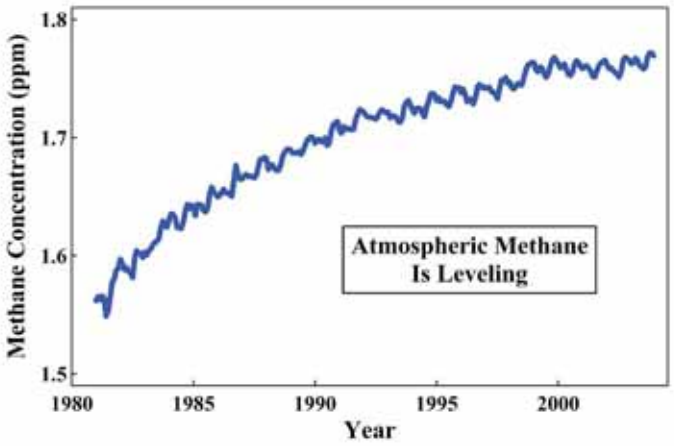

Figure 20: Global atmospheric methane concentration in parts per million between 1982 and 2004 (94).

strong greenhouse gas. Any comparable temperature increase from another cause would produce the same calculated outcome.

Thus, the 3,000-year temperature record illustrated in Figure 1 also provides a test of the computer models. The historical temperature record shows that the Earth has previously warmed far more than could be caused by CO_2 itself. Since these past warming cycles have not initiated water-vapor-mediated atmospheric warming catastrophes, it is evident that weaker effects from CO_2 cannot do so.

Methane is also a minor greenhouse gas. World CH_4 levels are, as shown in Figure 20, leveling off. In the U.S. in 2005, 42% of human-produced methane was from hydrocarbon energy production, 28% from waste management, and 30% from agriculture (95). The total amount of CH_4 produced from these U.S. sources decreased 7% between 1980 and 2005. Moreover, the record shows that, even while methane was increasing, temperature trends were benign.

The "human-caused global warming" – often called the "global warming" – hypothesis depends entirely upon computer model-generated scenarios of the future. There are no empirical records that verify either these models or their flawed predictions (96).

Claims (97) of an epidemic of insect-borne diseases, extensive species extinction, catastrophic flooding of Pacific islands, ocean acidification, increased numbers and severities of hurricanes and tornados, and increased human heat deaths from the 0.5 °C per century temperature rise are not consistent with actual observations. The "human-caused global warming" hypothesis and the computer calculations that support it are in error. They have no empirical support and are invalidated by numerous observations.

WORLD TEMPERATURE CONTROL

World temperature is controlled by natural phenomena. What steps could mankind take if solar activity or other effects began to shift the Earth toward temperatures too cold or too warm for optimum human life?

First, it would be necessary to determine what temperature humans feel is optimum. It is unlikely that the chosen temperature would be exactly that which we have today. Second, we would be fortunate if natural forces were to make the Earth too warm rather than too cold because we can cool the Earth with relative ease. We have no means by which to warm it. Attempting to warm the Earth with addition of CO_2 or to cool the Earth by restrictions of CO_2 and hydrocarbon use would, however, be futile. Neither would work.

Inexpensively blocking the sun by means of particles in the upper atmosphere would be effective. S.S. Penner, A.M. Schneider, and E. M. Kennedy have proposed (98) that the exhaust systems of commercial airliners could be tuned in such a way as to eject particulate sun-blocking material into the upper atmosphere. Later, Edward Teller similarly suggested (18) that particles could be injected into the atmosphere in order to reduce solar heating and cool the Earth. Teller estimated a cost of between $500 million and $1 billion per year for between 1 °C and 3 °C of cooling. Both methods use particles so small that they would be invisible from the Earth.

These methods would be effective and economical in blocking solar radiation and reducing atmospheric and surface temperatures. There are other similar proposals (99). World energy rationing, on the other hand, would not work.

The climate of the Earth is now benign. If temperatures become too warm, this can easily be corrected. If they become too cold, we have no means of response – except to maximize nuclear and hydrocarbon energy production and technological advance. This would help humanity adapt and might lead to new mitigation technology.

FERTILIZATION OF PLANTS BY CO_2

How high will the CO_2 concentration of the atmosphere ultimately rise if mankind continues to increase the use of coal, oil, and natural gas? At ultimate equilibrium with the ocean and other reservoirs there will probably be very little increase. The current rise is a non-equilibrium result of the rate of approach to equilibrium.

One reservoir that would moderate the increase is especially important. Plant life provides a large sink for CO_2. Using current knowledge about the increased growth rates of plants and assuming increased CO_2 release as compared to current emissions, it has been estimated that atmospheric CO_2 levels may rise to about 600 ppm before leveling off. At that level, CO_2 absorption by increased Earth biomass is able to absorb about 10 Gt C per year (100). At present, this absorption is estimated to be about 3 Gt C per year (57).

About 30% of this projected rise from 295 to 600 ppm has already taken place, without causing unfavorable climate changes. Moreover, the radiative effects of CO_2 are logarithmic (101,102), so more than 40% of any climatic influences have already occurred.

As atmospheric CO_2 increases, plant growth rates increase. Also, leaves transpire less and lose less water as CO_2 increases, so that plants are able to grow under drier conditions. Animal life, which depends upon plant life for food, increases proportionally.

Figures 21 to 24 show examples of experimentally measured increases in the growth of plants. These examples are representative of a very large research literature on this subject (103-109). As Figure 21 shows, long-lived 1,000- to 2,000-year-old pine trees have shown a sharp increase in growth during the past half-century. Figure 22 shows the 40% increase in the forests of the United States that has

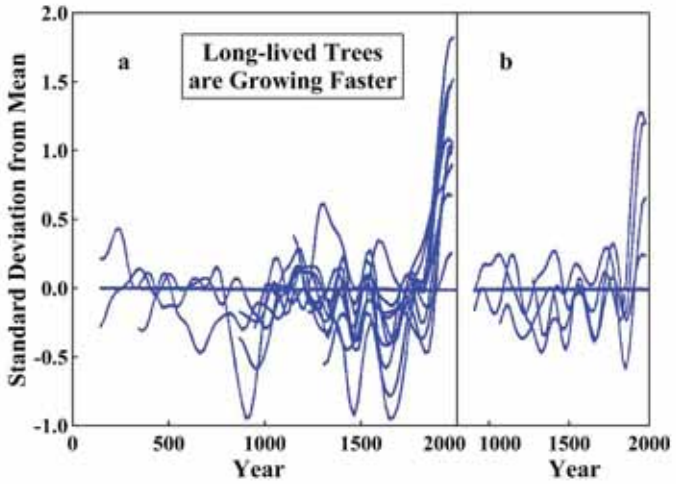

Figure 21: Standard deviation from the mean of tree ring widths for (a) bristlecone pine, limber pine, and fox tail pine in the Great Basin of California, Nevada, and Arizona and (b) bristlecone pine in Colorado (110). Tree ring widths were averaged in 20-year segments and then normalized so that the means of prior tree growth were zero. The deviations from the means are shown in units of standard deviations of those means.

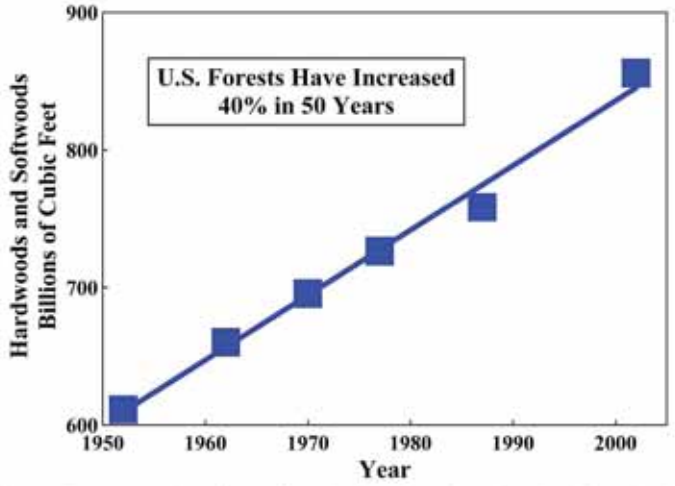

Figure 22: Inventories of standing hardwood and softwood timber in the United States compiled in *Forest Resources of the United States,* 2002, U.S. Department of Agriculture Forest Service (111,112). The linear trend cited in 1998 (1) with an increase of 30% has continued. The increase is now 40%. The amount of U.S. timber is rising almost 1% per year.

taken place since 1950. Much of this increase is due to the increase in atmospheric CO_2 that has already occurred. In addition, it has been reported that Amazonian rain forests are increasing their vegetation by about 900 pounds of carbon per acre per year (113), or approximately 2 tons of biomass per acre per year. Trees respond to CO_2 fertilization more strongly than do most other plants, but all plants respond to some extent.

Since plant response to CO_2 fertilization is nearly linear with respect to CO_2 concentration over the range from 300 to 600 ppm, as seen in Figure 23, experimental measurements at different levels of CO_2 enrichment can be extrapolated. This has been done in Figure 24 in order to illustrate CO_2 growth enhancements calculated for the atmospheric increase of about 88 ppm that has already taken place and those expected from a projected total increase of 305 ppm.

Wheat growth is accelerated by increased atmospheric CO_2, especially under dry conditions. Figure 24 shows the response of wheat grown under wet conditions versus that of wheat stressed by lack of water. The underlying data is from open-field experiments. Wheat was grown in the usual way, but the atmospheric CO_2 concentrations of circular sections of the fields were increased by arrays of computer-controlled equipment that released CO_2 into the air to hold the levels as specified (115,116). Orange and young pine tree growth enhancement (117-119) with two atmospheric CO_2 increases – that which has already occurred since 1885 and that projected for the next two centuries – is also shown. The relative growth enhancement of trees by CO_2 diminishes with age. Figure 24 shows young trees.

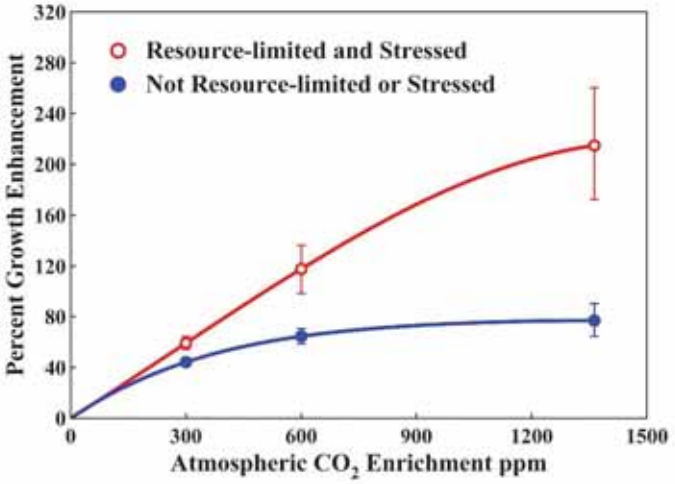

Figure 23: Summary data from 279 published experiments in which plants of all types were grown under paired stressed (open red circles) and unstressed (closed blue circles) conditions (114). There were 208, 50, and 21 sets at 300, 600, and an average of about 1350 ppm CO_2, respectively. The plant mixture in the 279 studies was slightly biased toward plant types that respond less to CO_2 fertilization than does the actual global mixture. Therefore, the figure underestimates the expected global response. CO_2 enrichment also allows plants to grow in drier regions, further increasing the response.

Figure 23 summarizes 279 experiments in which plants of various types were raised under CO_2-enhanced conditions. Plants under stress from less-than-ideal conditions – a common occurrence in nature – respond more to CO_2 fertilization. The selections of species in Figure 23 were biased toward plants that respond less to CO_2 fertilization than does the mixture actually covering the Earth, so Figure 23 underestimates the effects of global CO_2 enhancement.

Clearly, the green revolution in agriculture has already benefitted from CO_2 fertilization, and benefits in the future will be even greater. Animal life is increasing proportionally, as shown by studies of 51 terrestrial (120) and 22 aquatic ecosystems (121). Moreover, as shown by a study of 94 terrestrial ecosystems on all continents except Antarctica (122), species richness – biodiversity – is more positively correlated with productivity – the total quantity of plant life per acre – than with anything else.

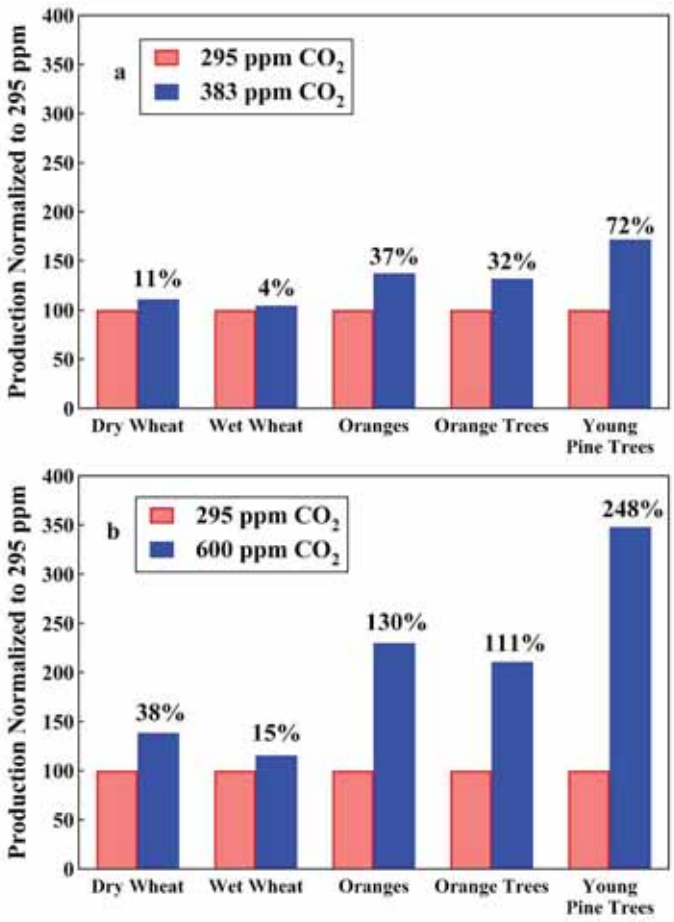

Figure 24: Calculated (1,2) growth rate enhancement of wheat, young orange trees, and very young pine trees already taking place as a result of atmospheric enrichment by CO_2 from 1885 to 2007 (a), and expected as a result of atmospheric enrichment by CO_2 to a level of 600 ppm (b).

Atmospheric CO_2 is required for life by both plants and animals. It is the sole source of carbon in all of the protein, carbohydrate, fat, and other organic molecules of which living things are constructed.

Plants extract carbon from atmospheric CO_2 and are thereby fertilized. Animals obtain their carbon from plants. Without atmospheric CO_2, none of the life we see on Earth would exist.

Water, oxygen, and carbon dioxide are the three most important substances that make life possible.

They are surely not environmental pollutants.

ENVIRONMENT AND ENERGY

The single most important human component in the preservation of the Earth's environment is energy. Industrial conversion of energy into forms that are useful for human activities is the most important aspect of technology. Abundant inexpensive energy is required for the prosperous maintenance of human life and the continued advance of life-enriching technology. People who are prosperous have the wealth required to protect and enhance their natural environment.

Currently, the United States is a net importer of energy as shown in Figure 25. Americans spend about $300 billion per year for imported oil and gas – and an additional amount for military expenses related to those imports.

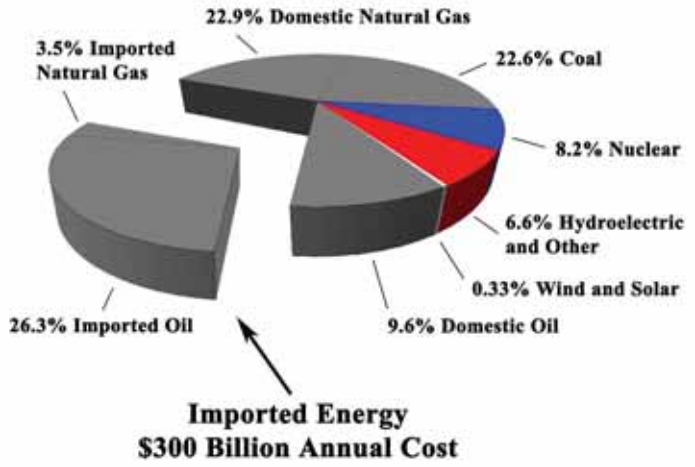

Figure 25: In 2006, the United States obtained 84.9% of its energy from hydrocarbons, 8.2% from nuclear fuels, 2.9% from hydroelectric dams, 2.1% from wood, 0.8% from biofuels, 0.4% from waste, 0.3% from geothermal, and 0.3% from wind and solar radiation. The U.S. uses 21 million barrels of oil per day – 27% from OPEC, 17% from Canada and Mexico, 16% from others, and 40% produced in the U.S. (95). The cost of imported oil and gas at $60 per barrel and $7 per 1,000 ft^3 in 2007 is about $300 billion per year.

Political calls for a reduction of U.S. hydrocarbon use by 90% (123), thereby eliminating 75% of America's energy supply, are obviously impractical. Nor can this 75% of U.S. energy be replaced by alternative "green" sources. Despite enormous tax subsidies over the past 30 years, green sources still provide only 0.3% of U.S. energy.

Yet, the U.S. clearly cannot continue to be a large net importer of energy without losing its economic and industrial strength and its political independence. It should, instead, be a net exporter of energy.

There are three realistic technological paths to American energy independence – increased use of hydrocarbon energy, nuclear energy, or both. There are no climatological impediments to increased use of hydrocarbons, although local environmental effects can and must be accommodated. Nuclear energy is, in fact, less expensive and more environmentally benign than hydrocarbon energy, but it too has been the victim of the politics of fear and claimed disadvantages and dangers that are actually negligible.

For example, the "problem" of high-level "nuclear waste" has been given much attention, but this problem has been politically created by U.S. government barriers to American fuel breeding and reprocessing. Spent nuclear fuel can be recycled into new nuclear fuel. It need not be stored in expensive repositories.

Reactor accidents are also much publicized, but there has never been even one human death associated with an American nuclear reactor incident. By contrast, American dependence on automobiles results in more than 40,000 human deaths per year.

All forms of energy generation, including "green" methods, entail industrial deaths in the mining, manufacture, and transport of resources they require. Nuclear energy requires the smallest amount of such resources (124) and therefore has the lowest risk of deaths.

Estimated relative costs of electrical energy production vary with geographical location and underlying assumptions. Figure 26 shows a recent British study, which is typical. At present, 43% of U.S. energy consumption is used for electricity production.

To be sure, future inventions in energy technology may alter the relative economics of nuclear, hydrocarbon, solar, wind, and other methods of energy generation. These inventions cannot, however, be forced by political fiat, nor can they be wished into existence. Alternatively, "conservation," if practiced so extensively as to be an alternative to hydrocarbon and nuclear power, is merely a politically correct word for "poverty."

The current untenable situation in which the United States is losing $300 billion per year to pay for foreign oil and gas is not the result of failures of government energy production efforts. The U.S. government does not produce energy. Energy is produced by private industry. Why then has energy production thrived abroad while domestic production has stagnated?

This stagnation has been caused by United States government taxation, regulation, and sponsorship of litigation, which has made the U.S. a very unfavorable place to produce energy. In addition, the U.S. government has spent vast sums of tax money subsidizing inferior energy technologies for political purposes.

It is not necessary to discern in advance the best course to follow. Legislative repeal of taxation, regulation, incentives to litigation, and repeal of all subsidies of energy generation industries would stimulate industrial development, wherein competition could then automatically determine the best paths.

Nuclear power is safer, less expensive, and more environmentally benign than hydrocarbon power, so it is probably the better choice for increased energy production. Solid, liquid and gaseous hydrocarbon fuels provide, however, many conveniences, and a national infrastructure to use them is already in place. Oil from shale or coal liquefaction is less expensive than crude oil at current prices, but its ongoing production costs are higher than those for already developed oil fields. There is, therefore, an investment risk that crude oil prices could drop so low that liquefaction plants could not compete. Nuclear energy does not have this disadvantage, since the operating costs of nuclear power plants are very low.

Figure 27 illustrates, as an example, one practical and environmentally sound path to U.S. energy independence. At present 19% of U.S. electricity is produced by 104 nuclear power reactors with an average generating output in 2006 of 870 megawatts per reactor, for a total of about 90 GWe (gigawatts) (125). If this were increased by 560 GWe, nuclear power could fill all current U.S. electricity requirements and have 230 GWe left over for export as electricity or as hydrocarbon fuels replaced or manufactured.

Thus, rather than a $300 billion trade loss, the U.S. would have a $200 billion trade surplus – and installed capacity for future U.S. re-

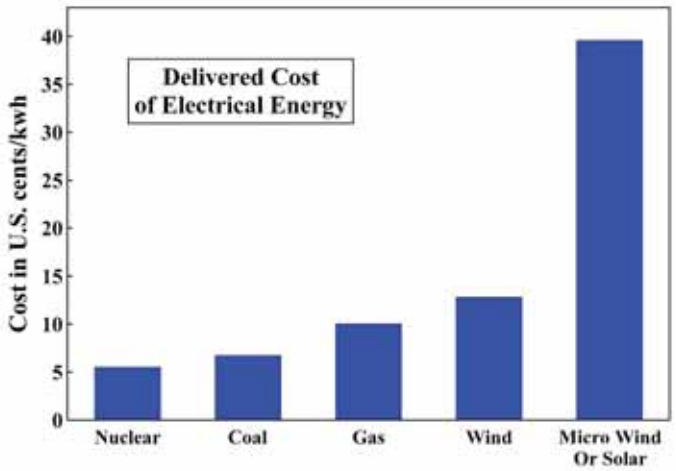

Figure 26: Delivered cost per kilowatt hour of electrical energy in Great Britain in 2006, without CO_2 controls (126). These estimates include all capital and operational expenses for a period of 50 years. Micro wind or solar are units installed for individual homes.

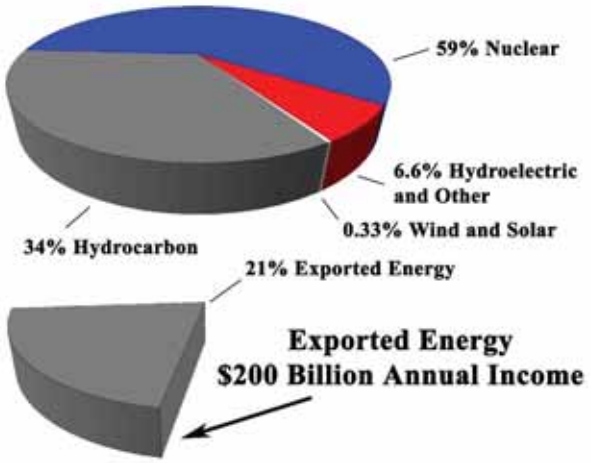

Figure 27: Construction of one Palo Verde installation with 10 reactors in each of the 50 states. Energy trade deficit is reversed by $500 billion per year, resulting in a $200 billion annual surplus. Currently, this solution is not possible owing to misguided government policies, regulations, and taxation and to legal maneuvers available to anti-nuclear activists. These impediments should be legislatively repealed.

quirements. Moreover, if heat from additional nuclear reactors were used for coal liquefaction and gasification, the U.S. would not even need to use its oil resources. The U.S. has about 25% of the world's coal reserves. This heat could also liquify biomass, trash, or other sources of hydrocarbons that might eventually prove practical.

The Palo Verde nuclear power station near Phoenix, Arizona, was originally intended to have 10 nuclear reactors with a generating capacity of 1,243 megawatts each. As a result of public hysteria caused by false information – very similar to the human-caused global warming hysteria being spread today, construction at Palo Verde was stopped with only three operating reactors completed. This installation is sited on 4,000 acres of land and is cooled by waste water from the city of Phoenix, which is a few miles away. An area of 4,000 acres is 6.25 square miles or 2.5 miles square. The power station itself occupies only a small part of this total area.

If just one station like Palo Verde were built in each of the 50 states and each installation included 10 reactors as originally planned for Palo Verde, these plants, operating at the current 90% of design capacity, would produce 560 GWe of electricity. Nuclear technology has advanced substantially since Palo Verde was built, so plants constructed today would be even more reliable and efficient.

Assuming a construction cost of $2.3 billion per 1,200 MWe reactor (127) and 15% economies of scale, the total cost of this entire project would be $1 trillion, or 4 months of the current U.S. federal budget. This is 8% of the annual U.S. gross domestic product. Construction costs could be repaid in just a few years by the capital now spent by the people of the United States for foreign oil and by the change from U.S. import to export of energy.

The 50 nuclear installations might be sited on a population basis. If so, California would have six, while Oregon and Idaho together would have one. In view of the great economic value of these facilities, there would be vigorous competition for them.

In addition to these power plants, the U.S. should build fuel reprocessing capability, so that spent nuclear fuel can be reused. This would lower fuel cost and eliminate the storage of high-level nuclear waste. Fuel for the reactors can be assured for 1,000 years (128) by using both ordinary reactors with high breeding ratios and specific breeder reactors, so that more fuel is produced than consumed.

About 33% of the thermal energy in an ordinary nuclear reactor is converted to electricity. Some new designs are as high as 48%. The heat from a 1,243 MWe reactor can produce 38,000 barrels of coal-derived oil per day (129). With one additional Palo Verde installation in each state for oil production, the yearly output would be at least 7 billion barrels per year with a value, at $60 per barrel, of more than $400 billion per year. This is twice the oil production of Saudi Arabia. Current proven coal reserves of the United States are sufficient to sustain this production for 200 years (128). This liquified coal exceeds the proven oil reserves of the entire world. The reactors could produce gaseous hydrocarbons from coal, too.

The remaining heat from nuclear power plants could warm air or water for use in indoor climate control and other purposes.

Nuclear reactors can also be used to produce hydrogen, instead of oil and gas (130,131). The current cost of production and infrastructure is, however, much higher for hydrogen than for oil and gas. Technological advance reduces cost, but usually not abruptly. A prescient call in 1800 for the world to change from wood to methane would have been impracticably ahead of its time, as may be a call today for an abrupt change from oil and gas to hydrogen. In distinguishing the practical from the futuristic, a free market in energy is absolutely essential.

Surely these are better outcomes than are available through international rationing and taxation of energy as has been recently proposed (82,83,97,123). This nuclear energy example demonstrates that current technology can produce abundant inexpensive energy if it is not politically suppressed.

There need be no vast government program to achieve this goal. It could be reached simply by legislatively removing all taxation, most regulation and litigation, and all subsidies from all forms of energy production in the U.S., thereby allowing the free market to build the most practical mixture of methods of energy generation.

With abundant and inexpensive energy, American industry could be revitalized, and the capital and energy required for further industrial and technological advance could be assured. Also assured would be the continued and increased prosperity of all Americans.

The people of the United States need more low-cost energy, not less. If this energy is produced in the United States, it can not only become a very valuable export, but it can also ensure that American industry remains competitive in world markets and that hoped-for American prosperity continues and grows.

In this hope, Americans are not alone. Across the globe, billions of people in poorer nations are struggling to improve their lives. These people need abundant low-cost energy, which is the currency of technological progress.

In newly developing countries, that energy must come largely from the less technologically complicated hydrocarbon sources. It is a moral imperative that this energy be available. Otherwise, the efforts of these peoples will be in vain, and they will slip backwards into lives of poverty, suffering, and early death.

Energy is the foundation of wealth. Inexpensive energy allows people to do wonderful things. For example, there is concern that it may become difficult to grow sufficient food on the available land. Crops grow more abundantly in a warmer, higher CO_2 environment, so this can mitigate future problems that may arise (12).

Energy provides, however, an even better food insurance plan. Energy-intensive hydroponic greenhouses are 2,000 times more productive per unit land area than are modern American farming methods (132). Therefore, if energy is abundant and inexpensive, there is no practical limit to world food production.

Fresh water is also believed to be in short supply. With plentiful inexpensive energy, sea water desalination can provide essentially unlimited supplies of fresh water.

During the past 200 years, human ingenuity in the use of energy has produced many technological miracles. These advances have markedly increased the quality, quantity, and length of human life. Technologists of the 21st century need abundant, inexpensive energy with which to continue this advance.

Were this bright future to be prevented by world energy rationing, the result would be tragic indeed. In addition to human loss, the Earth's environment would be a major victim of such a mistake. Inexpensive energy is essential to environmental health. Prosperous people have the wealth to spare for environmental preservation and enhancement. Poor, impoverished people do not.

CONCLUSIONS

There are no experimental data to support the hypothesis that increases in human hydrocarbon use or in atmospheric carbon dioxide and other greenhouse gases are causing or can be expected to cause unfavorable changes in global temperatures, weather, or landscape. There is no reason to limit human production of CO_2, CH_4, and other minor greenhouse gases as has been proposed (82,83,97,123).

We also need not worry about environmental calamities even if the current natural warming trend continues. The Earth has been much warmer during the past 3,000 years without catastrophic effects. Warmer weather extends growing seasons and generally improves the habitability of colder regions.

As coal, oil, and natural gas are used to feed and lift from poverty vast numbers of people across the globe, more CO_2 will be released into the atmosphere. This will help to maintain and improve the health, longevity, prosperity, and productivity of all people.

The United States and other countries need to produce more energy, not less. The most practical, economical, and environmentally sound methods available are hydrocarbon and nuclear technologies.

Human use of coal, oil, and natural gas has not harmfully warmed the Earth, and the extrapolation of current trends shows that it will not do so in the foreseeable future. The CO_2 produced does, however, accelerate the growth rates of plants and also permits plants to grow in drier regions. Animal life, which depends upon plants, also flourishes, and the diversity of plant and animal life is increased.

Human activities are producing part of the rise in CO_2 in the atmosphere. Mankind is moving the carbon in coal, oil, and natural gas from below ground to the atmosphere, where it is available for conversion into living things. We are living in an increasingly lush environment of plants and animals as a result of this CO_2 increase. Our children will therefore enjoy an Earth with far more plant and animal life than that with which we now are blessed.

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Manhattan Declaration on Climate Change

"Global warming" is not a global crisis

We, the scientists and researchers in climate and related fields, economists, policymakers, and business leaders, assembled at Times Square, New York City, participating in the 2008 International Conference on Climate Change,

Resolving that scientific questions should be evaluated solely by the scientific method;

Affirming that global climate has always changed and always will, independent of the actions of humans, and that carbon dioxide (CO_2) is not a pollutant but rather a necessity for all life;

Recognising that the causes and extent of recently-observed climatic change are the subject of intense debates in the climate science community and that oft-repeated assertions of a supposed 'consensus' among climate experts are false;

Affirming that attempts by governments to legislate costly regulations on industry and individual citizens to encourage CO_2 emission reduction will slow development while having no appreciable impact on the future trajectory of global climate change. Such policies will markedly diminish future prosperity and so reduce the ability of societies to adapt to inevitable climate change, thereby increasing, not decreasing human suffering;

Noting that warmer weather is generally less harmful to life on Earth than colder:

Hereby declare:

That current plans to restrict anthropogenic CO_2 emissions are a dangerous misallocation of intellectual capital and resources that should be dedicated to solving humanity's real and serious problems.

That there is no convincing evidence that CO_2 emissions from modern industrial activity has in the past, is now, or will in the future cause catastrophic climate change.

That attempts by governments to inflict taxes and costly regulations on industry and individual citizens with the aim of reducing emissions of CO_2 will pointlessly curtail the prosperity of the West and progress of developing nations without affecting climate.

That adaptation as needed is massively more cost-effective than any attempted mitigation, and that a focus on such mitigation will divert the attention and resources of governments away from addressing the real problems of their peoples.

That human-caused climate change is not a global crisis.

Now, therefore, we recommend –

That world leaders reject the views expressed by the United Nations Intergovernmental Panel on Climate Change as well as popular, but misguided works such as "An Inconvenient Truth".

That all taxes, regulations, and other interventions intended to reduce emissions of CO_2 be abandoned forthwith.

Agreed at New York, 4 March 2008.

To see the 1,100+ signatories to the Manhattan Declaration, please visit http://www.climatescienceinternational.org/