Energy, Kyoto and Climate Change, 2004

- The world will need lots more energy.
- Kyoto meetings in Argentina, Dec 2004.
- Kyoto treaty passes in Russia, Oct 2004.
- CO₂ emissions in 9 of 12 European countries will increase (not a decrease).
- Wind farms may change local climate.
- Legal actions on CO₂ and climate? (Help)
- World problems: Energy, water, health, climate...
  - Priorities for spending money
- Stories about climate warming
- Problems with some energy talk
- Ready to scan Mar 3, 2005 (158 p), Doc RJ0379

Doc RJ0379
158 pages

Roy Jenne
Mar 3, 2005

National Center for Atmospheric Research
Boulder CO
Some Kyoto and Energy Issues, Fall 2004

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end
World Energy Use to 2030, and Access to Electricity

World energy use and outlook, 1971 – 2030.
- Data from World Energy Outlook 2002 by IEA, publ Aug 2002.

The world will need 67% more energy in year 2030 than was used in 2000.

In year 2000, 1.64 billion people did not have electricity.

In year 2000, 2.39 billion people relied on traditional biomass for cooking and heating. → (elec or gas is a lot easier)

The world use of energy for transportation (from IEA).
The use of energy for transportation is almost all in the form of oil (gasoline), diesel, etc. The energy units here are MTOE (millions of tonnes of oil equivalent).

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Energy</th>
<th>Amount for Electricity</th>
<th>Use by Transportation</th>
<th>Other Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>4999</td>
<td>1209</td>
<td>851</td>
<td>2939</td>
</tr>
<tr>
<td>2000</td>
<td>9179</td>
<td>3636</td>
<td>1775</td>
<td>3768</td>
</tr>
<tr>
<td>2010</td>
<td>11132</td>
<td>4608</td>
<td>2220</td>
<td>4304</td>
</tr>
<tr>
<td>2020</td>
<td>13167</td>
<td>5559</td>
<td>2749</td>
<td>4859</td>
</tr>
<tr>
<td>2030</td>
<td>15267</td>
<td>6535</td>
<td>3327</td>
<td>5405</td>
</tr>
<tr>
<td>2030/1971</td>
<td>3.05</td>
<td>5.41</td>
<td>3.91</td>
<td>1.84</td>
</tr>
</tbody>
</table>

We have to worry more about energy supply (and cost). And it sure helps to have more efficiency when it is possible.

Roy Jenne
Oct 2, 2003
The Year of Peak Oil Production in the World

Year of world peak oil production; then output starts down.

◆ Some research papers in the 1990s
  - Had the peak year in the 1990s.
  - This did not happen.

◆ Some present papers (2000 – 2004) have the oil peak during 2005 – 2010
  - This seems doubtful to me. The peak will be later.

◆ The oil peak from operational energy forecasters
  - These forecasts now go to 2030.
  - The implied peak oil year is about 2035 – 2038.

Sources: USGS estimates, US Dept of Energy publications, publications by OECD/International Energy Agency. They all depend a lot on the USGS.

Roy Jenne
Jan 30, 2005
**TABLE 1. WORLD PETROLEUM USE PER DECADE, 1900 – 2059**

World petroleum use has increased from 26.5 bil barrels in the 1940s (1940-49) to 258.3 bil barrels in the 1990s

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1900s</td>
<td>2.2</td>
<td>1950s</td>
<td>54.3</td>
<td>2000s</td>
<td>308</td>
</tr>
<tr>
<td>1910s</td>
<td>4.3</td>
<td>1960s</td>
<td>112.3</td>
<td>2010s</td>
<td>369</td>
</tr>
<tr>
<td>1920s</td>
<td>10.6</td>
<td>1970s</td>
<td>208.3</td>
<td>2020s</td>
<td>406</td>
</tr>
<tr>
<td>1930s</td>
<td>16.0</td>
<td>1980s</td>
<td>225.6</td>
<td>2030s</td>
<td>448</td>
</tr>
<tr>
<td>1940s</td>
<td>26.5</td>
<td>1990s</td>
<td>258.3</td>
<td>2040s</td>
<td>e408</td>
</tr>
<tr>
<td>1900-49</td>
<td>59.6</td>
<td>1950-99</td>
<td>859</td>
<td>2050s</td>
<td>e350</td>
</tr>
</tbody>
</table>

**NOTE:** This petrol use includes crude oil, gas liquids, and tar sand oil.

**Figure 1.** World use of petroleum each decade. The petroleum sources include crude oil, natural gas liquids, and oil from tar sands. Data are observed through 2000. Estimates for 2001–2030 are from IEA (Aug 2002). The peak is assumed to be about 2035. - Roy Jenne

Roy Jenne
June 2004
World Use of Natural Gas, 1970 – 2080

Use of Gas in World (from Table 1, Dec 2004)

<table>
<thead>
<tr>
<th>Years</th>
<th>tcm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970 – 1999</td>
<td>30</td>
</tr>
<tr>
<td>2000 – 2029</td>
<td>30</td>
</tr>
<tr>
<td>2030 – 2060</td>
<td>31</td>
</tr>
<tr>
<td>2061 – 2070</td>
<td>10</td>
</tr>
<tr>
<td>2071 – 2080</td>
<td>10</td>
</tr>
</tbody>
</table>

466 tcm of gas

Estimate of remaining world gas in year 2000

- ~262 tcm (a 1992 est.)
- ~386 tcm (USGS est., 2000)
- ~500 tcm (Intl Gas Center est. in ~2000)

DIRE WARNINGS FROM NATIONAL ENERGY EXPERT

JAMES HOWARD KUNSTLER SAYS PEAK OIL PRODUCTION COMING SOON

By RICHARD VALENTY
Colorado Daily Staff Writer

Author James Howard Kunstler was the featured speaker at citizen group PLAN-Boulder County's annual dinner Sunday, and he told the crowd to be ready for a near-future energy crisis - one in which Americans will endure higher gasoline prices that could reach $3 per gallon or more and then yield even greater problems once supply shortages begin.

"The American public will go bat-shit," deadpanned Kunstler.

Kunstler said his next book, titled "The Long Emergency," will come out in May and will detail his predicted consequences of a peak in global oil production.

He said he has heard estimates that peak oil is reaching as early as this year or 2007, but said the year could be hard to pinpoint because Middle Eastern countries don't release "transparent" production figures.

Still, he said the actual date of the peak should be insignificant as Americans decide how to deal with a problem he says is being ignored by American corporate media and is underestimated by citizens believing a technological fix might forestall the crisis.

"I would agree with what he [Kunstler] says although a combination of a lot of renewable sources can make a large dent," said Guiterman.

Guiterman said the U.S. used about 33 billion gallons of diesel on highways in 2000, not including off-road use in farm equipment, and use has continued to increase since then.

"Statistics coming out of major research universities say with biodiesel production at full tilt, taking every available seed crop grown in the U.S. not being used for food and all of the recycled waste oil, you would perhaps reach 15 percent of on-highway diesel use," said Guiterman.

Kunstler said the U.S. is also likely to see supply problems with natural gas in the near future and said commonly accepted estimates of a "500 to 400 year" coal supply could be seriously overstated. Coal and natural gas are the most common fuels used to generate electricity.

"One of the biggest things is that the three student-run buildings on campus are now 100 percent powered by wind energy," said Carroll.

Carroll said using wind power saves about 8.8 kilowatt-hours of electricity annually. Also, she said the Center runs ads and creates "tip sheets" to educate students on how to save electricity used in lighting or computers.

Kunstler, however, said a natural gas crisis could be as bad or worse than an oil crisis. He said about half of U.S. homes use gas for heating - on top of use for cooking, electricity and transportation.

He said North America is already past its gas production peak and added the U.S. should not want to become dependent on imported gas.

"You tend to get gas from the continent you're on," said Kunstler.

He said gas from overseas must be compressed, liquefied, loaded onto tanker ships and transported to special terminals to "re-gasify" the liquid. He said the terminals could be especially attractive targets for terrorists because they "blow up with supernatural force."

Kunstler said the U.S. economy has been directly tied to oil prices, including the 1970s era of "stagflation," a combination of stagnant growth and double-digit inflation. He said stagflation came after the U.S. passed its peak production rate near 1970-1975, and said the inflation part was tied to the ability of OPEC nations to set prices.

Also, he said the Clinton-era economic expansion came during a period of low oil prices.

Kunstler said the U.S. will not be able to count on constant "2 to 7 percent" economic growth after the global oil production peak, especially since large-format retailers such as Wal-Mart are heavily dependent on cheap fuel to transport products.

He said U.S. military strength might not be enough to ensure constant oil supplies, especially since China is geographically much closer to Caspian and Persian Gulf supplies - and needs oil.

Despite Kunstler's predictions of serious near-future problems, County Commissioner Will Toor said he thought Kunstler underestimated the power of policy decisions to encourage renewables and efficiency.

"At the local level, we should first make planning decisions that will allow us to reduce auto dependency and give people real options besides having to go everywhere in their cars," said Toor.
What is a safe amount of warming?

NEWS OF THE WEEK

CLIMATE CHANGE

Panel Urges Unified Action, Sets 2° Target

A new report from an international task force on climate change calls for the major industrial nations to join with China and India to tackle the problem together. It describes the devastating long-term impact on the environment of a 2°C rise in average global temperatures. The report is expected to help British Prime Minister Tony Blair argue his case for reductions in greenhouse gas emissions as the United Kingdom this year assumes the presidency of the G8 nations and Blair becomes president of the European Union in July.

Issued this week by a 14-member independent panel of scientists and policymakers assembled by U.S., U.K., and Australian think tanks, the report (www.americanprogress.org/climate) seeks to find common ground between nations that have ratified the 1997 Kyoto Protocol and those, including the United States and Australia, that have not. It recommends a global effort to set up a cap-and-trade system for emissions that would extend beyond the Kyoto framework that expires in 2012 and a shift in agricultural subsidies from food crops to biofuels. It also calls on richer nations to help developing countries control their emissions as their economies grow. The panel was convened by Stephen Byers, an influential Labour member of parliament, and timed to coincide with a key speech by Blair this week at the World Economic Forum in Davos, Switzerland.

"The cost of failing to mobilize in the face of this threat is likely to be extremely high," the report says, noting that Blair has pledged to make climate change a priority for this year.

In 2001, U.S. President George W. Bush said that "no one can say with any certainty what constitutes a dangerous level of warming and therefore what level must be avoided." The report cites probabilistic analyses aimed at doing just that, however. Current global temperatures now hover around 0.8°C above preindustrial levels, and a 2001 report by the Intergovernmental Panel on Climate Change projects a rise of from 1.4° to 5.8° by 2100. Recent analyses conclude that even higher temperatures can't be ruled out (p. 497).

The report makes a case that even a 2° rise could have catastrophic effects on the planet, including the decimation of coral reefs worldwide, the melting of the West Antarctic Ice Sheet, and the severe degradation and disruption of various ecosystems. The report also notes that temperatures could exceed the 2° goal before emissions controls kick in and lower the temperature by 2100.

Despite that dire scenario, policy watchers of all stripes in Washington, D.C., doubt that the report will have much impact on the Bush Administration. Patrick J. Michaels, a professor of environmental sciences at the University of Virginia, Charlottesville, and a leading climate change contrarian, called the 2° goal "arbitrary" but speculates that the White House "will be amenable to" the report's suggestions to develop clean coal technologies and push for more efficient vehicles. Administration officials declined to comment on the recommendations.

"EU KINTSCH

28 Jan 2005

Science Mag., vol 307

Page 496
Kyoto meetings Argentina, Dec 2004

- Held Dec 6-17, 2004 in Argentina

- A warmer climate has warmer winters & warmer summers
  - So heat spells are hotter in summer
  - Cold spells in winter are less severe

- In the past century the earth has warmed up some (about 1°F)
  - There are debates as to how much of
    the warming is due to (1) fairly small changes in the sun (2) rebound after the previous colder spell (3) greenhouse effects
    - After about 1950 much of some of the warming is likely due to CO₂ and greenhouse gases. But we can't model the warmth of the 1930s without putting in a solar effect.
Locals head to climate summit

Adapting to warming will be part of the discussion

By Todd Neff
Camera Staff Writer

Major-league scientists don’t often go to big conferences knowing they’ll part of a sideshow. But at a major climate-change conference starting next week in Buenos Aires, Argentina, the sideshows could be as important as the main event.

Delegates from the 194 nations involved in the United Nations Framework Convention on Climate Change meet Dec. 6-17 in the Argentine capital, for the first time since Russia’s ratification poised the 1997 Kyoto Protocol to go into effect in February.

The United States will send a delegation, as well, although the country has rejected the protocol because it includes mandatory carbon-dioxide-emission limits, which threaten to slow U.S. economic development.

Local scientists will be among those convened in Buenos Aires, as well, as part of a series of “side events” that could shape how the world deals with climate change.

Marcus Moench, president of Boulder’s Institute for Social and Environmental Transition, will be there with a United Nations Educational, Scientific and Cultural Organization-sponsored group. Work he and others did for a report on how people react to floods and droughts caught the eye of UNESCO, he said.

“Part of the whole global debate is how folks adapt to climate change,” he said. “Ours is the first with some actual field data.”

Moench said he sees organizations that work to help people adapt to climate change as playing a larger role in the future debate because it’s too hard to get political consensus to cut back on greenhouse-gas emissions.

“We’re already committed to some climate change,” he said. “Once committed, the only alternative is to adapt.”

Moench said side events at major international conventions such as the one in Buenos Aires are where the newest research is presented. Also, he said, it’s where networking happens among people in hundreds of governments, non-governmental organizations such as the International Red Cross, and international organizations.

“It’s a big lobbying game, too,” he said, where organizations pitch their cases to big donors such as the World Bank.

Michael Glantz, a senior scientist with the National Center for Atmospheric Research, will present work on environmental “hot spots” as part of a team sponsored by the Food and Agriculture Organization of the United Nations. His research examines the impact of extreme environmental change, such as the drying of the Aral Sea in Uzbekistan and Kazakhstan.

“I’m trying to get people to understand that whether the climate gets warm or cold or stays the same, there’s going to be variability — extremes,” he said.

NCAR will have six people in Buenos Aires, said Peter Backlund, NCAR’s director of research relations. NCAR is an official observer of the Framework Convention on Climate Change, he said, and is hosting an exhibit as well as side events on NCAR research.

NCAR scientist Caspar Amman will preview recent climate-modeling work. Senior scientist Tom Wigley will present research on the relationship of greenhouse-gas emissions, their concentrations in atmosphere and temperature changes, Backlund said.

Linda Meams, an NCAR senior scientist, will also be there, presenting work on regional climate modeling.

Roger Pielke Jr., director of the Center for Science and Technology Policy Research at the Cooperative Institute for Research in the Environmental Sciences in Boulder, said the main diplomatic meetings are important as well.

In the face of apparently mounting impacts of a warming planet, countries are having difficulty meeting their Kyoto obligations, he said.

“The bottom line is that there’s a lot of work to do,” he said.

The Associated Press contributed to this report.

Contact Camera Staff Writer Todd Neff at (303) 473-1327 or neff@dailycamera.com.
Global storming
Having nixed Kyoto, Bush stifles discussion

President Bush rejected an international treaty outlining limits on greenhouse gases, leaving other industrialized nations to address the looming problem without the help of the United States, the world’s fattest gas hog.

But somehow, that wasn’t enough. Not only does the president refuse to help other nations address what they — and the emerging scientific consensus — see as a dire worldwide threat. Bush also wants to keep them from taking action as mild as getting together and issuing a report.

Last weekend in Buenos Aires, a U.N.-brokered conference addressed the Kyoto protocol on global warming. The Kyoto pact, signed by 132 countries (but not the United States), goes into effect on Feb. 16. The protocol requires signatory nations to reduce greenhouse-gas emissions to below 1990 levels by 2012.

The meeting in Argentina was designed to help signatory nations assess their progress in reducing the emission of carbon dioxide and other gases known to trap heat in the Earth’s atmosphere. The increase in such gases has coincided with a gradual rise in world temperatures.

Global warming is a scientifically verifiable fact. The human contribution to that trend has been questioned. But more and more data show that human-generated greenhouse gases are, in fact, helping to change the world’s climate. And we ignore these trends at our peril.

Just last month, for instance, researchers commissioned by the United States and seven other nations released the Arctic Climate Impact Assessment. The report, based on the work of 300 scientists, noted that the Arctic is experiencing “some of the most rapid and severe climate change on Earth.” Ice caps are receding, threatening the environment of the Arctic and elsewhere.

“Strong near-term action to reduce emissions is required in order to alter the future path of human-induced warming,” the report concluded.

Yet last week in Buenos Aires, Paula Dobriansky, U.S. undersecretary of state for global affairs, reflected no such alarm. “Science tells us that we cannot say with any certainty what constitutes a dangerous level of warming, and therefore what level must be avoided.”

Meanwhile, Dobriansky repeated the Bush administration’s pledge to reduce “greenhouse-gas intensity,” which is per-capita emissions divided by the gross domestic product. Reducing the greenhouse “intensity” does not reduce actual emissions. On the contrary, the United States will emit more greenhouse gases under the Bush plan that it would have emitted by simply enforcing the Clean Air Act.

Once again, the president proposes to do one thing (increase emissions) while pretending to do the opposite (reduce greenhouse “intensity”).

In Buenos Aires, the president added injury to this insult. The meeting ended with only a meek, weak vow among nations to start informal discussions on global warming. Members of the European Union, which produces a small fraction of the per-capita emissions of the United States, had hoped that U.N. members could arrange seminars and produce reports on global warming.

But the United States insisted that “there shall be no written or oral report” from any international seminar organized under the U.N. Convention on Climate Change.

This is another hallmark tactic of the president. It’s not just that the Bush team sets the world’s agenda; it also stifles dissenting views.
Bush slips off the hook over funds for ocean management

Rex Dalton, San Diego

A top-level panel’s demand for major reforms in US ocean management and research is getting the brush-off from the White House, say some of its members.

In a low-key announcement on 17 December, President George W. Bush said that he would set up an advisory committee to study the 212 recommendations of the Commission on Ocean Policy. These were published in September after a huge review of issues that ranged from fisheries conservation to coastal pollution.

But commission members are frustrated because Bush failed to promise substantial new funding. The commission’s recommendations would have cost about $1.5 billion in the first year, ramping up to nearly $4 billion in annual spending after five years, according to its chairman, James Watkins, a former energy secretary.

“I’m a bit disappointed,” says Andrew Rosenberg, a commission member and a fisheries scientist at the University of New Hampshire, Durham. The administration’s response, which it was legally required to issue, “is very much a fig leaf”, he says.

And Watkins himself says that the White House “fails to hit the nail on the head”. Current funding for managing coastal waters “is inadequate”, Watkins says, and the response does not specify by how much it should be increased. The oceans are “a precious resource”, he adds, “and we don’t have much time.”

The commission was established by Congress in the final year of the Clinton administration in a bid to reinvigorate US ocean policy, but its members were chosen by the Bush administration. It took three years to research its findings, which are similar to, but milder than, those of a privately funded panel, the Pew Oceans Commission.

Environmental groups are even more critical of Bush’s plan. “It’s a big yawn; there is nothing there but a lot of hot air,” says Gerry Leape, marine programme director at the National Environmental Trust. “It is a real missed opportunity.”

But James Connaughton, a lawyer and chairman of the White House’s Council on Environmental Quality, says that the administration will pursue a concrete response to the commission’s recommendations. A list of research programmes worth supporting will be compiled by March 2005, he pledges.

US proves a wet blanket at international climate meeting

Amanda Haag, Buenos Aires

The latest global meeting on climate change wrapped up in Argentina this week, having made only modest steps towards cutting future greenhouse-gas emissions.

Delegates from many nations said that the United States and its allies, such as Saudi Arabia, thwarted progress at the tenth meeting of the Conference of Parties to the UN Framework Convention on Climate Change.

From 6 to 17 December, representatives of some 200 countries got together to discuss present and future climate-change negotiations. Russia’s recent ratification of the Kyoto agreement on reducing greenhouse-gas emissions brings the protocol into force, so many delegates were keen to talk about what might happen after 2012, when Kyoto obligations expire. But the United States opposed such discussions. “We need to absorb and analyse lessons learned before committing to new actions,” says Paula Dobriansky, head of the US delegation to the meeting.

During the conference, the United States strongly opposed the idea of using any seminars scheduled between now and next November to jump-start discussions about 2012 and beyond. Environmental groups attacked this position as deliberately obstructive. “I really think they’ve sunk to a new low here, by not only taking their own path but actively blocking other countries from pursuing the path they want to take,” says Jeff Friedler, climate policy specialist with the New York-based Natural Resources Defense Council.

“They never answered the question ‘why are you objecting, why don’t you just step aside’ even though we asked them multiple times,” says Debbie Reed, legislative director with the National Environmental Trust, a Washington-based environmental coalition.

Delegates haggled until sunrise on the last day of the conference over the wording that will regulate the seminars. In the end, it was agreed that just one seminar would take place before the next annual meeting to “promote an informal exchange of information” and to “continue to develop” appropriate responses to climate change. This at least leaves an opening for discussions about policy after 2012, says Elliot Diringer, director of international strategies with the Virginia-based Pew Center on Global Climate Change.

In future, the United States may have less sway over such issues. The 2005 conference will be split into two sections, one stream of which will be for Kyoto parties only: US delegates may not be able to take part in these sessions.

Saudi Arabia also caused dissent at the meeting, by asking for money from the ‘adaptation fund’ to offset the economic losses it will suffer when petroleum exports are reduced. By 2010, the country expects lost fossil-fuel exports to cost it billions of dollars annually. But the adaptation fund is meant predominantly to compensate developing countries and vulnerable island nations.

Although Saudi Arabia always raises the issue of compensation, this year’s suggestion that it be provided by the adaptation fund was especially contentious, says Reed. “We’re having a hard time raising money for developing countries,” says Reed. “So for a country like Saudi Arabia to demand compensation for lost sales of oil—it’s worse than ironic.”

Despite these difficulties, the meeting struck some hopeful notes. The European Union and other nations renewed a pledge to deposit $420 million annually, beginning in 2005, to fund developing countries’ efforts. And, following Russia’s lead, Indonesia and Nigeria have ratified the Kyoto Protocol.
2004 among hottest years

U.N. scientists say global warming trend to continue

By Kevin Gray
Associated Press

BUENOS AIRES, Argentina — The year 2004, punctuated by four powerful hurricanes in the Caribbean and deadly typhoons lashing Asia, was the fourth-hottest on record, extending a trend since 1990 that has registered the 10 warmest years, a U.N. weather agency said Wednesday.

The current year was also the most expensive for the insurance industry in coping worldwide with hurricanes, typhoons and other weather-related natural disasters, according to new figures released by U.N. environmental officials.

The release of the report by the World Meteorological Organization came as environmental ministers from about 80 countries gathered in Buenos Aires for a United Nations conference on climate change, looking at ways to cut down on greenhouse gases that some say contribute heavily to Earth's warming.

Scientists say a sustained increase in temperature change is likely to continue disrupting the global climate, increasing the intensity of storms, potentially drying up farmlands and raising ocean levels, among other things.

Michel Jarraud, the World Meteorological Organization secretary-general, said the warming and increased storm activity could not be attributed to any particular cause, but was part of a global warming trend that was likely to continue.

Scientists have reported that temperatures across the globe rose an average of 1 degree over the past century with the rate of change since 1976 at roughly three times that over the past 100 years.

The World Meteorological Organization said it expects Earth's average surface temperature to rise 0.8 degrees above the normal 57 degrees Fahrenheit in 2004, adding this year to a recent pattern that included the four warmest years on record, with the hottest being 1998.

The month of October also registered as the warmest October since accurate readings

Please see U.N. on 2B

Go to 2
Hot news from summer 2003

Christoph Schär and Gerd Jendritzky

The European heatwave of 2003: was it merely a rare meteorological event or a first glimpse of climate change to come? Probably both, is the answer, and the anthropogenic contribution can be quantified.

The European summer of 2003 was characterized by highly anomalous meteorological conditions, and was extremely hot and dry. In the northern parts of the continent, the summer was perceived as beautiful and warm. But in central and southwestern Europe, the heat was prolonged and intense, and the economic and societal consequences were disastrous (as described in Box 1).

Given the heatwave’s severe repercussions, the question has arisen whether the summer of 2003 is evidence of man-made climate change. On page 610 of this issue, Stott, Stone and Allen take a major step towards answering this difficult question. Previous studies had found that recent changes in the European summer climate were consistent with climate-change scenarios, but there had been no attempts at a rigorous attribution of cause and effect. Indeed, because the atmosphere is a chaotic dynamical system, it is impossible to attribute — in a causal sense — an individual episode of extreme weather to changes in atmospheric composition. Nevertheless, it is feasible to estimate the probability or risk of occurrence of a certain weather event under natural and modified climatic conditions. This is the avenue taken by Stott and colleagues.

Using one of the leading global climate models available, the authors derive the probability distributions of European summer temperatures for two sets of climate simulations, each covering the period since 1900. The first set accounts for the past effects on climate that were due to variations in solar and volcanic activity, as well as to man-made influences (including increases in greenhouse-gas concentrations). The second set mimics a natural climate by prescribing natural factors alone. Stott and colleagues then calculate the changed risk of extremely hot summers that is attributable to past anthropogenic emissions of greenhouse gases, using a comparison of observed and simulated summer temperatures to account for uncertainties in man-made warming and natural variability. They find, at a confidence level of greater than 90%, that more than half of the risk of 2003-like extreme European summers is attributable to human influences on the climate system.

Methodologically, Stott and colleagues use an approach developed for detecting global climate change and attributing causes to the changes identified. There is long experience with such studies, all of which find that a significant anthropogenic contribution is required to explain the observed global climate records of the past 30–50 years. The new study fits into these results, as the probability of extreme heatwaves must change as mean temperatures increase. The details of the analysis are rather complex. But the basic interpretation of the main result is comparatively straightforward: anthropogenic warming shifts the statistical distribution of summer temperatures towards warmer conditions, and this has a dramatic impact on the chance of temperatures exceeding some threshold out in the upper tail of the temperature distribution.

What about the limitations of the new work? We will mention two. First, Stott et al. address the whole summer of 2003 (and not the extreme heatwave in early August), and all of continental and southern Europe (not the much smaller central European region where the heatwave was most intense). Consideration of shorter-term and smaller-scale heatwaves will require higher computational resolution, and will need to take the complexities of land-surface processes into consideration. Accounting for these factors is a challenge. Second, representing natural climate variability is a general difficulty in studies attempting to attribute causes to particular effects. Stott et al. show that their model appropriately represents the spectrum of continental-scale European climate variability on interannual to interdecadal timescales. But more detailed

Box 1 Impacts of the heatwave

According to reinsurance estimates, the drought conditions during the summer of 2003 caused (uninsured) crop losses of around US$12.3 billion, while forest fires in Portugal were responsible for an additional US$1.8 billion in damage. The European electricity markets reacted erratically to increases in demand, as power plants had to curtail production owing to the lack of cooling water, and electricity spot prices soared beyond €100 (US$130) per MW h.

In the Alps, many glaciers underwent unprecedented melting, and the thawing of permafrost led to a series of severe rock falls.

But it was the unusual number of deaths during 1–15 August that caught the headlines. Estimates based on the statistical excess over mean mortality rates amount to between 22,000 and 35,000 heat-related deaths across Europe as a whole. In France the mortality rate increased by 54% during those two weeks, and the increase was statistically significant in all 22 French regions and for all age groups above 45 years.

The figure, reproduced from ref. 13, shows the daily mortality rate in Baden-Württemberg, Germany, over a period of 20 months, and puts the August 2003 heatwave in context. Total daily mortality data are in black, with the mean seasonal evolution in red. Notable features are the seasonal cycle, with higher mortality in winter; a heat-related mortality peak in June 2002; the effects of an influenza outbreak in February–March 2003; and the striking peak in August 2003, due to the heatwave, which caused 900–1,300 extra deaths in a population of 10.7 million people.
Climatologist: Cut down emissions

He disputes U.S. claims

By Charles J. Hanley

Dec 15, 2004

Associated Press

BUENOS AIRES, Argentina — The world’s chief climate scientist on Tuesday disputed the U.S. government contention that cutbacks in carbon dioxide emissions are not yet warranted to check global warming.

Experts readied a report, meanwhile, saying 2004 will be one of the warmest years on record.


The Kyoto Protocol, the international accord requiring cuts in carbon dioxide, “is driven by the need to reduce emissions, and on that there is no question,” said Pachauri, chairman of a U.N.-sponsored network of climatologists.

Scientists largely blame the accumulation of carbon dioxide and other “greenhouse gases” in the atmosphere for the rising temperatures of the past century.

The 10 warmest years globally, since records were first kept in the 19th century, have all occurred since 1990, the top three since 1998. Specialists here this week will issue a report saying 2004 ranks as the fourth- or fifth-warmest year recorded.

Conference delegates from dozens of nations are fine-tuning the workings of the Kyoto pact, which takes effect Feb. 16. It sets targets for 30 industrial nations — excluding the nonparticipating United States and Australia — to reduce emissions of six greenhouse gases, most importantly carbon dioxide, a byproduct of coal, oil and gasoline use.

The United States is a member of the umbrella U.N. treaty on climate change, and it signed that treaty’s Kyoto Protocol in 1997. But President Bush renounced the Kyoto agreement in 2001, saying emission reductions would hurt the U.S. economy.

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- Pachauri is chair of the IPCC. Group of
  - He is from India

- Russia did sign Kyoto so it will go
  into effect in Feb 2005 (Feb 16)
  - But most countries will not meet their
  promises for yr 2012.
Best scientific advice is to read the climate report

Most researchers agree on the need to back Kyoto: let politicians deal with the politics.

Sir — Your Editorial "Not just academic" (Nature 431, 1; 2004) on the political climate in Russia stresses the importance of respecting academic freedom. But this is beside the point. To avoid bowing to political pressure, or indeed political incentives, Russian scientists should simply stop giving any political advice (either unsolicited or solicited) and confine themselves to developing genuine scientific concepts that reflect reality, not opinions.

Most conscientious researchers can distinguish the ideological and scientific aspects of the problems they study, and keep them separate. The existing range of scientifically justified concepts on climate change provides a wide, but well delineated, field for political manoeuvring. There is a broad consensus among climate scientists that humankind must urgently develop legal, institutional and financial mechanisms for regulating climate. The extent of regulation that’s needed is open to debate, but most scientists support the Kyoto Protocol as the first practical step towards this goal.

However, the problem of assessing the costs of such actions is traditionally tackled by politicians, not scientists. If we all agree that such problems are best addressed through politics, it is clear that the only advice a conscientious researcher can give to a Russian politician is as follows: "Read the reports of the Intergovernmental Panel on Climate Change."

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Climate: Russians face another disappointment

Sir — In the News Feature "Crunch time for Kyoto" (Nature 431, 12–13; 2004) you mention the lack of public pressure on Russian president Vladimir Putin to begin tackling climate change and ratify the Kyoto treaty. There seems to be a widespread belief in Russia that climate change is a peripheral issue, unrelated to the supply of jobs, to putting a roof over your family’s head or to food on your table. Add to this the belief that a warmer climate would be an improvement — taking some of the chill out of winter and maybe increasing harvests — and it’s little wonder that climate change isn’t on the lips of every Russian voter.

However, the reality of climate change for Russia, and boreal Asia as a whole, is unlikely to be the balmy-weathered, bumper-harvest future some expect. Although increasing temperatures may well allow extended growing seasons and a northward shift in crop zones, increased damage from pests, drought and severe weather could lead to a 30% cut in cereal production by 2050 across the region, with Siberia seeing a decrease of up to 20% in agricultural output (see Intergovernmental Panel on Climate Change Climate Change 2001: Impacts, Adaptation and Vulnerability Cambridge University Press, Cambridge, UK; 2001).

Even if the net effect is an increase in food production, it is likely to come at a price. Industries such as mining and construction face soaring costs as a result of melting permafrost, increased flooding and building subsidence. The health and transport sectors could come under huge additional pressure, and international tensions are likely to be inflamed by water shortages, famine and mass migration in other parts of Asia.

For our Russian voter then, living through Russia’s already painful social and economic post-Soviet transition, climate change threatens to make life more painful still.

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Passion and politics cloud the climate debate

Sir — I question the view expressed in "Crunch time for Kyoto" (Nature 431, 12–13; 2004) that Russian attitudes towards the Kyoto Protocol are "heavily influenced by its dented pride and need for respect", as a former superpower. I suggest that concerns held by members of the Russian Academy of Sciences about Kyoto, and their surprise at British delegates' complaints about the inclusion of climate-change 'sceptics', are shaped by disquieting memories of the Soviet era.

It is 40 years since the end of Trofim Lysenko’s dictatorship over Soviet biology. A poorly educated agronomist, Lysenko gained political support during the agricultural crisis of the 1930s by denouncing conventional genetics as a "bourgeois deception" and promising improved crop yields on the basis of crude and unsubstantiated "experiments". He became the autocrat of Stalinist science, with catastrophic results that linger today.

Lysenkoism was a tragic example of an illusion that became accepted as reality, despite all contrary evidence, because it was continually affirmed at meetings and by the media — see V. N. Soffer's Lysenko and the Tragedy of Soviet Science (tr. L. & R. Grulio, Rutgers University Press, New Brunswick; 1994). In 1965, Academician and Nobel prizewinner Nikolai N. Semenov was finally able to write: "There is nothing more dangerous than blind passion in science. This is a direct path to unjustified self-confidence, to loss of self-criticalness, to scientific fanaticism, to false science. Given support from someone in power, it can lead to suppression of true science, and, since science is now a matter of state importance, to inflicting great injury on the country."

Russian distrust of the interaction between science and politics remains strong. To many of the academicians, as to many of their colleagues around the world, the global-warming paradigm is far from 'fact', but objective debate is distorted by political and commercial interests. In this context, I suggest that it was perfectly reasonable for the academy's programme to include scientists with a range of viewpoints. It was unfortunate that the British delegation tried to exclude a selection of these because — as one member is reported as saying (Science 305, 319, 2004) — "We knew that we would not get to the scientific issues if we went down every rabbit hole of scepticism."

The 'sceptics' who were invited, including myself, were not speaking about the Kyoto Protocol. For my part, I argued against claims that malaria and other mosquito-borne diseases are spreading to new latitudes and altitudes because of climate change.

I feel no offence at being branded a sceptic — quite the contrary — but I never dreamt that I would hear a top Russian administrator at a Kremlin press conference refer to me, a British scientist, as a "disident", and to the representatives of the British government as "totalitarians" who had tried to "censor" me to protect their Party. Truly, an irony of history.

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They describe effects of change on everyday life.

By Kevin Gray

BUENOS AIRES, Argentina — A Nepalese Sherpa fears his mountain valley will be flooded by melting glacier runoff high in the Himalayas. A Fiji islander frets about rising sea levels, while villagers cope with the destruction of mangrove swamps in India.

As scientists debate whether global warming is affecting Earth, “climate witnesses” told a U.N. environmental conference Friday they are already feeling the heat of the changing weather patterns they say are drastically affecting the way of life from the Himalayas to the South Pacific.

“In the past we just accepted it was the will of God,” said Penina Moce, a woman from Udu, a fishing village in Fiji. “But now we believe there could be other reasons.”

Moce spoke as delegates from nearly 200 countries sat down in Buenos Aires for an annual gathering by government officials, scientists, and environmentalists aimed at trying to reduce “greenhouse” emissions believed by many to be causing a rise in Earth’s temperatures.

Environmentalists say her testimony exemplifies what is occurring in some areas affected by global warming and climate change — issues the world has tried to address through the Kyoto Protocol, an agreement requiring initial cuts in greenhouse gas emissions by 2012 that comes into force in February.

With only a few months remaining before Kyoto takes effect, the science over global warming remains divided. The United States — the largest industrialized country not to join the treaty — has cited scientific uncertainties as one of the reasons.

Caspar Ammann, a scientist and climatologist with the National Center for Atmospheric Research in Boulder, said changes are apparent around the world.

“You see the massive changes in the mountain ranges around the world. Where you see the glaciers disappearing very rapidly, you see changes in vegetation and changes in the whole seasonal cycles. The sea ice that is going back ... these are indications.”

A study by Tom Wigley of NCAR and Sarah Raper of the Climatic Research Unit in Britain found a 90 percent probability global temperatures will rise 3.1 to 8.9 degrees between 1990 and 2100 as a result of human influences if greenhouse gas emissions continue unchecked.

Other experts disagree, saying Earth’s temperatures have varied greatly over time, and little is known about how the atmosphere copes with temperature change.

“If you look at the long-term records of temperatures, you will see periods warmer than today and periods colder than today,” said John Christy, a climatologist at the University of Alabama.

But Anil Krishna Mistry, a 37-year-old rice farmer living in mangrove swamps along India’s border with Bangladesh, said he is worried by what he sees as changing climate patterns.

He said the region is under constant threat of flooding from heavy rains and that rising sea levels have washed away huge tracts of land and made others too salty for rice growing.

Norbu Sherpa, an expedition guide in the Himalayas, also warned of a changing landscape in the Everest region.

“In the years that I have worked as a trekking expedition guide, I have seen snow lines and glaciers go back higher and higher,” he said. “Meanwhile, new lakes are forming; others are growing larger and larger.”
A key environmentalist endorses nuclear

• Lovelock is now 84 years old
• He says: Nuclear is the only green solution for the energy problems
• His words will cause huge disquiet for the environmental movement

• This was in May 2004
• The story is on the next page

DISTRICT OF COLUMBIA
U.S. says dams non-negotiable part of two rivers

WASHINGTON — The Bush administration on Tuesday ruled out the possibility of removing federal dams on the Columbia and Snake rivers to protect 11 endangered species of salmon and steelhead; even as a last resort.

In an opinion issued by the fisheries division of the National Oceanographic and Atmospheric Administration, the government declared that the eight large dams on the lower stretch of the two rivers are an immutable part of the salmon’s environment.

Dec 1, 2004
Rocky Mtn News
Only nuclear power can now halt global warming

Leading environmentalist urges radical rethink on climate change

By Michael McCarthy Environment Editor

24 May 2004

"Only nuclear power can now halt global warming"

"The ice is melting much faster than we thought"

Guru who tuned into Gaia was one of the first to warn of climate threat

James Lovelock: Nuclear power is the only green solution

Global warming is now advancing so swiftly that only a massive expansion of nuclear power as the world's main energy source can prevent it overwhelming civilisation, the scientist and celebrated Green guru, James Lovelock, says.

His call will cause huge disquiet for the environmental movement. It has long considered the 84-year-old radical thinker among its greatest heroes, and sees climate change as the most important issue facing the world, but it has always regarded opposition to nuclear power as an article of faith. Last night the leaders of both Greenpeace and Friends of the Earth rejected his call.

Professor Lovelock, who achieved international fame as the author of the Gaia hypothesis, the theory that the Earth keeps itself fit for life by the actions of living things themselves, was among the first researchers to sound the alarm about the threat from the greenhouse effect.

He was in a select group of scientists who gave an initial briefing on climate change to Margaret Thatcher's Conservative Cabinet at 10 Downing Street in April 1989.

He now believes recent climatic events have shown the warming of the atmosphere is proceeding even more rapidly than the scientists of the UN's Intergovernmental Panel on Climate Change (IPCC) thought it would, in their last report in 2001.

On that basis, he says, there is simply not enough time for renewable energy, such as wind, wave and solar power - the favoured solution of the Green movement - to take the place of the coal, gas and oil-fired power stations whose waste gas, carbon dioxide (CO2), is causing the atmosphere to warm.

He believes only a massive expansion of nuclear power, which produces almost no CO2, can now check a runaway warming which would raise sea levels disastrously around the world, cause climatic turbulence and make agriculture unviable over large areas. He says fears about the safety of nuclear energy are irrational and exaggerated, and urges the Green movement to drop its opposition.

In today's Independent, Professor Lovelock says he is concerned by two climatic events in particular: the melting of the Greenland ice sheet, which will raise global sea levels significantly, and the episode of extreme heat in western central Europe last August, accepted by many scientists as unprecedented and a direct result of global warming.

These are ominous warning signs, he says, that climate change is speeding, but many people are still in ignorance of this. Important among the reasons is "the denial of climate change in the US, where governments have failed to give their climate scientists the support they needed".

He compares the situation to that in Europe in 1938, with the Second World War looming, and nobody knowing what to do.

The attachment of the Greens to renewables is "well-intentioned but misguided", he says, like the Left's 1938 attachment to disarmament when he too was a left-winger.

He writes today: "I am a Green, and I entreat my friends in the movement to drop their wrongheaded objection to nuclear energy."
His appeal, which in effect is asking the Greens to make a bargain with the devil, is likely to fall on deaf ears, at least at present.

"Lovelock is right to demand a drastic response to climate change," Stephen Tindale, executive director of Greenpeace UK, said last night. "He's right to question previous assumptions.

"But he's wrong to think nuclear power is any part of the answer. Nuclear creates enormous problems, waste we don't know what to do with; radioactive emissions; unavoidable risk of accident and terrorist attack."

Tony Juniper, director of Friends of the Earth, said: "Climate change and radioactive waste both pose deadly long-term threats, and we have a moral duty to minimise the effects of both, not to choose between them."

Also in Environment

'Only nuclear power can now halt global warming'
Guru who tuned into Gaia was one of the first to warn of climate threat
'The ice is melting much faster than we thought'
How trains, planes and parties are driving Britain barking mad
Hunting ban to be forced through in a single day
Kyoto treaty passes in Russia (Oct 2004)

- Now it will go into effect in Feb 2005

- if people do Kyoto promises --
  - then it will make a 5% difference in the future climate
  - but most countries will not be able to do their Kyoto promises

- And the developing countries have not made any Kyoto promises

- Two main advisors in Russia did not want Russia to pass Kyoto,
  - Their main economist - Illarionov
  - Their main climatologist - Israel
Crunch time for Kyoto

Only Russia can rescue the global agreement on climate change. So why aren't Russian climate scientists speaking up? Quirin Schiermeier and Bryon MacWilliams report from Moscow.

Reach for the seatbelt in a Moscow taxi cab, and you are likely to be reprimanded by the driver. "We're in Russia," he might say — his way of letting you know he feels insulted by your low regard for his driving skills.

Although the cabbie's attitude may surprise first-time visitors, it's old hat to David King, chief scientific adviser to the British government. King is well aware that attitudes in this former superpower are heavily influenced by its dented pride and need for respect.

Yet even he was taken aback at a recent Moscow summit with Russian climate researchers. King and a delegation of British experts had come to the 7 July workshop at the invitation of the Russian Academy of Sciences. But it soon became clear that the agenda had been hijacked by some of Russia's most vocal critics of the Kyoto Protocol on climate change, the international agreement to reduce global warming, which Russia has yet to ratify. The UK delegates reacted with dismay as several unscheduled speakers got up to state that man-made global warming was a myth.

King remains diplomatic. "I am very disappointed that this event wasn't as successful as it should have been," he told Nature. Michael Grubb, a climate-change expert at Imperial College London and a member of the UK delegation, is more blunt. "We walked into a trap," he says.

That a small group of treaty-objectors could co-opt a high-level scientific meeting illustrates Russia's unusual situation. Unlike Europe and the United States, where most scientists strongly support efforts to limit greenhouse-gas emissions, Russia is under virtually no pressure from its scientific community to take steps to avert climate change. While the majority remains silent, a small group within the Russian Academy of Sciences speaks with nationalistic fervour about the need to avoid restrictions on the Russian economy. In post-Soviet Russia, where economic hardship and growing nationalism are everyday realities, it is difficult for anyone to speak out against them.

The Kyoto agreement, drafted in 1997, requires industrialized countries to cut their greenhouse-gas emissions to 5% below 1990 levels by 2012. It has been ratified or accepted by 124 countries, which collectively account for 44% of the industrialized world's emissions. But 55% is needed for the treaty to take effect, and, after the United States withdrew its support in 2001, Russia, with its 17.5% share of emissions, became the treaty's last remaining hope.

**Doing a deal**

President Vladimir Putin's statements on the matter have been ambiguous. In May he told European Union leaders that he might be willing to sign in exchange for their support of Russia's application for membership of the World Trade Organization. But neither Putin nor his ministers have shown any real enthusiasm for the treaty beyond its use as a negotiating tool, and it now seems that a handful of anti-treaty Russian scientists and economists are busy in the background setting the stage for the Kremlin ultimately to reject it.
Two powerful advisers to Putin are spearheading this opposition. One is Yuri Izrael, the 74-year-old director of the Moscow-based Institute of Global Climate and Ecology. His age and political leanings have led some of his opponents to call him a "fossil communist fighting for fossil fuel". The other is Andrei Illarionov, 40, Putin's top economic adviser and a staunch opponent of any government interference in the economy.

**Economic argument**

While Izrael says he opposes the Kyoto Protocol mainly on scientific grounds, Illarionov argues that it threatens Russia's wealth and development. He says that Russia's rapidly growing economy will soon produce more emissions than the treaty allows, forcing it to buy emission rights on the international market. And as the world's largest greenhouse polluter, the United States, has backed out despite its much stronger economy, it is even more unreasonable to expect Russia to sign the Kyoto treaty, Illarionov argues.

Observers worry that Putin will find this argument persuasive. Illarionov's influence is thought to be extensive, and even his critics admit that he is an eloquent and sharp-witted lobbyist with a solid understanding of science. "Not many countries have such an intelligent expert dealing with climate issues at this high level," says Grubb.

Now the Russian Academy of Sciences has been drawn into the fray. Izrael, a prominent academy member, was accused of stage-managing last year's World Climate Change Conference in Moscow to promote his agenda (see *Nature* 423, 792; 2003). Shortly after the conference, Putin asked the academy to reassess the risk of man-made climate change and the effectiveness of the Kyoto Protocol.

Observers considered the move to be politically motivated, as all the key scientific issues had already been addressed in great detail by the Intergovernmental Panel on Climate Change (IPCC), of which Izrael is a vice-president. The last IPCC report in 2001, *Climate Change 2001: The Scientific Basis*, quoted extensive evidence that anthropogenic greenhouse warming is real and could dangerously alter the climate.

But Izrael has challenged this finding. In May, he put out a two-page memorandum based on a series of meetings with selected academy members that claimed "a high level of uncertainty as to whether the rise in temperature (over the past 100 years) was in fact due to human activity". The Kyoto Protocol has "no scientific basis", the report concludes.

But Illarionov's participation in the seminars, and concerns that Izrael's selection of experts was biased, have led observers to doubt the independence of these conclusions. "I agree there are many uncertainties," says Igor Mokhov, a climate modeller at the Obukhov Institute of Atmospheric Physics in Moscow. "But no serious analysis can deny the existence of a profound anthropogenic influence on global warming."

Izrael insists that the academy's mission is purely scientific and that the treaty itself is politically motivated. "The Kyoto Protocol came about because there is big money being spent on it," he told Nature. "But everyone has forgotten about the climate, and is focusing on how best to trade emission rights and earn money. They're just deluding themselves."

The July workshop was to have been an informal exchange of ideas about climate-change research. But unknown to the attendees, Izrael, one of the meeting's organizers, had invited a group of known climate-change sceptics, including Richard Lindzen, a meteorologist at the Massachusetts Institute of Technology in Cambridge, who is widely regarded as the 'guru' of global-warming doubters. Izrael added them to the list of speakers only at the last minute.

This led to complaints by King and other British delegates. "The workshop was an excellent opportunity to discuss the important issue of climate change," King says. "But there were some very unfortunate last-minute changes made by the organizers."

In response, Illarionov accused Britain of attempting to force governments against their will to ratify the Kyoto Protocol. "Unfortunately, it is a war. War against the whole world and, in this case, against Russia," Illarionov said at a press conference after the meeting.

The British Office of Science and Technology is playing down the incident, calling it a "storm in a teacup". But on the quiet, scientists inside and outside Russia worry that it is a sign that the Russian Academy of Sciences is lending its considerable weight to Kyoto-hostile forces in the country.

**Cold comfort**

This is in marked contrast to the academy's behaviour in communist times, when concerned members successfully opposed several government proposals they considered misguided, including a plan to re-route large northward-flowing Siberian rivers with a series of controlled nuclear explosions. But in the current climate debate, few within the academy are willing to voice their objections to Izrael's stance on the treaty.

There is also no public pressure on the government. Climate change is of little concern in a country in the middle of a painful social and economic transition. "Most every Russian family simply has much more immediate problems with adjusting to the new life," says Mokhov.

And warming doesn't sound such a bad thing to residents of the coldest country in the world. Indeed, there is a widespread notion, held even by some scientists, that a slightly warmer climate would actually help the country to save energy and produce better harvests.

An upside to climate change is not out of the question, although the reality is likely to be more complicated, says Vladimir Kotlyakov, director of the Russian Academy of Science's Institute of Geography in Moscow. Melting permafrost could damage roads and pipelines, for instance. Several institutes of the academy plan to join forces to examine the likely social, economic and physical consequences of a northward shift of climate zones. The results could help Russian scientists find their voice on the climate issue, says Kotlyakov.

Even this summer's workshop may have helped by raising awareness among Russian experts about the urgency of the situation, suggests Georgy Golitsyn, director of the Obukhov Institute. "Many of us were quite impressed at the level of preparation Britain is already taking with regards to a changing climate," he says.

As Russia contemplates what it will do, patience should be the name of the game, says Grubb. "Disputes within the Russian Academy of Sciences are not something that foreign comment will help resolve," he says. "Every attempt to play hardball with the Russians will backfire."

Quirini Schiermeyer is *Nature*'s German correspondent; Bryan MacWilliams is a freelance writer in Moscow.
Global Warming Glasnost

President Bush could kill two shibboleths with one stone. He has asked the Russian President to pick up the phone and tell Vladimir Putin what an asset the Russian President has in Andrei Illarionov. It could encourage Russia to finally ditch the Kyoto Protocol, as well as serve as the start of a much smarter global warming policy in the U.S.

Mr. Illarionov is the Russian adviser who on Tuesday told reporters that his nation was sending Kyoto the way of the czars. Since Russia's signature is needed to make the pact, Mr. Illarionov's words sounded like Kyoto's death knell. Or at least they did until a Russian deputy economy minister took the opposite position and said Russia was "moving towards ratification."

Our own hunch is that what's driving this contradiction is old-fashioned politics. Mr. Putin needn't decide on Kyoto until next year and he is free until then to bide the price of his vote. Some Putin advisers (including Mr. Illarionov) are inclined to stand with the U.S. and dump Kyoto on reasons of principle and the economy. But others are surely being wooed with economic bribes from European politicians who agree with U.N. weapons inspector Hans Blix that the world's biggest threat is warmer climates.

Politics aside, much of the Kremlin leadership seems to have reached the intellectual conclusion that the protocol is a lot of hot air. Mr. Illarionov in particular has repeatedly had the courage to say what most politicians won't: Both the science and the economics of Kyoto are fundamentally flawed.

In remarks at an October international climate conference in Moscow, Mr. Illarionov noted that the science on which Kyoto is based has never been able to explain basic questions. Most glaring is why the Earth warmed so much in the early part of the 20th century, before the boom in carbon dioxide emissions. Another is why the near-earth atmosphere (measured by satellites) isn't warming as much as the Earth's surface. There's also the nagging problem that temperatures more than 1,000 years ago at times appear to have been as warm, if not warmer, than today's.

Yet while Kyoto's science might be theory, its economic costs are real. Mr. Illarionov pointed out that the past 40 years of data show a correlation in 150 countries between increasing carbon dioxide emissions and higher GDP; countries with no growth in emissions were marked by stagnation. This is of real concern to Mr. Putin, who has committed himself to doubling Russia's GDP by 2010. "No country in the world can double its GDP with a lower increase in carbon dioxide emissions," said Mr. Illarionov.

Russia isn't alone in these concerns, even if it's alone in voicing them. European signatories are realizing it will be impossible for the EU to emerge from global recession while also cutting emissions. Even with lackluster growth Europe has missed its emissions targets, and at current rates is expected to bring emissions down just 4.7% by the time the targets become binding, compared with the 8% reduction from 1990 levels it promised.

Mr. Illarionov's air-clearing comments could have an added benefit if they cause the White House to settle its own internal global warming debate. Mr. Bush did the right thing, and has taken political abuse for it, by rejecting Kyoto and casting doubt on global warming science. Yet in a forlorn attempt to soften that criticism, his Administration has instituted its own "voluntary" emissions reduction plan.

This has left Mr. Bush vulnerable to critics who say he knows global warming is a problem but refuses to take action. Their strategy is to build political and media momentum to force him to cave, and they made progress this fall when John McCain and Joe Lieberman came closer to pushing a domestic Kyoto bill through the Senate. By some estimates, such a bill would reduce U.S. GDP by $106 billion.

Which brings us back to Mr. Bush's potential phone call. A few words with Mr. Putin about the wisdom of Mr. Illarionov's counsel might just tip the Russian President into the anti-Kyoto camp, and put Al Gore's treaty in permanent cold storage.
Kyoto treaty passes in Russia

United States pulled its support of climate pact in 2001

By Peter Baker  Oct 23 2004
The Washington Post

MOSCOW — Russia's lower house of parliament ratified the long-stalled Kyoto climate change treaty on Friday, clearing the last major hurdle for the global pact to take force seven years after it was drafted.

The State Duma voted 334-73 to approve the treaty on the recommendation of President Vladimir Putin, following years of bitter debate in Moscow and around the world about balancing economic growth and environmental health.

Kyoto treaty gets Russian OK

Continued from 1B

17 percent, could put it over the threshold.

"It's a great event that took place, not only for Russia but for the rest of the world," said Vladimir Zakharov, director of the Moscow-based Center for Russian Environmental Policy and co-chairman of Russia's Social Forum on Climate Change. The two advocacy groups have been lobbying for ratification of the agreement, which was negotiated in Kyoto, Japan, in 1997.

Putin had endorsed the accord several times in the last few years without ever actually allowing a Duma vote. The breakthrough came in May, when he concluded a deal with the European Union in which he agreed to secure ratification in exchange for E.U. support for Russian membership in the World Trade Organization.

Kremlin factions opposed to Kyoto waged a last-ditch campaign to kill it, led by Putin's top economic adviser, Andrei Illarionov, who has termed the pact a "death treaty" that would strangle the growing Russian economy. But Putin settled the matter when his cabinet endorsed it on Sept. 30.

It's detrimental to Russian interests, and I strongly advised our government in this respect to follow the example of the United States," Natalya Narochntskaya, a Duma deputy from the nationalist Motherland party, said in an interview after the vote. She said the Kremlin embraced the treaty "to appease the Western society," which has assailed Putin for rolling back democratic institutions.

Wednesday, the treaty goes to the largely ceremonial upper house of parliament for approval, which has always been a formality in post-Soviet Russia. It will then go back to Putin for his signature.

The treaty requires participating industrial countries to reduce emissions of greenhouse gases by 5.2 percent below 1990 levels by 2012. For Russia, the terms could prove an economic boon, because its levels have already fallen about 25 percent since 1990 in the industrial collapse that followed the breakup of the Soviet Union. Russia stands to earn billions of dollars by selling its excess quotas, as the treaty allows, to countries not in compliance with the requirement.
Dragged into the fray

Willingly or not, Russia's science academy has become part of the political economy of climate.

W

We've been here before. Last December, Russian ministers and advisers were sending contradictory signals about whether they would ratify the Kyoto Protocol for climate change, in the end leaving the issue unresolved. Last week saw an apparently similar phenomenon, except that in the process the Russian Academy of Sciences apparently allowed itself to be hijacked by opponents of the protocol.

According to the news agency Reuters, a document handed to Russian President Vladimir Putin by the academy strongly opposed ratification, asserting that the protocol "lacks a scientific basis" and would put a brake on Russia's economic development. This matters, because Russia's ratification would bring the Kyoto Protocol into force.

The report, commissioned by Putin in January, was adopted by an academy commission on 14 May, despite disagreement among leading Russian climate scientists about its tone and recommendations.

Climate researchers are upset that the report's main author, Yuri Izrael, director of the academy's Institute of Global Climate and Ecology in Moscow and an influential scientific adviser to the Kremlin, is also a vice-chairman of the Intergovernmental Panel on Climate Change (IPCC). As such, he was a signatory to the IPCC's 2001 assessment of climate change — the very document that flatly contradicts some of the Russian anti-Kyoto statements.

There are suggestions that the chairman of the IPCC, Rajendra Pachauri, might take some action against Izrael. This should be resisted, partly because the IPCC has better things to do, and partly because the Russian report may well be part of a political charade. It appeared in the same week as a summit between Russia and the European Union (EU) in which Putin sought approval and improved conditions for entry into the World Trade Organization. The EU is a strong supporter of Kyoto. Lo, Putin got the backing he wanted and, lo again, he immediately expressed his willingness for Russia to move towards ratification of Kyoto.

How and why the academy allowed itself to become a pawn may never be clear to outsiders. What is clear is that science in Russia, as elsewhere, has been hijacked by the politics and economics of energy investment and emission reductions. Anyone seeking to interpret messages about such science should apply the same filter of scepticism as they do to politics. Even so, the bottom line is that prospects for the Kyoto Protocol are brighter than they have been for a while.

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"I met Israel. He is very bright. He and Budyko worked together on climate problems."

"The Russian economy is increasing rapidly. There is a big world demand for their oil and gas. And it takes energy to produce oil & gas. Russia's CO₂ emissions are now increasing and in a few years they will be back above 1990 levels."

"Thus Israel and the main Russian economist fought the Kyoto idea for good reasons."

"The story above is too political. The facts about Russian CO₂ emissions should have been included."

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27 May 2004

Nature Mag
Russia passed Kyoto in Oct 2004
So Kyoto will go into effect on 16 Feb 2005.

Kyoto's big day
16 February 2005 will go down in history, for it is the day we begin to save the world.

On that date, the long-awaited Kyoto protocol will become law. The international treaty designed to curb global warming by cutting greenhouse gas emissions has spent the past seven years in limbo.

Carbon will instantly become a commodity that can be bought and sold, while the 30 industrialised countries signed up to the protocol will have to get to grips with meeting their emissions targets by 2012.

The protocol finally got the backing it needed when Russia formally ratified it on 18 November, triggering a 90-day countdown. The ratification documents, signed by Russian president Vladimir Putin, were presented to Kofi Annan, secretary-general of the UN, at a meeting of the Security Council in Nairobi, Kenya. "This is a historic step forward in the world's efforts to combat a global threat," Annan said.

HSBC Joins Battle On Global Warming: Will Slash Emissions

HSBC Holdings PLC, the big international bank, is going "carbon neutral." HSBC, London, emits about 550,000 tons of carbon dioxide a year. It said it will reduce its carbon-dioxide emissions and will pay for credits that offset the remainder.

The bank's action isn't likely to have a huge impact on the planet. HSBC's carbon-dioxide emissions are a fraction of what comes out of a single big coal-fired electricity plant in a year.

HSBC said the move will cost the bank as much as $7 million in the first year-hardly a huge sum for an international bank.

Still, the announcement, which comes on the opening day of a big United Nations global-warming conference in Buenos Aires, is symbolically significant. HSBC is among the first major financial institutions to announce a plan to address its global-warming emissions.

Francis Sullivan, HSBC's environmental adviser, said HSBC is acting in part to understand how the cost of reducing global-warming emissions will affect its banking clients, including major industrial firms.

HSBC's carbon-dioxide emissions come from using electricity, natural gas and fuel oil in normal business operations, such as heating and cooling its offices around the world, and from business travel. The bank said it will offset the emissions by buying electricity produced from environmentally friendly sources, by buying so-called global-warming emissions credits and by investing in projects outside its operations that reduce global-warming emissions.
Europe set to miss Kyoto targets "by a mile"

London European countries are nowhere near complying with the Kyoto Protocol on climate change, energy economists have warned.

Over the past two months, European Union (EU) states have been working on plans for emission allowances before the 2005 opening of a market for trading carbon dioxide emissions. But almost all the national targets for industrial emissions are above levels needed to meet the Kyoto Protocol, according to the Carbon Trust, a group that lobbies on climate-change issues for the British government. "Member states are going to miss their Kyoto targets by a mile," says Michael Grubb, the trust's director of policy and an energy economist at Imperial College London.

The analysis, published on 2 July, shows that 9 of 12 countries plan to increase emissions in the next three years. But under Kyoto, the EU should cut emissions by 8% from 1990 levels by 2012. If signatories miss domestic targets they must invest in overseas projects to comply with the protocol.

- The nations will not meet the Kyoto targets of CO2 emissions

- It is worse; In 9 of the 12 countries, the emissions will increase during the next 3 years.

CO2 emissions in 9 of 12 European countries will increase, not decrease,
Climate study highlights inadequacy of emissions cuts

Quirin Schiermeier, Munich
As representatives from 188 countries gather in Milan, Italy, to work through the latest round of negotiations for the Kyoto Protocol on limiting greenhouse-gas emissions, German researchers have released a study showing that “intolerable” levels of climate change are more likely than decision-makers may realize.

In a report published on 25 November, the German Advisory Council on Global Change contends that the world can tolerate a rise of up to 2 °C over pre-industrial levels. Beyond this, the effects of climate change on society would become too severe, they say. This would be mainly due to sudden phenomena such as the possible irreversible disintegration of large ice sheets, or abrupt disturbances to the North Atlantic Ocean’s currents and to monsoons in Asia.

Global mean temperatures have already increased by 0.6 °C since 1908. By the end of the twenty-first century, temperatures may increase by a further 1.4-5.8 °C, according to the latest projection of the Intergovernmental Panel on Climate Change.

Even the lower limit of this estimate will pose an intolerable threat to human health, food and water supplies, economic development and natural ecosystems in many parts of the world, says the German report.

But it seems unlikely that political action will be able to keep temperature increases down. The 1997 Kyoto Protocol has yet to be ratified, as Russia has not decided whether to sign it. But even if the protocol comes into effect, the cuts that it prescribes will be insufficient to hold climate change to a ‘tolerable’ level, the report says.

It concludes that global carbon dioxide emissions would need to be curbed by 45–60% by 2050 compared with 1990 levels to avoid dangerous climate change. The Kyoto Protocol calls for average cuts of 5% in industrialized countries by 2012, and even that may be unrealistic.

The report will be presented in Milan at the ninth Conference of the Parties to the United Nations Framework Convention on Climate Change on 10 December. But it is unlikely to have an immediate impact on Kyoto negotiations, say the report’s authors.

“These findings reinforce our position,” says Karsten Sach, head of the German environment ministry’s international climate-protection department, and leader of the German delegation in Milan. Germany is committed to a reduction of 40% in its emissions by 2020, he says, regardless of whether the Kyoto Protocol comes into effect. Other European countries, including Britain, France, Sweden and the Netherlands, have similarly set their own goals.

Plans for a climate-protection strategy beyond Kyoto are not yet on the table, but some analysts expect the Italian host delegation in Milan to outline possible next steps.

Some Comments

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German report.

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decided whether to sign it. But even if the
protocol comes into effect, the cuts that
it prescribes will be insufficient to hold
climate change to a ‘tolerable’ level, the
report says.

Flood warnings: global warming is widely
expected to disrupt the monsoon in Pakistan.

Doing Kyoto would only decrease CO₂ by about 5% by year 2100. So the amount of warming would only decrease by a small amount.

It is very hard for countries to achieve the 5% CO₂ reductions for Kyoto. Most will not be able to do this.

This report says that world CO₂ emissions need to be cut by 45-60% by year 2050 when compared with year 1990.

Germany promises that in 2020, their emissions will be 40% below year 1990. They probably can not do this.
Global warming can seem too remote to worry about, or too uncertain—something projected by the same computer techniques that often can’t get next week’s weather right. On a raw winter day you might think that a few degrees of warming wouldn’t be such a bad thing anyway. And no doubt about it: Warnings about climate change can sound like an environmentalist scare tactic, meant to force us out of our cars and cramp our lifestyles.

Comforting thoughts, perhaps. But turn to “GeoSigns,” the first chapter in our report on the changing planet. The Earth has some unsettling news.

From Alaska to the snowy peaks of the Andes the world is heating up right now, and fast. Globally, the temperature is up 1°F over the past century, but some of the coldest, most remote spots have warmed much more. The results aren’t pretty. Ice is melting, rivers are running dry, and coasts are eroding, threatening communities. Flora and fauna are feeling the heat too, as you’ll read in “EcoSigns.” These aren’t projections; they are facts on the ground.

The changes are happening largely out of sight. But they shouldn’t be out of mind, because they are omens of what’s in store for the rest of the planet.

Wait a minute, some doubters say. Climate is notoriously fickle. A thousand years ago Europe was balmy and wine grapes grew in England; by 400 years ago the climate had turned chilly and the Thames froze repeatedly. Maybe the current warming is another natural vagary, just a passing thing?

Don’t bet on it, say climate experts. Sure, the natural rhythms of climate might explain a few of the warming signs you’ll read about in the following pages. But something else is driving the planet-wide fever.

For centuries we’ve been clearing forests and burning coal, oil, and gas, pouring carbon dioxide and other heat-trapping gases into the atmosphere faster than plants and oceans can soak them up (see “The Case of the Missing Carbon,” February 2004). The atmosphere’s level of carbon dioxide now is higher than it has been for hundreds of thousands of years. “We’re now geological agents, capable of affecting the processes that determine climate,” says George Philander, a climate expert at Princeton University. In effect, we’re piling extra blankets on our planet.

Human activity almost certainly drove most of the past century’s warming, a landmark report from the United Nations Intergovernmental Panel on Climate Change (IPCC) declared in 2001. Global temperatures are shooting up faster than at any other time in the past thousand years. And climate models show that natural forces, such as volcanic eruptions and the slow flickers of the sun, can’t explain all that warming.

As CO₂ continues to rise, so will the mercury—another 3°F to 10°F by the end of the century, the IPCC projects. But the warming may not be gradual. The records of ancient climate described in “TimeSigns” suggest that the planet has a sticky thermostat. Some experts fear today’s temperature rise could accelerate into a devastating climate lurch. Continuing to fiddle with the global thermostat, says Philander, “is just not a wise thing to do.”

Already we’ve pumped out enough greenhouse gases to warm the planet for many decades to come. “We have created the environment in which our children and grandchildren are going to live,” says Tim Barnett of the Scripps Institution of Oceanography. We owe it to them to prepare for higher temperatures and changed weather—and to avoid compounding the damage.

It won’t be easy for a world addicted to fossil fuels to limit emissions.

Three years ago the United States spurned the Kyoto Protocol, citing cost. But even Kyoto would barely slow the rise in heat-trapping gases. Controlling the increase “would take 40 successful Kyotos,” says Jerry Mahlman of the National Center for Atmospheric Research. “But we’ve got to do it.”

The signs of warming in the following pages are striking enough, but they are just a taste of the havoc the next century could bring. Can we act in time to avert the worst of it? The Earth will tell.
### Table 17. Quantified Emissions Reduction Targets Under the Kyoto Protocol by Country

<table>
<thead>
<tr>
<th>Country</th>
<th>Reduction Target (Percent)</th>
<th>Country</th>
<th>Reduction Target (Percent)</th>
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<td>-8.0</td>
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<tr>
<td>Latvia (R)</td>
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</tr>
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</table>

(R) = Country has ratified, accepted, approved, or acceded to the Kyoto Protocol.

European Union member countries renegotiated their individual targets under the EU Shared Burden Agreement, which was agreed to in 1998 and reaffirmed in the ratification of the Kyoto Protocol in 2002.


**Comments:**

It is interesting that Spain gets to increase its greenhouse emissions by 15%, Sweden up 4%, Australia up by 8%, but Canada must decrease by 6%. One wonders why Canada agreed to this.

Actually, many countries are now well above their 1990 emissions, and will not be able to make their agreements to reduce carbon dioxide, etc.

If the population of a country goes up, and the economy goes up a lot, and people travel more, then it is especially hard to reduce the emissions of carbon dioxide.

Roy Jema
Dec 2004
Bush not likely to change stance on global warming

Reports conclude that phenomenon is human-caused

By Joan Lowy
Scripps Howard News Service

WASHINGTON — Despite the release of two major new studies that conclude global warming is dramatically affecting the United States faster than many scientists had anticipated, President Bush is unlikely to significantly alter his stance on the issue, a key White House official said Monday.

Mandatory regulation or caps on greenhouse-gas emissions are unlikely for the foreseeable future, White House science adviser John Marburger said in an interview. "Not in this administration," Marburger said.

A report by the Pew Center on Global Climate Change found "abundant evidence" that global warming has begun to affect plants and animals in every region of the United States, from the earlier nesting of birds in the desert Southwest to the earlier flowering of trees in forests around the Great Lakes.

Another report, commissioned by the United States and other nations with Arctic territory, found that northern Alaska and the rest of the Arctic are warming rapidly, with

Lou Codispoti, a chemical oceanographer aboard the U.S. Coast Guard cutter Healy shoves ice away from cables holding water sample collection equipment on the Arctic Ocean, about 50 miles north of Point Barrow, Alaska, in July 2002, during a National Science Foundation and Office of Naval Research project.

the loss of polar ice projected to accelerate global warming as well as contributing to sea-level rise and flooding.

Both reports conclude that

the warming is human-caused through heat-trapping emissions from the burning of fossil fuels.

Please see NO on 5B
No change expected in Bush’s stance

Continued from 1B

“The message is that global warming is here and now,” said Hector Galbraith, an ecological research consultant in Newsane, Vt., and coauthor of the Pew report. “It’s surprising to me how soon we’re seeing these impacts and how ubiquitous they are.”

Despite saying the Bush administration would not change its policy on greenhouse-gas emissions, Marburger praised the two new reports.

“I think it’s always good to have good scientific information and these reports appear to be responsible,” he said. “The Arctic report points pretty clearly to effects and we’ve known about other things that are happening around the world.”

Bush withdrew the United States from the Kyoto Protocol, the international treaty to curb greenhouse-gas emissions, saying the treaty would be too costly for the United States.

Instead, Bush has pushed a plan that allows U.S. greenhouse-gas emissions to continue to increase, but at a slightly slower rate of growth as the result of increased efficiency in the use of energy. The administration also has pumped billions of dollars into research on long-term alternative sources of energy, such as hydrogen fuel cells.

“I think the present policy is flexible enough to accommodate these existing reports and any recent scientific reports that I am aware of,” Marburger said. “There is general acceptance of the need to decrease the amount of CO2 (carbon dioxide) produced in the process of making energy. Exactly how you go about doing that and how much is necessary is not yet understood.”


“We have a responsibility to those who will inherit the Earth from us to take immediate steps to stop the worst of these impacts,” Lieberman said.

The Arctic Climate Impact Assessment, conducted and reviewed by nearly 300 scientists, is the most comprehensive evaluation to date of the impacts of climate change.

Its release was initially scheduled to be accompanied by a set of policy recommendations, but the Bush administration pressured other nations that are part of the assessment not to release the recommendations, Sheila Watt-Cloutier, chair of the Inuit Circumpolar Conference, which represents native people of the Arctic region, told a Senate committee in September.

The Pew report looked at 40 studies from around the United States on changes in plants and animals as the result of global warming.

“The amazing thing is that we’re finding there are responses (in plants and animals) all the way from Florida to Alaska and from the East Coast to the West Coast,” said Camille Parmesan, a biologist at the University of Texas at Austin and coauthor of the Pew report.

“People should know climate change is affecting what is happening in their back yard,” Parmesan said.

In Florida, for example, four species of dragonfly have migrated to the state from equatorial regions and several species of birds are wintering longer in the state rather than moving farther south, Parmesan said.

“We might not care about butterflies and birds, but we are worried about malaria and water parasites,” Parmesan said. “If we are seeing the big stuff coming up, then the other insects — the mosquitoes and the diseases — are going to be coming in. They are all part of wildlife, not some separate group.”

Climate researchers see dark days ahead

By Jim Erickson
Rocky Mountain News

Boulder climate researcher Michael Glantz predicts that future historians will look back on the 21st century as the Climate Century.

“Climate will dominate the news, now and then, throughout this century,” Glantz said this week at a meeting of the Geological Society of America.

Food production, water resources, energy needs, infectious disease outbreaks, wildfires and the frequency and severity of extreme weather events will be altered in unknown and surprising ways by climate changes, said Glantz, a social scientist at the National Center for Atmospheric Research.

And humans will help shape future climate by their actions — or by failing to act.

Heat-trapping greenhouse gases emitted by the burning of fossil fuels are blamed for part of the 1 degree global temperature increase of the past century. Most climate researchers expect the warming to accelerate in coming decades.

“People are now part of the climate system, and we have to accept that,” Glantz said during a session titled “Geoscientific Aspects of Human and Ecosystem Vulnerability.”

During another session Sunday, three climate researchers explained how sea ice and glaciers are already responding to a warming world.

University of Colorado glaciologist Mark Meier said the global retreat of mountain glaciers is “perhaps the most visible evidence of global warming.”

Melting glaciers are contributing to rising sea levels, which threaten coastal areas with flooding and erosion, he said.

Satellite observations show that the global sea level is rising 0.12 to 0.16 inches per year, Meier said. By the end of this century, the sea level could rise 1 to 1.3 feet, he said.

In the Antarctic, the outer edges of the continental ice sheet are thinning, while inland ice is slowly thickening.

The collapse of ice shelves along the outer fringes of Antarctica does not affect sea level because the shelves float on the ocean.

But the shelves act as dams that block the seaward flow of glacial ice off the continent, said Pennsylvania State University researcher Richard Alley.

In March 2002, a Delaware-sized Antarctic Peninsula ice shelf collapsed. Since then, some glaciers in the region have been flowing seaward five times faster.

Losing substantial amounts of glacial ice from the Antarctic and Greenland could increase the rate of sea-level rise dramatically, Alley said.

“At this point, it would be reckless to predict any disaster,” Alley said. “But it would also be reckless to assure that there’s no disaster coming.”

More than 6,000 researchers are attending this week’s Geological Society of America meeting at the Colorado Convention Center in Denver.
Is Bush warming to global warming?

The mood music has certainly changed. A report for the US Congress describing the activities and plans for the national Climate Change Science Program (www.climatescience.gov) states in clear terms that increases in global temperature over the past 50 years are "unlikely to be due only to natural climate variations". And it lays the blame for some of the warming on greenhouse gases (see page 5).

Until now, the Bush administration has gone out of its way to distance itself from statements about human-induced climate change. President Bush dismissed a 2002 report by the State Department which predicted dire consequences from global warming, saying it had been "put out by the bureaucracy". The same year, the Environmental Protection Agency dropped global warming completely from its annual report on air pollution. But the latest report is endorsed by none other than Donald Evans and Spencer Abraham, the secretaries of commerce and energy respectively, and by John Marburger, Bush's science adviser.

So has there been a change in policy? The Bush administration has never denied the existence of global warming. Rather, it has argued that we do not know enough about the causes to set sensible policy. The admission that humans have something to do with driving climate change seems like a significant shift. But until the administration creates legally binding rules to curb greenhouse gas emissions, such change is meaningless.

R. James

Bush's U-turn

It's enough to make you think there is an election looming. After four years of reticence, the Bush administration has finally accepted what thousands of scientists and politicians claim to have known all along: that human activity has caused the increase in global temperatures seen over the past 30 years.

A report issued on 25 August that summarises climate-change research by 13 US government agencies, and is endorsed by the secretary of commerce, secretary of energy and the president's science adviser, says "global warming in the first half of the 20th century - estimated at 0.4°F [0.22°C] above pre-industrial temperatures - was likely due to natural climate variation", including increased solar activity. But the roughly 0.5°C rise over the second half of the century, and most dramatically in the last 30 years, could be explained only by taking "anthropogenic forcings" of carbon dioxide and other greenhouse gases into account.

"Well over 98 per cent of scientists that are competent in this area would agree with that," says Thomas Graedel, an industrial ecologist at Yale University who has reviewed the government's climate-change research strategy.

"The big question is what effect this will have on climate policy," says Anthony Janetos, director of the global-change programme at the Heinz Center, a non-profit environmental policy think tank that has ties to Teresa Heinz Kerry, wife of presidential candidate John Kerry. "The administration has been pretty consistent saying they believe in voluntary actions [to cut greenhouse gas emissions]. I haven't seen any indication they have changed their mind, but if they had, that would be big news indeed."

"The Bush administration has accepted what thousands of scientists said all along."

R. James
Kyoto won’t stop climate change

With Russia’s backing, the Kyoto protocol might finally come into force. But it’s what comes next that counts

FRED PEARCE

IT HAS been a long wait since the Kyoto protocol was signed in the early hours of 11 December 1997. Next year, if Russia sticks to the commitment it made last week, the treaty will at last come into force. And that will allow the world to get on with what really matters: drawing up the successor to Kyoto.

For if ardent greens and out-and-out sceptics can agree on anything, it is that Kyoto will not even come close to solving the problem of climate change. It is, as the UN Environment Programme director Klaus Toepfer said in a statement last week, “only the first step in a long journey”.

The clock is ticking. Every year we are releasing almost 7 billion tonnes of carbon into the atmosphere – carbon that had lain buried since the days of the dinosaurs. It will remain in the atmosphere for around a century, raising the level of carbon dioxide in the atmosphere and trapping more of the sun’s heat.

Before the industrial age, the CO₂ level was steady at around 280 parts per million. When the Kyoto protocol was drawn up in 1997, the CO₂ level had reached at 368 ppm. This year, it hit 379 ppm.

Most predictions of soaring temperatures, floods, droughts, storms (see page 10) and rising sea levels are based on a concentration of 550 ppm. On current trends, this figure, is likely to be reached in the second half of this century. Even if levels rose no higher, this would just be the start. Time lags in natural systems such as ice caps and ocean circulation mean that changes will continue for millennia after the CO₂ level stabilises (see Graphic).

The bottom line is that only drastic cuts in global emissions of CO₂, of two-thirds or more, can stop the concentration of the gas rising even higher and stave off ever more severe climate change. The more quickly the world can make such cuts, the lower the level at which concentrations will eventually stabilise.

The Kyoto protocol, however, involves only very modest reductions of less than 5 per cent. The US does not support it, developing nations do not have to make any cuts and it expires in 2012. Perhaps most crucially, it does not provide a blueprint for where we want to end up and how we intend to get there.

But activation of the Kyoto protocol would still be highly significant, as it would free negotiators to begin to discuss what to do next. That process is set to begin formally next year, but is also likely to be the main talking point before then, at the next meeting of the protocol’s signatories in Buenos Aires in December. Activation of the
part will be deciding who is entitled to make those emissions. Developing countries insist they can only accept quotas based on population and suggest extending the Kyoto plans for emissions trading to smooth the transition. Industrialised countries such as the US, which emits eight times as much CO₂ per head of population as China and 18 times as much as India, reject such suggestions, but are having difficulty finding a fair alternative.

Assuming agreement can be reached on emissions quotas, the next step will be achieving them. Stabilising at 550 ppm would mean ensuring global emissions peak no later than 2025, according to the Intergovernmental Panel on Climate Change. Simple measures such as improving energy efficiency would help, but they will not be nearly enough. To ensure we add no more carbon to the atmosphere than we take away will require major structural changes to the global energy industry.

How much this will cost is unclear. Some economists say “A CO₂ cap puts an absolute limit on emissions. The tricky part will be deciding who is entitled to make those emissions” such changes will be hugely expensive, while companies with a competitive lead in alternative technologies see only profits. Big changes will be necessary whatever happens, as oil and natural gas supplies dwindle, though coal is still available in huge quantities.

Then there is the question of exactly what changes to make. The relative contribution of renewable energy sources such as wind and solar power, the role of the hydrogen economy and whether fission power has a role to play are still fiercely debated. The Bush administration insists that research into better technologies is more important than premature, expensive measures to cut emissions, and that may be right. But time is running out. It took 150 years for CO₂ concentrations to rise from 280 ppm to 330 ppm; it has taken just 30 years to get from 330 ppm to 380 ppm. Last year, concentrations rose by a record 3 ppm.

That might have been an blip. But it could also mean that the ability of oceans and forests to soak up much of our emissions is reaching saturation point. If so, then we could be on course for 450 ppm by 2030 and 550 ppm by 2060.

The Big Picture

Even if carbon emissions are slashed in the 21st century, and atmospheric CO₂ levels stabilise at between 450 and 1000 parts per million, the temperature will continue to rise for centuries and sea level will continue to rise for millennia. Under the Kyoto protocol, emissions are likely to continue to rise until the treaty expires in 2012.

The Kyoto Protocol expires in 2012. It does not provide a blueprint for where we want to end up and how to get there. Protocol would also increase pressure on the US to rejoin the process (see page 15).

Climate scientists say politicians must move on from Kyoto-style piecemeal negotiations on individual national targets to a global plan to cap concentrations of critical greenhouse gasses, especially CO₂. Most would like to see CO₂ concentrations in the atmosphere kept below 450 ppm, but many accept that 550 ppm is more realistic. “I don’t believe that we should be anywhere higher than 550 parts per million of carbon dioxide in our atmosphere,” David King, chief scientific adviser to the UK government, said in a speech earlier this year.

This would still lead to substantial climate change, with the temperature rising by 2 to 5 °C and the sea level rising by 0.3 to 0.8 metres by 2100, and by 7 to 13 metres over the next millennium. But a 550 ppm ceiling would stave off even more severe changes. It would also address the international commitment made at the Earth Summit in Rio in 1992 to prevent “dangerous” climate change. The Bush administration says it stands by that agreement, even though it disowns the Kyoto protocol.

The UK could help set the agenda. The prime minister, Tony Blair, has promised to make tackling climate change the centrepiece of his presidency of the G8 group of rich industrial nations in 2005. Though he is far from finalising his contribution, one option being discussed is to propose a ceiling on atmospheric CO₂, that would set a firm and scientifically coherent benchmark to measure the success of future negotiations.

Agreeing on a CO₂ ceiling would be the easy part. Any ceiling effectively puts an absolute limit on global emissions over the coming century, and the tricky
Emissions targets ‘unrealistic’ says US climate change body

Colin Macilvain, Washington

US climate-change activists are up in arms again. But for once it is not against the fossil-fuel lobby. This time the focus of their ire is one of their strongest supporters — the Pew Center on Global Climate Change.

One of the main organizations working for cuts in US greenhouse-gas emissions, the Pew Center has issued a statement saying that the emissions targets set by the 1997 Kyoto Protocol are unrealistic and will eventually have to be renegotiated. Eileen Claussen, the centre’s president and former chief negotiator on climate change issues at the US state department, says that “few national governments” will reach their targets for 2008–12.

“There is nothing wrong with ambitious targets, but they have to be grounded in reality,” Claussen said in remarks delivered privately in London last month, and repeated publicly in Washington last week at a meeting of scientists and economists who advise the Pew Center.

“The targets in the Kyoto Protocol cannot and will not be met on the established timetable in the United States and elsewhere,” said Claussen. “By adhering to unrealistic targets that will be very difficult, if not impossible to meet, we provide the Protocol’s opponents with additional ammunition in their efforts to shoot the treaty down.”

The Pew Center was established in 1998 by the Pew Charitable Trusts to educate the public on climate-change issues and to encourage reductions in greenhouse-gas emissions. It operates in partnership with a group called the Business Environmental Leadership Council, which includes Boeing and DuPont, but receives no financial support from it.

Claussen still believes that “the good qualities of the Kyoto Protocol vastly outweigh its flaws” and she wants negotiators, who will meet in The Hague this November to finalize the protocol, to implement firm rules on how the treaty will operate before considering revisions to the targets. “If, after ensuring that the framework reflects these priorities, we need to renegotiate the targets or timetables — and I suspect we will — then so be it.”

The remarks were welcomed by some climatologists at the Washington meeting. “I agree with everything she said,” says Tom Wigley, senior scientist at the National Center for Atmospheric Research at Boulder, Colorado. “The targets are too much, too soon. She is echoing what many economists believe, that a more moderate approach is going to be a much better approach.”

But Claussen’s blunt characterization of the targets has alarmed environmental groups, who believe that the Kyoto Protocol is the main driving force for global action by governments and industry to cut emissions.

Claussen’s pessimism is not shared, at least in public, by other groups who support action to cut carbon emissions. “We’re making a lot of progress here,” says Dan Lashof, head of the climate-change programme at the Natural Resources Defense Council, pointing to recent bipartisan calls in the Congress for reductions in power-plant emissions.

Jennifer Morgan, director of the World Wildlife Fund’s climate-change campaign, also believes the Kyoto Protocol can work. “We should be focusing on a domestic plan to meet the targets, not on changing them,” she says.

But the Global Climate Coalition, the industry group that has opposed binding action to cut carbon emissions, said that Claussen’s statements bore out its early warnings about the Kyoto Protocol. “We agree with her that the targets are simply unrealistic,” says Connie Holmes, chair of the coalition’s board. “In the last three years, they have become more unrealistic — and not just for the United States.”

http://www.pewclimate.org/media/transcript_nia.html
Senate Rejects CO₂ Caps

On October 30, by a vote of 43 to 55, the Senate rejected an amendment by Senators John McCain (R.-Ariz.) and Joe Lieberman (D.-Conn.) that would have regulated carbon dioxide emissions for the first time.

The so-called "McLieberman" amendment was really a bill (S. 129) that the pair of senators brought to the floor. The vote on an amendment to that bill was part of their parliamentary strategy to get a vote on the floor, but its essentially meant the bill's defeat as well.

The bill, according to its official description, would "accelerate the reduction of greenhouse gas emissions in the United States by establishing a market-driven system of greenhouse gas trade-able allowances." The bill was a backdoor attempt to implement the Kyoto treaty in the United States—which has not ratified that treaty. Under the McCain-Lieberman plan, "emissions credits" would be given to polluters, which they could buy and sell from each other and spend by emitting carbon dioxide. In this way, only a limited amount of carbon dioxide would be emitted into the atmosphere. This is known as a so-called "cap-and-trade" system.

Although this system vaguely resembles some kind of free market activity, that appearance is totally bogus. The cap-and-trade system's enormous costs would be borne entirely by the consumer in several ways. For example, when energy prices skyrocket in order to limit the amount of pollution produced by power plants, consumers would pay. They would also pay dearly when caps are reached and further production of various goods and services—including electricity—are halted or slowed by carbon dioxide regulations. Even food rationing would not be outside the realm of possibility once major shippers, manufacturers and growers reach CO₂ caps.

For these and other reasons, the economic results of the McCain-Lieberman legislation would have been devastating for the United States for years to come. In the long run, it also would have probably increased pollution, since an expanding economy is far more likely to produce new, cleaner methods of energy production than is a suffocated economy burdened by environmental regulations.

Moreover, under a cap-and-trade regime some decision would have to be made about how much each human being is entitled to pollute when the government issues the pollution credits at the beginning. If the credits are given proportionately to the largest polluters—which in a way would make sense—that gives all polluters an incentive to ramp up the amount of pollution they create, so as to take advantage when the cap-and-trade system is finally implemented. If the credits are distributed in some other way—say, one to each person in the United States—then a significant amount of time and energy will go into finding and buying credits, that should instead be dedicated to economic expansion.

Either way, the government credit system would be an ugly attempt to justify government interference in minute activities of everyday life, plus it would destroy the U.S. economy. Sen. Kit Bond (R-Mo.) pointed out the failures of other countries to live up to their goals in carbon dioxide reductions.

"Russia is now finding that they cannot live up to the commitments that were made in Kyoto," said Bond. "I just read another article that the European Union finds they really can't come up with all of their carbon dioxide reductions that they had promised. Why? Even in a Communist country they begin to realize that government actions have consequences. [...] This bill will cripple our economy, cripple our communities, and financially cripple many of our struggling families."

Sen. Lamar Alexander's (R-Tenn.) "no" vote was a pleasant surprise for conservatives, since the freshman senator had voted in favor of carbon dioxide caps in committee earlier this year (see HUMAN EVENTS, July 21, page 5).

A "yes" vote was a vote for the McCain-Lieberman amendment, to impose caps on carbon dioxide emissions in the United States. A "no" vote was a vote against the amendment and the underlying bill.

FOR THE AMENDMENT (43):

REPUBLICANS FOR (9): Chafee, Collins, Gregg, Lugar, McCain, and Snowe.

DEMOCRATS FOR (37): Akaka, Bayh, Biden, Bingaman, Boxer, Cantwell, Carper, Clinton, Corzine, Daschle, Dayton, Dodd, Durbin, Feingold, Feinstein, Graham (Fla.), Harkin, Hollings, Inouye, Johnson, Kennedy, Kerry, Kohl, Lautenberg, Leahy, Lieberman, Mikulski, Murray, Nelson, Reid (R-I.), Reid (Nev.), Rockefeller, Sarbanes, Schumert, Stabenow, and Wyden.

INDEPENDENT FOR (1): Jeffords.

AGAINST THE AMENDMENT (55):


NOT VOTING (2): Edwards and Nelson.
Global Warming Debates

- The politics and science of Global Warming will heat up more

- Chris Landsea resigns from IPCC (Jan 17, 2005)

- Story in "The Economist" (Jan 29, 2005, p. 78)

This month saw the start of a period when climate change will be in the news a lot. On January 17th Chris Landsea, a hurricanes specialist, withdrew from the Intergovernmental Panel on Climate Change, accusing it of "having become politicised". On January 25th a report by the International Climate Change Taskforce called for drastic actions to cut carbon dioxide (CO₂) emissions. On February 1st a conference on the subject will be held at Britain's Hadley climate centre. And on February 16th the Kyoto protocol comes into force. You have been warned.

As part of the fun, there was also the publication of an intriguing paper in Nature. The research was intriguing not so much for what it said (things may get hotter than expected), but for how it arrived at that conclusion. For it was one

See next page: story in The Economist (Jan 29, 2005)
Hot models

How to model the climate on the cheap

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As part of the fun, there was also the publication of an intriguing paper in Nature. The research was intriguing not so much for what it said (things may get hotter than expected), but for how it arrived at that conclusion. For it was one of the first serious scientific studies to exploit the idea of distributed computing.

Storms ahead

Modelling the climate requires a huge amount of computing power, which is one reason the models have not been tested as thoroughly as they might have been. So David Stainforth of Oxford University and his colleagues decided to employ the idle capacity of 95,000 private desk-top computers to do it for very little money. Willing computer owners registered at a website (climateprediction.net), downloaded the appropriate software and then used their machines as normal. This enabled Dr Stainforth to test what is known as the Met Office Unified Model with 2,000 different sets of starting parameters.

Dr Stainforth wanted to explore the consequences of doubling CO2 levels from their pre-industrial values (at the moment they are about 1.6 times what they were at the beginning of the industrial revolution). What he observed, depending on the values of the parameters (such things as average cloud cover) was a range of increases between 2°C and 11°C, which is far greater than the current consensus of 2-3°C.

That is not as alarming as it sounds since, by his own admission, the model Dr Stainforth has been testing is crude. It dumps all its CO2 into the atmosphere in one go, instead of leaking it in over the years. And its description of the interaction between atmosphere and ocean is far too simple. But it does point the way towards a better way of doing the modelling business. And a cheaper one, too.
Britain Feeling Pressed for Power

As North Sea Sources Wane, Nuclear Gets Another Look

By ALAN COWELL

ASKAM, England — From her home above this village near the sea, Norma White, a retired schoolteacher, contemplates a vista stretching from her ornamental pond to the distant blades of a huge wind turbine that represents part of Britain's huge quandary about its future energy supplies.

With its North Sea oil and gas beginning to dwindle, its nuclear power generation set to be scaled back and its commitment to reducing greenhouse gases propelling a hunt for renewable energy sources — like tides, waves or wind — Britain is facing hard decisions that those in authority seem reluctant to take.

The most passionate argument is swirling around the contentious prospect of expanding nuclear power, which produces about one-quarter of Britain's electricity.

"Gimmicks such as wind turbines are hardly relevant," the newspaper columnist Simon Jenkins said recently. "If Britain's leaders really believe in the apocalypse, only one technology is currently available to hold it at bay and that is nuclear power. All else is hypocrisy."

The government has been less forthright.

In a major speech on climate change in September, Prime Minister Tony Blair said nuclear power remained an option to reduce carbon emissions — a goal that Britain has adopted with enthusiasm under the Kyoto agreement to cut greenhouse gases. That seemed to suggest nuclear power was back on the agenda.

Just a few days later, though, Patricia Hewitt, the minister of trade and industry, said there were "no proposals now for building new nuclear power stations, but at some point in the future new nuclear build might be necessary if we are to meet our carbon targets."

Her remarks prompted the government's chief scientific adviser, Sir David King, to warn that time is running out. "The government is..."

Continued on Page 12

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Some countries, like Italy, now call themselves nuclear-free zones. While France and Germany remain heavily dependent on nuclear power, Austria and Denmark have forsworn any use of it.

Elsewhere there are indications of a rethinking. Finland has ordered a $3.5 billion nuclear reactor, and opposition politicians in Germany have spoken about extending the deadline for closing nuclear plants past 2021. Sweden has generally delayed a promise made in 1980 to phase out...
saying we will come back and look at nuclear power when we've seen how well we are doing on energy efficiency gains," he told a conference recently. "But the time scale to do that is relatively short. I do think five years or less is when we've got to make a decision."

The discussion is part of a wider and patchier debate across Europe since the Chernobyl disaster in 1986 provoked such wide opposition to nuclear power that no new reactors have been built since then.

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In the United States, no new nuclear plants have been ordered since the Three Mile Island accident in Pennsylvania in 1979. Nuclear power contributes 20.3 percent of the country's electricity needs.

At Mrs. White's home in this blustery, northeastern corner of England, the energy debate is framed by the competing presence of wind farms on the hillsides and shores — and a massive nuclear plant just up the road.

"We are an island battered by the wind," she said, explaining Britain's aptitude for renewable energy sources like winds, tides and waves.

"We are an island surrounded by the sea."

But a few miles north of here, also on the coast, stands the nuclear fuel reprocessing plant at Sellafield that has long raised concerns about the costs and hazards of nuclear waste. And just down the road is Barrow in Furness, the home port of two specialist ships that recently carried American plutonium to France, ac-

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**As Oil Wanes, Nuclear Power Beckons**

As Britain's supply of oil and gas from the North Sea wanes, the country is debating whether to expand the use of nuclear power, which supplies a quarter of the country's electricity and 9 percent of its overall energy.

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**A blustery island lags the Continent in the use of wind energy.**

compounded by protests about the perils of transporting nuclear materials in an era of global terrorism.

"The question with nuclear power is this disposal business," Mrs. White said. "And there's always a huge question mark over it."

In some ways, the onetime abundance of Britain's North Sea oil and gas in particular allowed it to prevaricate on future energy supplies leaving others to commit themselves to different sources of energy.

While Britain claims to be Europe's windiest nation, its wind farms produce only a tiny fraction of its electricity, and Denmark has taken a lead in turbine technology. And, while Britain is committed to reducing its reliance on nuclear power generation, France is deriving 80 percent of its electricity from nuclear power.

According to the United Kingdom Offshore Operators Association, a body representing the offshore oil and gas industry, oil and gas production in British waters, which peaked at the equivalent of 4.5 million barrels a day in 1999, is likely to be 3.7 million barrels a day this year, falling to 2.5 million barrels a day in 2010. After two decades of self-sufficiency, according to official statistics, Britain now imports more oil than it exports.

That has underscored the urgency of the current debate, leading some analysts to speculate that future supplies could be held ransom to developments beyond Britain's control.

"We will be ever more reliant in the future on importing gas and oil from politically sensitive areas such as the Middle East and Russia," said Ruth Lea, director of the Center for Policy Studies, a private research body, in a recent newspaper article.

Environmentalists have long argued in favor of wind, wave and tide power, and the British Wind Energy
Association, a private advocacy group, says the wind turbines sprouting offshore and on hillsides — despite the protests of opponents — will provide 8 percent of Britain’s electricity supply by 2010.

Some people argue that those alternative sources of power are not economically viable while the nuclear industry provides not only electricity, but also jobs. “Sellafield has been a lifeline to this part of Cumbria,” Mrs. White said. “It has brought huge prosperity.”

Indeed, said Ali McKibbin, a spokeswoman for BNFL, the state-owned company that runs Sellafield, over 10,000 people rely for jobs on the nuclear industry around the plant.

Against that, wind turbines “bring very little in the way of direct economic benefit,” said Stuart Klosinski, a spokesman for Furness Enterprise, a local group seeking economic regeneration in an area that over the years has witnessed the decline of shipbuilding and its other industries.

Many of the companies building windmills around here are foreign, from countries including Denmark and the United States, and do not provide long-term local jobs in the manufacture or maintenance of turbines, Mr. Klosinski said.

The apparent swing toward nuclear power — at least in public discussion — has been hastened by remarks from some prominent environmentalists casting doubt on Britain’s ability to meet its own targets for replacing fossil fuels with renewable sources of energy.

“Many politicians hope that green, renewable energy will save the day. This is wishful thinking,” said Prof. Ian Fells, chairman of the New and Renewable Energy Center, a private research organization.

Against that, John Whitelegg, a Green Party specialist on sustainable development, said in a letter published in The Times of London, “The nuclear option is fraught with environmental, human health, financial and terrorism risks.”

Under its commitment to the Kyoto protocol, Britain is supposed to produce 10 percent of its electricity from renewable sources by 2010 — more than three times the present level. That is supposed to rise to 15.4 percent by 2015 and to 20 percent by 2020, Mr. Blair said in September.

In fact, though, the most effective allies of the antinuclear lobby may turn out to be not so much the advocacy groups and activists as the markets and investors’ reluctance to sink money into new plants.

In recent years, the mounting cost of nuclear waste disposal has forced both the state-owned BNFL and the beleaguered British Energy into reorganizations to ease the burden of closing aging plants and dealing with the problems of nuclear waste, expected to cost at least $90 billion. In September, the European Union approved a $6 billion bailout for British Energy to stave off bankruptcy.

At present, BNFL operates four nuclear power stations, generating about 5 percent of Britain’s electricity, and they are set to be closed by 2010, according to a BNFL spokesman. British Energy operates eight nuclear power plants in Britain, accounting for 20 percent of electricity supply, and is set to be closed by 2023 — a deadline that makes the current debate all the more urgent.

In the absence of new investment, the situation does not augur well for the nuclear industry, said Graham Meeks, an analyst at Climate Change Capital, which advises potential investors on the energy business.

“We will get a closure of the nuclear program by default,” he said.

In some ways, the onetime abundance of Britain’s North Sea oil and gas in particular allowed it to prevaricate on future energy supplies leaving others to commit themselves to different sources of energy.

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You Don’t Need a Reason to Hate CO₂

That guy who was elected yesterday will have to face the Queen—and she’s hopping mad. It appears that the British monarch has noticed some undisclosed evidences of global warming on her hereditary estates and instructed Prime Minister Tony Blair to raise her concerns with the executive branch of the United States starting with a global climate conference in Berlin that begins tomorrow.

California has its own unelected royalty: The dukes and earls of the Air Resources Board want automakers to reduce vehicular carbon dioxide 30% by 2015. Meanwhile, the head of Exelon Corp., an operator of U.S. nuclear power plants, has endorsed carbon limits on his competitors, operators of coal plants. Coal specialists in turn are racing to invest in techniques to capture carbon and dispose of it, which they hope will be a lucrative new sideline.

The U.S. government now budgets $6 billion a year for climate research, supporting a growing industry of scientists and university labs that specialize in the subject. The feds are also spending $1 billion on a coal gasification project aimed at capturing carbon before it goes out the stack, plus another $1.2 billion to develop a hydrogen car.

What’s going on? It all adds up to a significant institutionalization of the impulse to treat carbon as a problem, perhaps the biggest problem facing the world, as everybody from Hans Blix to John McCain keeps telling us.

For all that has happened over the past four years, Al Gore might have been president. Carbon is rapidly becoming the first “anti-resource” in the global economy—billions will be spent trying to get rid of it and no controversy over the reality of climate change seems likely to impede this development.

Public majorities now affirm for pollsters that global warming is a real problem. That guarantees (farm subsidies are your model here) that a majority will be content to cheer on politicians as they divert truly large chunks of the national income to battle carbon—just as long as those chunks aren’t too directly noticeable on any individual taxpayer’s bottom line.

Still, it’s remarkable that the sole reliable observation on which all this “progress” is based is a measurable rise in carbon dioxide in the atmosphere from man-made sources. An 0.028% before industrial society, the atmospheric concentration of CO₂ today is 0.036% and deemed likely to hit 0.06% or more by century’s end.

Now CO₂ is a greenhouse gas, trapping heat in the atmosphere, though by far the most important greenhouse gas is water vapor, which explains why simple models of the atmosphere—more CO₂ equals more heat—still produce fierce scientific debate.

We’ve become a lot more careful, for instance, about measuring temperature since global-warming fears emerged. Lo, the result has been to undermine any certainty that the globe is warming at all, even to the minor extent that advocates of the global warming scenario insist upon, about one degree Fahrenheit in the past century.

With the institutionalization of global warming fears, we’re also looking more carefully at climate patterns, though increasingly these patterns seem more strongly correlated to solar variation than to changes in atmospheric CO₂. Never mind. Global warming is a theory constantly in search of facts, yet that has proved no brake on a self-interested steamroller.

Carbon dioxide comes out of the tailpipes of cars and factories, reason enough for green believers to accept that carbon dioxide should be curbed, regardless of whether it can be confidently linked to unpleasant phenomena. Plus there’s the fact that CO₂ is easily measured, presenting an attractively one-dimensional problem for technologists and entrepreneurs to try to solve. Too much CO₂? Get rid of some of it. Simple.

Indeed, farm subsidies may be the best guide to how this will play out. Politics favors the permissive over the restrictive. That’s why Tom Harkin’s perennial plan to prop up farm incomes with production quotas never got much traction. Greenies are already grumbling at how quickly carbonophobia is being captured by the proponents of technological fixes rather than the root canal approach of giving up the comforts of industrial civilization.

Folks at Los Alamos National Lab are beaving away at artificial trees, designed to scrub CO₂ from the air. Likewise, a U.S.-Canadian group is well along in testing the feasibility of injecting CO₂ into underground wells. If that doesn’t pan out, the Department of Energy has an entire facility devoted to exploring the possibility of sending great blobs of liquefied CO₂ to the bottom of the ocean.

Investors, get your billions ready. These approaches sell themselves because success can be measured in terms of carbon dioxide kept out of the air, allowing proponents to claim triumph whatever the science of global warming turns out to be.

By contrast, we’d advise steering clear of the many ingenious schemes aimed at influencing global temperature directly, such as by throwing shiny material into the skies to increase the reflectivity of the atmosphere. The drawback here is obvious: The temperature record being one of the flimsier reeds of global warming theory, failure of warming to occur could easily undermine the market for such solutions.

Carbonophobia, on the other hand, can be an end in itself. Like farm programs that serve no real purpose other than to make farmers happy, it doesn’t matter why we’re getting rid of CO₂ as long as politicians, the media and vested scientific interests agree that we should get rid of it.
climate model warming; and carbon trading

  - Title: "Three degrees of consensus"
  - The amount of warming (sensitivity) for doubling of CO2
    - But about 3°C for a doubling
  - See the story
  - Kiehl (NCAR) comments about clouds in the models
  and notes that much of the USA gets wetter in
  the NCAR model, where it gets drier in
  the GFDL model (This is important; what
  explains it?)

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- And three short papers about carbon trading

13 Aug 2004
Science, P 932

Roy Femme
Jan 2005
NCAR
Climate researchers are finally homing in on just how bad greenhouse warming could get—and it seems increasingly unlikely that we will escape with a mild warming.

**Three Degrees of Consensus**

**PARIS**—Decades of climate studies have made some progress. Researchers have convinced themselves that the world has indeed warmed by 0.6°C during the past century. And they have concluded that human activities—mostly burning fossil fuels to produce the greenhouse gas carbon dioxide (CO₂)—have caused most of that warming. But how warm could it get? How bad is the greenhouse threat anyway?

For 25 years, official assessments of climate science have been consistently vague on future warming. In report after report, estimates of climate sensitivity, or how much a given increase in atmospheric CO₂ will warm the world, fall into the same subjective range.

At the low end, doubling CO₂—the traditional benchmark—might eventually warm the world by a modest 1.5°C, or even less. At the other extreme, temperatures might soar by a scorching 4.5°C, or more warming might be possible, given all the uncertainties.

At an international workshop here late last month on climate sensitivity, climatic wishy-washiness seemed to be on the wane. “We’ve gone from hand waving to real understanding,” said climate researcher Alan Robock of Rutgers University in New Brunswick, New Jersey. Increasingly sophisticated climate models seem to be converging on a more probable sensitivity. By running a model dozens of times under varying conditions, scientists are beginning to pin down statistically the true uncertainty of the models’ climate sensitivity.

And studies of natural climate changes from the last century to the last ice age are also yielding climate sensitivities.

Although the next international assessment is not due out until 2007, workshop participants are already reaching a growing consensus for a moderately strong climate sensitivity. “Almost all the evidence points to 3°C” as the most likely amount of warming for a doubling of CO₂, said Robock. That kind of sensitivity could make for a dangerous warming by century’s end, when CO₂ may have doubled. At the same time, most attendees doubted that climate’s sensitivity to doubled CO₂ could be much less than 1.5°C. That would rule out the feeble greenhouse warming espoused by some greenhouse contrarians.

But at the high and especially dangerous end of climate sensitivity, confidence faltered; an upper limit to possible climate sensitivity remains highly uncertain.

**Hand-waving climate models**

As climate modeler Syukuro Manabe of Princeton University tells it, formal assessment of climate sensitivity got off to a shaky start. In the summer of 1979, the late Jule Charney convened a committee of fellow meteorological luminaries on Cape Cod to prepare a report for the National Academy of Sciences on the possible effects of increased amounts of atmospheric CO₂ on climate.

None of the committee members actually did greenhouse modeling themselves, so Charney called in the only two American researchers modeling greenhouse warming, Manabe and James Hansen of NASA’s Goddard Institute for Climate Studies (GISS) in New York City.

On the first day of deliberations, Manabe told the committee that his model warmed 2°C when CO₂ was doubled. The next day Hansen said his model had recently gotten 4°C for a doubling. According to Manabe, Charney chose 0.5°C as a not-unreasonable margin of error, subtracted it from Manabe’s number, and added it to Hansen’s. Thus was born the 1.5°C-to-4.5°C range of likely climate sensitivity that has appeared in every greenhouse assessment since, including the three by the Intergovernmental Panel on Climate Change (IPCC). More than one researcher at the workshop called Charney’s now-enshrined range and its attached best estimate of 3°C so much hand waving.

**Model convergence, finally?**

By the time of the IPCC’s second assessment report in 1995, the number of climate models available had increased to 13. After 15 years of model development, their sensitivities still spread pretty much across Charney’s 1.5°C-to-4.5°C range. By IPCC’s third and most recent assessment report in 2001, the model-defined range still hadn’t budged.

Now model sensitivities may be beginning to converge. “The range of these models, at least, appears to be narrower,” said climate modeler Gerald Meehl of the National Center for Atmospheric Research (NCAR) in Boulder, Colorado, after polling eight of the 14 models expected to be included in the IPCC’s next assessment. The sensitivities of the 14 models in the previous assessment ranged from 2.0°C to 5.1°C, but the span of the eight currently available models is only 2.6°C to 4.0°C, Meehl found.

If this limited sampling really has detected a narrowing range, modelers believe there’s a good reason for it: More-powerful computers and a better understanding of atmospheric processes are making their models more realistic. For example, researchers at the Geophysical Fluid Dynamics Laboratory (GFDL) in Princeton, New Jersey, recently adopted a better way of calculating the thickness of the bottommost atmospheric layer—the boundary layer—where clouds form that are crucial to the planet’s heat bal-
NCAR's, GFDL's, and GISS's, have converged on a sensitivity of 2.5°C to 3.0°C. They once differed by a factor of 2.

**Less-uncertain modeling**

If computer models are increasingly brewing up similar numbers, however, they sometimes disagree sharply about the physical processes that produce them. "Are we getting [similar sensitivities] for the same reason? The answer is clearly no," Jeffrey Kiehl of NCAR said of the NCAR and GFDL models. The problems come from processes called feedbacks, which can amplify or dampen the warming effect of greenhouse gases.

The biggest uncertainties have to do with clouds. The NCAR and GFDL models might agree about clouds' net effect on the planet's energy budget as CO₂ doubles, Kiehl noted. But they get their similar numbers by assuming different mixes of cloud properties. As CO₂ levels increase, clouds in both models reflect more shorter-wavelength radiation, but the GFDL model's increase is three times that of the NCAR model. The NCAR model increases the amount of low-level clouds, whereas the GFDL model decreases it. And much of the United States gets wetter in the NCAR model when it gets drier in the GFDL model.

In some cases, such widely varying assumptions about what is going on may have huge effects on models' estimates of sensitivity; in others, none at all. To find out, researchers are borrowing a technique weather forecasters use to quantify uncertainties in their models. At the workshop and in this week's issue of *Nature*, James Murphy of the Hadley Center for Climate Prediction and Research in Exeter, U.K., and colleagues described how they altered a total of 29 key model parameters at a time—variables that control key physical properties of the model, such as the behavior of clouds, the boundary layer, atmospheric convection, and winds. Murphy and his team let each parameter vary a bit higher than they would have gotten by simply polling the eight independently built models. Their estimates ranged from 2.4°C to 5.4°C (with 5% to 95% confidence intervals), with a most probable climate sensitivity of 3.2°C. In a nearly completed extension of the method, many model parameters are being varied at once, Murphy reported at the workshop. That is dropping the range and the most probable value slightly, making them similar to the eight-model value as well as Charney's best guess.

Murphy isn't claiming they have a panacea. "We don't want to give a sense of excessive precision," he says. The perturbed physics approach doesn't account for many uncertainties. For example, decisions such as the amount of geographic detail to build into the model introduce a plethora of uncertainties, as does the model's ocean. Like all model oceans used to estimate climate sensitivity, it has been simplified to the point of having no currents in order to make the extensive simulations computationally tractable.

**Looking back**

Faced with so many caveats, workshop attendees turned their attention to what may be the ultimate reality check for climate models: the past of Earth itself. Although no previous change in Earth's climate has ever matched the CO₂ doubling, colleagues have recently estimated Earth's sensitivity to a CO₂ doubling at 3.0°C. A similar calculation for the eruption of Agung in 1963 yielded a sensitivity of 2.8°C. And estimates from the five largest eruptions of the 20th century would rule out a climate sensitivity of less than 1.5°C.

Estimates from such a brief shock to the climate system would not include more sluggish climate system feedbacks, such as the expansion of ice cover that reflects radiation, thereby cooling the climate. But the globally dominant feedbacks from water vapor and clouds would have had time to work. Water vapor is a powerful greenhouse gas that's more abundant at higher temperatures, whereas clouds can cool or warm by intercepting radiant energy.

![](image)

**Volcanic chill.** Debris from Pinatubo (above) blocked the sun and chilled the world (left), thanks in part to the amplifying effect of water vapor.

One telling example from the recent past was the catastrophic eruption of Mount Pinatubo in the Philippines in 1991. The debris it blew into the stratosphere, which stayed there for more than 2 years, was closely monitored from orbit and the ground, as was the global cooling that resulted from the debris blocking the sun. Conveniently, models show that Earth's climate system generally does not distinguish between a shift in its energy budget brought on by changing amounts of greenhouse gases and one caused by a change in the amount of solar energy allowed to enter. From the magnitude and duration of the Pinatubo cooling, climate researcher Thomas Wigley of NCAR and his colleagues have recently estimated Earth's sensitivity to a CO₂ doubling as 3.0°C. A similar calculation for the eruption of Agung in 1963 yielded a sensitivity of 2.8°C. And estimates from the five largest eruptions of the 20th century would rule out a climate sensitivity of less than 1.5°C.

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![](image)

**Probability of the smallest cloud doesn't change.** Using this perturbed physics approach to generate a curve of the probability of a whole range of climate sensitivities (see figure), the Hadley group found a sensitivity of the smallest cloud doesn't change.
Carbon Trading

Carbon-emissions trading

A green future

The creation of a new exchange

Market forces and the environment are not always in harmony, but a new venture, announced on September 7th, may help lessen the discord. The European Climate Exchange (ECX), formed in an agreement between the Chicago Climate Exchange (CCX) and London’s International Petroleum Exchange (IPE), will offer European companies a place to trade emissions credits for greenhouse gases.

Regulation has spurred the creation of the ECX. Next January, the European Union will put into effect new rules designed to curb carbon-dioxide emissions, which contribute to global warming. Companies in the EU’s 25 member states will be allowed to emit a certain amount. If they go over, they can buy credits from companies that have stayed within their limits. The ECX plans to offer trading in emissions-

- credit futures by the end of this year, with cash products to follow soon afterwards.
- In anticipation of this scheme, forward trading has already begun, though not on the ECX. Nine European brokerage houses already facilitate over-the-counter trades. Evolution Markets, one such firm, estimates that the volume traded has risen from 25,000 tonnes of carbon dioxide in January to 600,000 in July. In addition, companies trade directly with one another. To put this trade into context, Germany alone produces at least 800m tonnes a year. “It’s only now that you’re beginning to see real liquidity in the market,” says Stan Releve of Point Carbon, a Norwegian market-analysis firm.
- America, where the CCX opened for business last year, seems further behind. Despite the exchange’s list of illustrious corporate members (including Ford, IBM and Dow Corning), trading is light for a country that emits perhaps a quarter of the world’s greenhouse gases. There are lots of sellers but far fewer buyers, so a tonne of carbon dioxide goes for about $1, compared with €8.50 (around $10) in Europe.
- The reason is that the American market has not had Europe’s regulatory shove: the United States, unlike Europe, did not sign the Kyoto agreement on climate change and is not forcing companies to limit emissions. Still, the CCX seems to be betting that one day this will change. Nine northeastern states, for example, are mulling a “cap and trade” programme similar to Europe’s. The CCX also says that it will begin trading in allowances for sulphur-dioxide emissions, which cause acid rain.

For now, though, the CCX is pinning high hopes on its new European subsidiary. Volume on the ECX and elsewhere is likely to soar as the scheme begins. By 2007, Mr Releve estimates, allowances worth up to €10 billion will be traded, compared with €65m this year. Bumps may lie ahead, though. For one thing, there will be plenty of novice participants: although energy companies have long experience of hedging on the IPE and other exchanges, other companies may have trouble adjusting to futures trading.

The ECX will also face competition. Brokers such as Evolution Markets are already in the market and intend to stand their ground. Other exchanges are also planning to enter the fray. The European Energy Exchange, an electricity specialist based in Leipzig, says it will start a cash market for carbon-dioxide emissions in a few months. In addition, Nord Pool, the Nordic power exchange, and Austria’s energy exchange are making similar plans. Whether there is room for everyone remains to be seen.

Markets for carbon

- US - price about $1 per tonne
- Europe - about €10 per tonne

€8.50 a puff
A most precious commodity

FRED PEARCE

MOST power stations are surrounded by coal tips or pipes carrying gas. But round the plant that powers the Swedish town of Enköping, some 70 kilometres west of Stockholm, there is a willow coppice stretching as far as the eye can see. Enköping is probably the only town in Europe that is powered by biofuels.

The plant’s director, Eddie Johansson, says that willow is an economic alternative to coal or gas because Sweden levies a tax on carbon emissions from most power plants. Under the government’s rules, he does not have to pay the tax because for every tonne of carbon dioxide that disappears up the stack, the plant’s willow trees soak up a tonne from the air as they grow. Hundreds of willow-powered plants could operate across Europe, he says, if power companies had similar incentives to cut carbon emissions.

On 1 January, the European Union introduced a system that, if the optimists are right, could make that happen. Rather than imposing a carbon tax, the EU has launched the world’s first carbon trading scheme. Its aim is to force down industrial emissions of greenhouse gases and so moderate global warming, while preserving the competitiveness of European companies.

Under the scheme, companies are issued with pieces of paper that grant them permission to emit a certain quantity of CO₂ into the atmosphere in a particular year. Companies that don’t have enough permissions to cover their emissions will have to buy them in from someone who does. While the system was initially designed only for industrial installations in Europe, the US-based corporation DuPont says it believes the EU’s trading system could become the hub of a global carbon trading market. Countries outside the EU, such as Norway, have already said they would like to join and issue their companies with emissions allocations that could, in future, be traded on the EU market.

So far the scheme covers emissions until 2007, but the EU hopes it will pave the way for governments to force down their national emissions from 2008, as they are required to do under the Kyoto protocol. The
current permits also only cover around half of the carbon emitted by the EU. Most of the rest is produced by vehicles, which are outside the scheme.

But amid the euphoria at the launch of the scheme, there is concern. Three EU countries, Italy, Poland and the Czech Republic, cannot yet trade in carbon as they failed to submit their allocations in time. Greece has yet to submit any allocations at all. More worryingly, some analysts fear that overcautious governments may have wrecked the market before it starts by being too generous with the permits they have issued (see “Carbon bank opens for business”). If everyone has a generous allocation, no one will have any incentive to cut down the quantities of greenhouse gases they pump into the atmosphere.

Michael Grubb of the University of Cambridge, an expert in the economics of climate change, says this is exactly what has happened, and that the permits will be almost worthless. “There will be very few buyers and prices will fall through the floor.” And with low prices, the incentive for industry to clean up evaporates.

The problem, Grubb says, is that the lack of any strict rules governing allocations has meant most governments have bent over backwards not to place their own companies at a competitive disadvantage by forcing them to spend money on buying permits.

The UK, despite publicly banging the drum for action on climate change, has ended up being one of the worst offenders. When environment secretary Margaret Beckett published her draft allocations for British industry in May 2004, they added up to a total of 736 million tonnes of CO₂ over the next three years. This, according to calculations by the Department for Environment, Food and Rural Affairs, would require a reduction of less than 1 per cent compared with business-as-usual emissions. Even so, intense lobbying by industry followed, apparently supported by industry minister Patricia Hewitt, and in October 2004, the expected business-as-usual emissions were substantially raised, and the permitted emissions raised to 756 million tonnes.

Nonetheless, many analysts believe that carbon trading can help save the Kyoto protocol, because it will for the first time create a financial motive for industry to cut emissions. They point to the success of a similar market created in the US some years ago for sulphur dioxide, a cause of acid rain. By restricting allocations of permits to emit the gas, while allowing the permits to be traded, the US government succeeded in cutting national emissions at what it believes was the minimum cost to industry.

Joseph Kruger, who under the Clinton administration was part of the US team that negotiated the Kyoto protocol, is optimistic about carbon trading. Even if carbon prices on the EU market begin low, the creation of the world’s first carbon market is “an impressive achievement”, he says. He predicts that once the Kyoto national targets come into force, governments will impose tougher targets on industry, carbon prices will rise, and incentives for industry to clean up will take hold.

But if governments seriously want to use industry trading to meet their Kyoto targets, then the industries covered by the scheme have to widen, Kruger says. Emissions permits for other greenhouse gases, such as methane, will also have to be issued and traded. And in future, governments might use the antecedent of authorisation allocations of emissions permits, rather than simply handing them out.

One area of confusion will be the relationship between this commercial market in carbon and the various trading systems included in the Kyoto protocol itself. There are in essence two separate markets: for companies, which have to meet targets imposed by governments; and the other for governments themselves, which have internationally agreed targets for national emissions. This will mean that there could be two different prices for carbon. Analysts agree this will be confusing, but say that if governments could buy or sell their national entitlements to emit CO₂ there would be chaos.

So will the system lead to coprice plantations, across the industrial heartlands of Europe, and reduced emissions? It looks as if the market will decide.
The CARBON game

Companies are already swapping money for the right to emit more pollution, and cashing in on projects designed to suck up greenhouse gases. As this market booms, will it actually help to cut down on emissions? Michael Hopkin reports.

This summer, a group of power companies in Japan and Canada developed an unusual interest in pig manure. The porcine waste was at the heart of a landmark multimillion-dollar deal between Chile's largest pork producer and the power companies, allowing the latter to emit more pollution. The pig farm promised to recycle its animals' emissions of methane — a potent greenhouse gas — by covering the manure, capturing the gas, and burning it as sustainable energy. In return, the power companies bought the right to emit more carbon dioxide from their stations, half a world away from the oblivious pigs.

The deal, signed in August, is one of the largest such exchanges, but it is by no means the first: trading in greenhouse-gas emissions has been going on since the mid-1990s. That may seem strange in a world that has not yet entered into the full grip of the Kyoto Protocol — the international agreement that aims to reduce greenhouse-gas levels, in part by allowing companies to buy and sell 'equivalents' of carbon dioxide emissions. But, as the ink is drying on that deal thanks to Russia's recent ratification of the treaty (see Nature 431, 1030; 2004), carbon markets are already doing brisk business.

Carbon trading has been slowly growing since its inception (see Graph, opposite), and is now set to explode under the stewardship of a handful of dedicated brokers. By the end of this year, the total volume of CO₂ traded is expected to be double that of 2003. But 2005 will be the year in which the trade truly comes of age, when in January the European Union (EU) launches its Emissions Trading Scheme (ETS), involving some 12,700 industrial organizations spread across all 25 EU member states. By 2007, the European market is expected to be worth €10 billion (US$13 billion) per year, says Henrik Haselknappe, an analyst at consultancy firm Point Carbon in Oslo, Norway.

Trading places

Emissions limits in the ETS are established by National Allocation Plans — proposals submitted by each EU member state that are now being individually approved by the European Commission. Once they get the green light, governments farm out their allowances to industrial installations — such as power companies, mineral miners, and cement and paper manufacturers — giving each an allotment of 'emissions credits' that they can trade internationally. The governments involved keep track of the emissions, based mainly on the known inputs to these installations, and update their figures with information on registered trades. For every tonne of CO₂ emitted above the limit, companies face a fine of €40, rising to €100 from 2008 onwards.

In tandem with schemes designed to increase compliance with Kyoto — such as the ETS and forthcoming systems in Canada...
The world will need
- Lots more energy -

- In year 2000, 1.64 billion people did not have electricity.

- In year 2000, 2.39 billion people relied on traditional biomass for cooking and heating.
  - Electricity and gas are lots better for cooking.

[See the next 5 pages]
World Energy Use to 2030, and Access to Electricity

- World energy use and outlook, 1971 – 2030.

- The world will need 67% more energy in year 2030 than was used in 2000.

- In year 2000, 1.64 billion people did not have electricity.

- In year 2000, 2.39 billion people relied on traditional biomass for cooking and heating.

- The world use of energy for transportation (from IEA).
  The use of energy for transportation is almost all in the form of oil (gasoline), diesel, etc.) The energy units here are MTOE (millions of tonnes of oil equivalent).

### World Energy Use (MTOE)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Energy</th>
<th>Amount for Electricity</th>
<th>Use by Transportation</th>
<th>Other Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>4999</td>
<td>1209</td>
<td>851</td>
<td>2939</td>
</tr>
<tr>
<td>2000</td>
<td>9179</td>
<td>3636</td>
<td>1775</td>
<td>3768</td>
</tr>
<tr>
<td>2010</td>
<td>11132</td>
<td>4608</td>
<td>2220</td>
<td>4304</td>
</tr>
<tr>
<td>2020</td>
<td>13167</td>
<td>5559</td>
<td>2749</td>
<td>4859</td>
</tr>
<tr>
<td>2030</td>
<td>15267</td>
<td>6535</td>
<td>3327</td>
<td>5405</td>
</tr>
<tr>
<td>2030/1971</td>
<td>3.05</td>
<td>5.41</td>
<td>3.91</td>
<td>1.84</td>
</tr>
</tbody>
</table>

- We have to worry more about energy supply (and cost). And it sure helps to have more efficiency when it is possible.

*Roy Jenne  
Oct 2, 2003*
### Table 7.5: Total Primary Energy Demand in China (Mtoe)

<table>
<thead>
<tr>
<th></th>
<th>1971</th>
<th>2000</th>
<th>2010</th>
<th>2030</th>
<th>Average annual growth 2000-2030 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>192</td>
<td>659</td>
<td>854</td>
<td>1,278</td>
<td>2.2</td>
</tr>
<tr>
<td>Oil</td>
<td>43</td>
<td>236</td>
<td>336</td>
<td>578</td>
<td>3.0</td>
</tr>
<tr>
<td>Gas</td>
<td>3</td>
<td>30</td>
<td>57</td>
<td>151</td>
<td>5.5</td>
</tr>
<tr>
<td>Nuclear</td>
<td>0</td>
<td>4</td>
<td>23</td>
<td>63</td>
<td>9.3</td>
</tr>
<tr>
<td>Hydro</td>
<td>3</td>
<td>19</td>
<td>29</td>
<td>54</td>
<td>3.5</td>
</tr>
<tr>
<td>Other renewables</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>9</td>
<td>6.8</td>
</tr>
<tr>
<td>Total primary energy demand</td>
<td>241</td>
<td>950</td>
<td>1,302</td>
<td>2,133</td>
<td>2.7</td>
</tr>
</tbody>
</table>

### Table 7.7: Electricity Generation Mix in China (TWh)

<table>
<thead>
<tr>
<th></th>
<th>1971</th>
<th>2000</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>98</td>
<td>1,081</td>
<td>1,723</td>
<td>2,509</td>
<td>3,503</td>
</tr>
<tr>
<td>Oil</td>
<td>16</td>
<td>46</td>
<td>51</td>
<td>53</td>
<td>54</td>
</tr>
<tr>
<td>Gas</td>
<td>0</td>
<td>19</td>
<td>74</td>
<td>209</td>
<td>349</td>
</tr>
<tr>
<td>Nuclear</td>
<td>0</td>
<td>17</td>
<td>90</td>
<td>163</td>
<td>242</td>
</tr>
<tr>
<td>Hydro</td>
<td>30</td>
<td>222</td>
<td>333</td>
<td>511</td>
<td>622</td>
</tr>
<tr>
<td>Other renewables</td>
<td>0</td>
<td>2</td>
<td>10</td>
<td>16</td>
<td>42</td>
</tr>
<tr>
<td>Total</td>
<td>144</td>
<td>1,387</td>
<td>2,282</td>
<td>3,461</td>
<td>4,813</td>
</tr>
</tbody>
</table>

### Figure 7.4: Oil Balance in China

- Production
- Consumption
- Oil use
- Net Exports
- Net Imports
- Production

### Population

<table>
<thead>
<tr>
<th>Year</th>
<th>People, m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>845 m</td>
</tr>
<tr>
<td>2000</td>
<td>1,272</td>
</tr>
<tr>
<td>2030</td>
<td>1,481 m</td>
</tr>
</tbody>
</table>

### Economy

<table>
<thead>
<tr>
<th>Year</th>
<th>Value, US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>$4,913 b</td>
</tr>
<tr>
<td>2000</td>
<td>$4,861 b</td>
</tr>
<tr>
<td>2030</td>
<td>$9,753 b</td>
</tr>
</tbody>
</table>

- PPP adjusted
World Energy Use by Fuel Type
(Based on WEO 2002)
(MTOE: million tonnes of oil equivalent)

China’s car industry

The rich hit the road

BEIJING

Luxury cars are driving fast into China

O

nce it was assumed that when Chinese consumers could finally afford to buy cars, they would want basic, inexpensive models. But China, like every market in the world, has a wealthy minority that wants to drive something more racy or luxurious, especially from a famous marque. Although luxury cars account for only about 2-3% of car sales in China, that still adds up to a possible 120,000 vehicles to be sold in the country this year. And, as in the rest of China’s car industry, this is causing competition to hot up.

At this month’s Beijing motor show, Toyota’s luxury division, Lexus, announced that it will open 14 Chinese dealerships in the coming year. Ford is to start selling cars from two of its upmarket brands, Aston Martin and Jaguar. Even Italy’s Ferrari is coming. Cars from General Motors’ luxury division, Cadillac, arrive in Chinese showrooms later this year—imported at first, but eventually made in China. Germany’s BMW has already begun producing a version of its 5-Series in Shenyang, and Mercedes-Benz is preparing Chinese-made versions of some of its models. “By 2010, China could represent 15-20% of our total volume,” says Mark LaNeve, Cadillac’s general manager.

This is a huge change from barely a decade ago when there were few private cars of any kind on Chinese roads. Now, in Beijing alone, some 1,000 cars a week are being added to the city’s vehicle fleet.

So far this decade, demand for cars in China has grown at double and even triple-digit annual rates. This year, the pace has slowed a bit, and sales have actually declined in April and May as Chinese authorities have struggled to cool a red-hot economy. And yet, even with these declines, sales were up 21% in first five months of this year over the same period last year. With 5m vehicles likely to be sold this year, China is now a bigger national market by volume than Germany, China could soar past Japan by 2007, making it second only to car-crazy America.

So, as well as their luxury-vehicle projects, carmakers have been announcing production increases in China across most of their ranges. GM plans to double its production capacity in China, at a cost of $3 billion, and Volkswagen is investing €5.3 billion ($6.4 billion) in its facilities. New investment in China’s car industry announced in the past year or so exceeds $13 billion, according to research by Automotive Resources Asia (ARA), a consultancy.

“We’re going to see overkill, just like we have in other industries,” says ARA’s founder Michael Dunne. He points to China’s over-optimistic television manufacturers, who now have four times more capacity than they need.

There is, however, a potential safety valve. A new Honda plant will be devoted specifically to exports. Volkswagen hints that it will begin exporting from China as well, and others could follow. Chinese factories have long been seen as too inefficient to export—and perhaps the coming exports will bring in only enough revenues to cover marginal production costs, not total costs. Successful exporting will require the Chinese assembly plants to keep their quality levels high—something consumers abroad have come to expect of their cars, luxury or not.

Can I trade in the trike?
The Supply of World Oil and Gas

- World oil supply will probably peak ~year 2035
  - Many have said would peak ~1990 to 2010

- In 2035 we will have bigger problems:
  - Pressure for more use of gas and coal
  - By 2020 maybe nuclear will be revived
  - Then getting more of cheaper renewables (but not enough)
  - But still need huge amounts of energy

- A Guess: Gas use peaks about 2055
  - Then the choices are still more limited

- To avoid severe problems, the world needs:
  - Enough energy supply
  - And at an affordable cost

- The lead time to prepare for more energy needs is likely 15 to 30 years

Result: We will be hearing a lot more about energy
  - Will the chatter help or not?

Roy Jenne
May 9, 2004
converted to a liquid or gas, which requires energy and therefore raises their cost.

Even with plenty of fossil fuels available, it's doubtful we'll want to use them all. Burning fossil fuels has already increased the concentration of CO₂ in the atmosphere from 280 to 370 parts per million (ppm) over the past 150 years. Unchecked, it's expected to pass 550 ppm this century, according to New York University physicist Martin Hoffert and colleagues in a 2002 *Science* paper (*Science*, 1 November 2002, p. 981). "If sustained, [it] could eventually produce global warming comparable in magnitude but opposite in sign to the global cooling of the last Ice Age," the authors write. Development and population growth can only aggravate the problems.

On the face of it, hydrogen seems like the perfect alternative. When burned, or oxidized in a fuel cell, it emits no pollution, including no greenhouse gases. Gram for gram, it releases more energy than any other fuel. And as a constituent of water, hydrogen is all around us. No wonder it's been touted as the clean fuel of the future and the answer to modern society's addiction to fossil fuels. In April 2003, *Wired* magazine laid out "How Hydrogen Can Save America." Environmental gadfly Jeremy Rifkin has hailed the hydrogen economy as the next great economic revolution. And General Motors has announced plans to be the first company to sell 1 million hydrogen fuel cell cars by the middle of the next decade.

Last year, the Bush Administration plunged in, launching a 5-year, $1.7 billion initiative to commercialize hydrogen-powered cars by 2020. In March, the European Commission launched the first phase of an expected 10-year, €2.8 billion public-private partnership to develop hydrogen fuel cells. Last year, the Japanese government nearly doubled its fuel cell R&D budget to $268 million. Canada, China, and other countries have mounted efforts of their own. Car companies have already spent billions of dollars trying to reinvent their wheels—or at least their engines—to run on hydrogen. They've turned out nearly 70 prototype cars and trucks as well as dozens of buses. Energy and car companies have added scores of hydrogen fueling stations worldwide, with many more on the drawing boards (see p. 964). And the effort is still gaining steam.

### The problem of price

Still, despite widespread goals and good intentions, many researchers and energy experts say current hydrogen programs fall pitifully short of what's needed to bring a hydrogen economy to pass. The world's energy infrastructure is too vast, they say, and the challenges of making hydrogen technology competitive with fossil fuels too daunting unless substantially more funds are added to the pot. The current initiatives are just "a start," Dresselhaus says. "None of the reports say it's impossible," she adds. However, Dresselhaus says, "the problem is very difficult no matter how you slice it."

Economic and political difficulties abound, but the most glaring barriers are technical. At the top of the list: finding a simple and cheap way to produce hydrogen. As is often pointed out, hydrogen is not a fuel in itself, as oil and coal are. Rather, like electricity, it's an energy carrier that must be generated using another source of power. Hydrogen is the most common element in the universe. But on Earth, nearly all of it is bound to other elements in molecules, such as hydrocarbons and water. Hydrogen atoms must be split off these molecules to generate dihydrogen gas (H₂), the form it needs to be in to work in most fuel cells. These devices then combine hydrogen and oxygen to make water and liberate electricity in the process. But every time a fuel is converted from one amount of hydrogen that releases as much energy as a gallon of gasoline. Current techniques for liberating hydrogen from coal, oil, or water are even less efficient. Renewable energy such as solar and wind power can also supply electricity to split water, without generating CO₂. But those technologies are even more expensive. Generating electricity with solar power, for example, remains 10 times more expensive than doing so with a coal plant. "The energy in hydrogen will always be more expensive than the sources used to make it," said Donald Huberts, chief executive officer of Shell Hydrogen, at a hearing before the U.S. House Science Committee in March. "It will be competitive only by its other benefits: cleaner air, lower greenhouse gases, etcetera."

The good news, Devlin says, is that production costs have been coming down, dropping about $1 per gallon ($0.25/liter) of gasoline equivalent over the past 3 years. The trouble is that DOE's own road map projects that drivers will buy hydrogen-powered cars only if the cost of the fuel drops to $1.50 per gallon of gasoline equiv-

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*Over a barrel.* The world is growing increasingly dependent on fossil fuels.
World Use of Electricity (1900-on)

The world's use of electricity was just getting a good start in a few regions of the world around the year 1900. The global generation of electricity increased by a factor of 5.1 in the short 30-year period from 1960 to 1990 (See Table 1). Note that electricity use in Japan plus India plus China is similar to the US but it lags by 20 years. It will pass the US in the future.

Table 1: Total World Electricity Production (Twh)
(or billions of Kwh)

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<tr>
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<th>US</th>
<th>Western Europe</th>
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<th>Latin America</th>
<th>Japan China</th>
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Sources:

B.R. Mitchell texts (for some early data)
US DOE publications; OECD, (IEA) energy publications, other.

Figure 60. World Net Electricity Consumption, 2001-2025

Note: This page has net electricity. The use of electricity in power stations is not counted.

Sources: 2001: Energy Information Administration (EIA), calculated by the Office of Integrated Analysis and Forecasting, based on estimates of fuel inputs for electricity generation and assumed average generation efficiencies by fuel type.

Change in the Weather?

Wind farms might affect local climates

Large groups of power-generating windmills could have a small but detectable influence on a region’s climate, new analyses suggest.

Windmills once were quaint several-story-high mechanisms that pumped water or ground grain. They’ve since evolved into skyscraping behemoths that can each generate electrical power for more than 100 homes.

Some modern turbines are 72 meters tall and have rotor blades that are about 25 m long, says S. Baidya Roy of Duke University in Durham, N.C. Future windmills may reach higher than 100 m, and their rotor blades may measure 50 m long, he notes.

All such turbines disrupt natural airflow to extract energy from wind. To investigate potential effects of a wind farm that includes thousands of windmills, Roy and his colleagues used a detailed climate model based on wind speeds, temperatures, and ground-level evaporation in north-central Oklahoma during a 2-week period in July 1995. In their scenario, the researchers considered a 100-by-100 array of windmills spaced 1 kilometer apart.

The simulation suggests that during the day, while sun-induced convection handily mixes the lower layers of the atmosphere, such a wind farm wouldn’t have important climatic effects.

In predawn hours, however, when the atmosphere typically is less turbulent, a large windmill array could influence the local climate. For example, at 3 a.m., the average wind speed at ground level was 3.5 meters per second (m/s) in the absence of windmills. Adding the wind farm would increase the average wind speed to 5 m/s. Also, the 10,000 windmills would increase the temperature across the area by about 2°C for several hours.

Averaged over an entire day, the wind speed at ground level would go up about 0.6 m/s and the temperature would jump 0.7°C.

Turbulence caused by the rotating blades would shunt some of the high-speed winds typically found 100 m off the ground down to Earth’s surface, says Roy. Those surface winds would boost evaporation of soil moisture by as much as 0.3 millimeter per day.

The researchers describe their simulation in the Oct. 16 Journal of Geophysical Research (Atmospheres).

The findings may stimulate scientists to validate the analysis with real-world tests, says Neil Kelley, a meteorologist at the National Renewable Energy Laboratory in Golden, Colo. In general, says Kelley, the simulation agrees with atmospheric data he gathered at a wind farm in California. —S. PERKINS
CLIMATE

Pushing and Pulling

The global average surface temperature increased by approximately 0.4°C between 1960 and 1990, even though Incident shortwave radiation (sunlight) at land surfaces decreased significantly over the same period. This apparently contradictory pair of observations requires either an increase in the downward longwave radiation (heat) that outweighs the decrease in shortwave radiation, or a decrease in surface cooling due to reduced surface evaporation. Wild et al. used a global climate model to calculate how much downward longwave radiation may have changed but could explain a third or less of what is needed to account for the upward temperature trend. The authors suggest instead that reduced evaporative cooling at the land surface is responsible for the divergence of the trends in surface radiative heating and temperature. Recent independent reports also show that the rate of pan evaporation (how fast water evaporates from an open container or body) has decreased during that time. Thus, increased advection of moist air from ocean to land areas may explain the apparent contradiction. — HJS


Batting at Windmills

Wind energy is supposed to be environmentally friendly—but ask a bat about that. Puddles of dead bats, apparent collision victims, have been found at the bases of wind turbines in West Virginia.

Last summer, wildlife biologists found almost 500 casualties representing nine species near the 44 turbines at the Mountaineer Wind Energy Center in West Virginia. Now scientists and bat conservationists have established a three-member group, funded by the U.S. government and the wind industry, to do a 3-year study on how many bats are losing their lives at wind power sites and what to do about it.

Wildlife biologist Merlin Tuttle of Bat Conservation International, a member of the study group, says that scientists suspect the dead bats were migrating—and might even have been attracted to the sound of the turbines. The fix could be as simple as air foils that disrupt the wind vortices created by the towers, he says.

In any case, “there’s an urgency to the problem,” says wildlife biologist Alan Hicks of the New York State Department of Environmental Conservation in Albany. “These [wind energy] projects are popping up all over the place.” In fact, another 366 turbines are planned for the Mountaineer site in the next few years.

From Science
18 June 2004
Page 1719

9 April 2004
Science May
Page 203
Is the green dream doomed to fail?

Without real commitment and substantial subsidies, renewable energy sources will never replace fossil fuels.

JENNY HOGAN AND PHILIP COHEN

The lack of effective policies on renewable energy could lead to the building of more nuclear power plants. That's the prospect raised by a report from the UK's House of Lords which slams the government for what it says is inadequate vision and planning.

The rest of the world, including the US, will face the same choice as it attempts to reconcile increasing energy demands with the need to cut greenhouse gas emissions. Worldwide, total energy consumption is shooting up. But, the proportion of electricity produced from renewable sources has fallen from 24 per cent in 1970 to 15 per cent today, while the nuclear contribution has increased, according to figures from the International Energy Agency.

It is becoming clear that market-driven policies on renewable energy will not be enough to realise the dream of going green. To make it reality, many governments will have to change their thinking, and make a concerted long term commitment to renewable energy by bringing in substantial subsidies and incentives, the House of Lords report strongly suggests.

Last year, the British government was applauded for its White Paper on energy, which called for 10 per cent of all energy to come from renewables by 2010. But the report released on 15 July by the House of Lords Science and Technology Committee says that the target is unlikely to be met.

The report blames the government's hands-off approach. "We could not avoid the conclusion that the government is not taking energy problems seriously enough," the committee says. "We were told simply that market forces would solve the problem. We are not convinced."

None of the renewable technologies available today, with the exception of hydro, can compete with gas and coal-fired power stations, which sell electricity for about £15 to £20 per megawatt-hour, so some mechanism will be needed to bridge the gap. Many economists argue that the environmental costs of fossil fuels and nuclear energy should be factored into their price, but there is no agreed way to do this.

At present, the only way to make most renewable technologies attractive is to subsidise them, though wind power can almost hold its own.

To make renewable energy commercially viable, the UK has set up a complex system called the Renewables Obligation. Under this arrangement, electricity distribution companies are required to buy a certain proportion of their energy from renewable sources. Those that fail to meet the target must make up the difference by buying what is called a "renewables obligation certificate" for each megawatt-hour by which they fall short.

Companies generating electricity from renewable sources earn a certificate for each megawatt-hour of electricity they produce. They can sell these...
certificates to make up the difference between the cost of production and the price the electricity fetches on the open market. Demand for these certificates from the distribution companies means they currently sell for about £50 per megawatt-hour, which is enough to make onshore wind farms highly profitable. But other technologies such as biomass just break even.

There is no guarantee that the price of the certificates will remain high enough to keep renewable energy projects profitable. "The mechanism is inherently uncertain, and that does prove to be a disincentive," says Graham Meeks from the Climate Change Capital, a bank that specialises in investments related to climate change. The House of Lords report goes further: "We believe that this mechanism will in fact ensure that the government's targets are not attained." Electricity eligible for the renewables obligation accounted for just 2 per cent of the electricity generated in 2003, making the target of 10 per cent by 2010 seem a long way off.

In the US too, renewable sources, excluding hydro, contribute only about 2 per cent of national energy needs, a proportion that has barely changed in the past decade. According to Alan Nogee, energy programme director of the Union of Concerned Scientists, based in Boston, the US fossil fuel industry has used its economic and political influence to derail its competitors. Nogee points to the repeated defeat of legislation aimed at setting requirements that would force electricity utilities to steadily increase the share of power they obtain from renewable sources. "It's clear the standards were strongly opposed by major electric utilities," he says. "A lot of campaign money for members of Congress came from those utilities."

Some US states are going it alone in attempting to break the impasse. New Jersey, for instance, is demonstrating how suitable policies can promote rapid growth in new energy technologies. With little room for wind farms, but plenty of rooftops, the state is targeting solar energy by picking up between 60 and 70 per cent of the cost of switching to solar.

In its first two years, the number of installations, each ranging from a few kilowatts to hundreds of kilowatts, more than doubled, from 37108 in 2004 to 86 installations were completed in the first quarter of this year alone. "We are trying to make New Jersey the solar capital of the East Coast," says Jeanne Fox, president of the New Jersey Board of Public Utilities.

Bright spots like New Jersey serve to highlight the lack of coordinated policy nationally. Germany, by contrast, has developed a policy that has sent it to the top of the world league table for wind power. It guarantees that wind farms will get a fixed price for 20 years for their electricity, keeping them in the black even when the market price is low.

Germany now has 40 per cent of the world's entire wind-powered generating capacity, and is the world leader in the manufacture of wind turbines. The success "is entirely policy driven" says Thomas Johannson, an environmental economist at the University of Lund in Sweden. "When you look at how much this cost the German economy, it is dwarfed by the advantages."

Similar policies are also paying dividends in Brazil. In the 1970s, the country established a programme to produce ethanol from sugar cane to fuel cars and other vehicles. The fuel now sells for about 60 to 70 per cent of the cost of petrol on the free market, thanks to significant reductions in the cost of production, according to a paper in the journal Energy Policy (vol 33, p 1141) co-authored by José Goldemberg, environment secretary for the state of São Paulo. The reduced reliance on fossil fuels has less obvious advantages, too. The ethanol industry generates about 150 jobs for every job created by the oil industry, and Brazil's ethanol programme "has become the most important biomass energy programme in the world", the paper says.

In contrast, the UK and US are now seriously considering returning to nuclear energy. Last week, the prime minister, Tony Blair, reportedly said that a new generation of nuclear power stations may be the only way for the UK to meet its goal of reducing carbon dioxide output, and admitted that the US was pressing the UK to reconsider nuclear energy. The Bush administration wants to see a 19 per cent increase in funding for nuclear power research, as well as vast subsidies for a new generation of nuclear reactors (New Scientist, 9 August 2003, p 10). And the UN's International Atomic Energy Agency said in a report on 26 June that more nuclear power plants are needed to combat climate change and raise living standards.

The House of Lords report predicts the UK could go down this road, saying, "The government may have no option but to follow the lead of other countries" and accept that, "new nuclear build might be necessary," while acknowledging that "nuclear fission, whatever its other environmental impacts, remains a reliable source of carbon-free power."

Both nuclear and renewable energy will require heavy subsidies from the government. The crucial question now is which way the money will go.
Try to Make Big Cuts in Carbon Dioxide

- Britain aims to cut CO₂ by 60% by 2050.
  - They are not likely to succeed with their policies and strategy.

- Why Alberta, Canada, opposes the Kyoto Protocol
  - Alberta supplies more and more oil from their big oil sand deposits. It takes energy to produce this oil.
  - The central Canadian government ignored the arguments of Alberta and they signed Kyoto.
  - But there is no way that Canada would meet its Kyoto promises.

- Population growth in the USA
  - When the economy grows, more energy is needed.
  - When the population grows fast, more energy is needed.

Roy Jenne
Dec 2004
Britain to Cut CO₂ Without Relying on Nuclear Power

CAMBRIDGE, U.K.—Britain and the United States may be marching side by side to war in Iraq, but their energy policies could not be more different. Prime Minister Tony Blair’s government announced this week that it wants to up the ante on reducing carbon emissions over the next half-century, without building any new nuclear power stations. Lauded by environmentalists as “a crucial landmark,” the Energy White Paper is nonetheless taking heavy flak from energy experts.

In what seems the death blow to nuclear energy in this country, the white paper outlines a plan to reduce levels of carbon dioxide in the atmosphere by increasing funding and incentives for companies to invest in renewable energy sources, such as wind, wave, and tidal power. “Climate change is a clear and present danger,” says Trade and Industry Secretary Patricia Hewitt. “The government is serious about cutting carbon emissions, but we know this cannot be achieved without a fundamental review of the way we produce and consume energy.”

Over the next 50 years, the U.K. aims to cut its carbon dioxide output by 60% from today’s levels, substantially more than is required by the Kyoto Protocol. It intends to do so by setting tougher standards for energy efficiency and by boosting renewable energy from its current 3% of total energy capacity to 10% by 2010 and 20% by 2020. If achieved, this ramping up of renewables will offset the decline of nuclear power as the country’s 33 nuclear reactors—which now produce 26% of Britain’s energy—reach the end of their working lives over the next 30 years.

Prior to publication of the white paper, several scientific bodies, including the Royal Society and the Institute of Physics, as well as the government’s own chief scientific adviser, David King, all warned the government against abandoning nuclear power entirely. And the government has not shut the door: If renewables do not fill the gap, new nuclear stations could be built.

Energy experts consulted by Science were generally skeptical of the government’s plans. “To try to reduce carbon dioxide by 60% is a fantastic thing to do. But I don’t think it is remotely achievable,” says Ian Fells, an energy consultant and professor of energy conversion at the University of Newcastle upon Tyne. And electrical engineer Mike Laughton of London’s Queen Mary College believes that a 20% share of renewable energy is wishful thinking: “It is totally aspirational and not realistic at all.”

The government has put several measures in place to achieve its 20% ambition. There is $95 million in new money for renewable projects, raising spending on renewable energy to $550 million over 4 years. Further tax breaks will endow the renewables industry with an estimated $1.6 billion a year by 2010. In addition, planning regulations will be loosened to speed approval of onshore and offshore wind farms.

Although critics of the white paper concede that renewable energy needs to be pushed, they argue that a mix of nuclear and renewables is more realistic.

Wind is notoriously unreliable power supply, they say, so nuclear energy or conventional gas-fired power stations are still needed as a backup. “A wind policy is not an emission-free policy in total,” says Laughton. “[The white paper] will be taken to pieces gradually and sorted out.”

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- Daniel Bachtold

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- Britain aims to reduce carbon dioxide emissions by 60% by 2050 from today’s levels.

- They plan for a decline in nuclear energy (now 26%) as the 33 nuclear plans are retired over the next 30 years.

- Several science bodies and key government scientists advised against abandoning nuclear power. This was before the plan was printed.

- The Energy White Paper is taking heavy flak from energy experts.

- One engineer believes that a 20% share of renewable energy is wishful thinking.

- MY COMMENTS: Credible energy plans must be based on real numbers, and a good analysis of energy possibilities, costs, and tradeoffs. Present day planning often does not do a good job of this. Why is this?

Roy James
NCAR
28 Feb. 2003 P1291
Why Alberta opposes the Kyoto Protocol

450,000 Jobs Lost in Canada
Income Taxes Increase
Gasoline Prices Increase
Investment Flees Province

We could see these headlines if the Kyoto Protocol is approved!

If approved, the Kyoto Protocol will affect the Canadian economy more than that of any other country and Alberta will suffer the most. It could cost Alberta over $8 billion and thousands of jobs per year. Every business and every individual in Canada would be negatively affected by higher prices, higher taxes and a devastated economy.

Although experts have conducted many studies, the potential impact of implementing the Kyoto Protocol is still uncertain. Some reports suggest that 450,000 jobs would be lost, income taxes would increase substantially, electricity costs could increase by 100%, natural gas prices could increase by 60%, and gasoline could reach $1.10 per litre.

You will likely pay more income taxes; worry about job security; pay more to drive your car, heat your home, and keep your appliances running - all without making an actual or significant reduction in global gas emissions.

What is the Kyoto Protocol?

In 1997, an international agreement under the United Nations was created to reduce greenhouse gases in the developed countries of the world. Its goal is to reduce greenhouse gas emissions an average of 5.2% below 1990 levels by 2012.

There is general agreement among all countries, and in Canada by all provinces, that the goal of reducing greenhouse gas emissions is desirable. Disputes have largely arisen over details of the Protocol such as implementation time frames and the relatively small number of countries that actually have to make emission reductions.

Size: 11 x 17 inches
### Population in the USA

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**USA** 38,558 76,212 151,326 281,222 1.86


Between 1950 and 2000 the population of California increased by more than 3 times. The same is true of Colorado. Such fast growth is hard to cope with, especially in dry areas.

Fast growth means:
- more need for water
- more energy use
- more congestion in transport systems
- etc.

The whole USA almost doubled in population between 1950 and 2000. This is one reason that we use a lot more energy. Yet there are big politics to suddenly use a lot less energy. Talk seems to be cheap.

My father, Carl Jones, was born in 1900. Things have sure changed a lot since then.
This is not suitable bedtime reading — not if you want to fall asleep, that is. Those who think that public policy should be based on sound science will be left in despair that such a goal can ever be achieved in the midst of the competing political interests endemic to modern industrialized democratic societies, exacerbated by scientific illiteracy on the part of both leadership and electorate.

"Politicizing Science" relates the personal trials and tribulations of 12 scientists whose careers were directly affected when their scientific advice conflicted with the political interests of those in power. Although several of its US stories pertain to the Clinton administration, the recent death of Edward Teller, bringing with it memories of the Oppenheimer affair, reminds us that conflicts between science and policy determination are ideologically invariant. These days, for instance, scientists who thoughtfully question the efficacy of the Bush administration's limited missile-defence initiative are not exactly welcome to spend the weekend on the president's ranch at Crawford, Texas. The essays in "Politicizing Science" illustrate that the risk of a given scientific issue becoming politicized depends on the difficulty of its proof and falsification, and on its perceived risks and potential benefits. A few examples from the book will illustrate the point.

The first essay is by William Happer, a professor of physics at Princeton University, who was director of basic energy sciences in the US Department of Energy during the administration of the first President Bush. Happer's tenure saw the 'discovery' of cold fusion, an event that rapidly became politicized. After all, who could ignore cashing in on the energy deliverance of mankind? Happer compares this episode with the Soviet agronomist Trofim Lysenko's subversion of genetic inheritance in favour of 'environmental determinism'. What they had in common was that each was clearly subject to Karl Popper's litmus test: scientists must attempt to falsify their hypotheses. Cold fusion was quickly disposed of in the West, where the litmus test could not easily be politically coloured. By contrast, the totalitarian Soviet Union protected the 'correct' interpretation of genetic inheritance until Stalin's demise.

When a hypothesis or assertion are precise and can be tested, a free society that demands full disclosure will eventually sort it all out. A recent example of just that was the satisfactory resolution of last year's Bell Labs scandal (see Nature 419, 419–421; 2002). But when the science gets "fuzzy", as with carbon dioxide-forced global climate change, the effectiveness of radiations or chemical agents, or bioengineering plants or animals for human purposes, opportunities for the politicization of science compound and abound.

Bernard Cohen, a nuclear physicist, has spent a large part of his later career on efforts, mostly unsuccessful, to attract coverage in the wide-circulation media of the facts about radiation and health. Especially revealing is his compilation of the numbers of stories relating to various 'everyday' accidents in The New York Times during the years 1974–78, before the 1979 crisis at the Three Mile Island nuclear plant. There were, on average, 120 reports per year on road accidents (US death toll: 50,000 per year), 50 on industrial accidents (12,000 killed each year in the United States) and 20 on asphyxiation (4,500 US deaths per year). For accidents involving radiation, there were 200 entries, despite the fact that none involved related illnesses or fatalities.

Robert Nilsson, a professor of toxicology, has worked for the Swedish Environmental Protection Agency, as well as that country's National Chemicals Inspectorate. Nilsson recounts the rise of politicized environmentalism in Sweden, enforced through a plethora of regulatory agencies created by a parliament long dominated by a single party and whose oversight seldom involves a single scientist. These agencies have a long reach, descending even to the composition of the sand piles in playgrounds (crystalline silica has been identified as a low-risk carcinogen).

Roger Bate is concerned with the harm that the imposition of environmental standards devised for industrialized nations can do to developing societies. In particular, he focuses on how a ban on the use of the pesticide DDT in Africa has led to a disastrous re-emergence of malaria, which now kills 3,000 African children a day. DDT spraying in Africa began in the 1950s and greatly reduced the incidence of malaria. But environmental and economic pressures brought by developed nations led to its almost total discontinuance until recently, when attempts were begun to 'vector' its application to the walls of houses. However, the long-standing ban on DDT use means that almost none is now made, and there is a danger that the supply may run out.

But perhaps the most egregious example of political interference in the free and open discussion of unsettled scientific issues was the campaign conducted by an associate of the former senator and later vice-president Al Gore and members of his staff against Fred Singer and his colleagues, all vocal sceptics of a link between carbon dioxide emissions and climate change. Singer, a pioneer in the field of atmospheric measurements, was the first to predict that population growth would result in a greater concentration of methane, an important greenhouse gas. He is also a prolific writer on issues of the environment and climate change. In "Politicizing Science", Singer recounts the pressure that was exerted on him to remove the name of the
The Crux:
To Worry
Or Not
To Worry?

By CHÁRLES McGRATH

Almost every Michael Crichton novel has embedded in its clockwork plot machinery a microchip of alarm, intended to start readers fretting about something they hadn't sufficiently worried about before. In his first book, "The Andromeda Strain," Mr. Crichton introduced us to space-borne plagues. In "Jurassic Park" and its sequel, "The Lost World," we found out what could happen if genetic engineering ran amok. "Airframe," it seems safe to say, did not swell the ranks of frequent fliers, and "Timeline" ought to have made any sensible person think twice about stepping into a quantum teleportation machine.

"Rising Sun" raised the specter of a Japanese takeover of the American economy. "Disclosure" revised that scenario somewhat to suggest that an even bigger problem might be rapacious female executives. And "Prey," Mr. Crichton's last book, refined that message still further to suggest that an overly ambitious mother who worked outside the home might find herself caught up in nanotechnology research and unwittingly turning the world into goo.

In an interview last week, Mr. Crichton suggested that we have become a nation of worrywarts. "There are many groups in contemporary society who find it in their interest to promote fears," he said. "A free society, a free press, has a lot of good features, but giving you an accurate view of the world is not one."

Mr. Crichton himself, of course, is not without blame for this state of affairs. His scary techno-thrillers typically spend lengthy sojourns on the loftiest slopes of the best-seller lists and bounce up there again, in paperback, when they're made into movies.

Mr. Crichton's newest novel, which came out last week, has the classically Crichtonian title "State of Fear," and it's about a subject so menacing that it's surprising he hadn't got to it long before now. This time he has taken on global warming, which provides the book with some cliffhanging action sequences including an ice slide, tidal waves, a flash flood and some SUV-melting lightning strikes — except they're all engineered, it turns out, by a new kind of fear monger. The villains here are the sinister agents of an environmental group called NERF, reverse eco-terrorists.

Continued on Page 10

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Dec 14, 2004
New York Times

Jim Cooper/Associated Press

Michael Crichton.
The Question: To Worry or Not to Worry

Continued From First Arts Page

bent on making us think that the earth is in much worse shape than it actually is. In a review of the book yesterday in The New York Times, Michiko Kakutani called the plot "ludicrous" and said the characters "practically come with Post-it notes on their foreheads indicating whether they are good guys or bad guys."

Plot aside, the not-so-hidden message of "State of Fear," spelled out in copious footnotes, a lengthy afterword, an appendix and a 20-page bibliography, is an oddly reassuring one for a Crichton book, even if many scientists would disagree with it: there is no such thing as global warming, or not that anyone can prove or predict, and when it comes to climatic change, the only thing we have to fear is fear itself and the compromised and politicized experts who are in the business of purveying it.

For good measure the book also includes a number of mini-lectures challenging some of the green movement's most cherished beliefs and arguing, for example, that DDT is safe enough to eat, that the giant sequoias are practically junk trees and that the methane emitted by termites is potentially a greater hazard than the atmospheric buildup of carbon dioxide.

"For most of my life I have felt burdened by highly publicized fears that decades later did not turn out to be true," Mr. Crichton wrote in a recent article for Parade magazine, and the new novel appears in some ways to be a heave of exorcism. Throughout the novel and in the afterword, he takes the opportunity to disparage a number of other widely held fears. Fossil fuel shortage? Not to worry, we'll come up with something. Population explosion? Nope, birthrates are coming down. Cancer from power lines? Please, you've got to be kidding.

Mr. Crichton, who was in New York last week to promote his new book, could easily be mistaken for one of his own creations. He is himself an example of superior bioengineering: extremely tall (6 feet 7 inches), almost unnaturally youthful looking (62, but you'd never know it), and opinionated about all manner of scientific subjects. (He is also a medical doctor, a successful film director and the creator of a long-running television series.) He speaks slowly, without much inflection, in perfectly outlined paragraphs that frequently begin with a topic sentence and include subsections and analogies.

Sitting in his hotel room, he had at hand a stack of photocopied graphs and articles, but he seldom needed to refer to them as he patiently explained what he thinks is wrong with the theory of global warming: temperatures have not increased at anything like the rate that was originally predicted, and temperature data are not especially reliable to begin with; back in the 70's we were worried about global cooling. He was particularly dismissive of the various computer models for climate change, saying, "You have to remember, I come from an experience where you can use a computer to make a photo-realistic dinosaur, and I know that isn't real."

He began idly looking at temperature records about three years ago, he explained, and even after he became convinced that climate changes were impossible to predict and the threat of global warming much less than environmentalists were claiming, he resisted writing about it. "I didn't want the hassle," he said, adding that at first he didn't see a way to turn his findings into a novel. "My message is there isn't a problem," he said. "That's not a very good message — it's not a smash-bang one." Eventually Mr. Crichton shamed himself into starting "State of Fear" — he "felt like a coward," he admitted — and his most important breakthrough came when he hit upon the notion of inverting everything and turning the ostensibly good guys into bad ones.

The book's action sequences, he said, were modeled on the old Saturday-morning movie serials, though he added that "no one in the contemporary world knows what a Saturday-morning serial is."

And, indeed, for readers who may not remember how often cannibals figured in Saturday-morning cliff-hangers, "State of Fear" includes a doozy of a scene in which the heroes are captured and tied to posts by some man-eating Solomon Islanders led by a menacing chief called Sambuca, as in the liqueur. ("Don't ask why this name," another character says, "Him crazy man.")

"This book has been the most wrenching experience for me personally — in terms of what changes it brought about in my view of the world," Mr. Crichton said. He explained that two years ago some armed robbers entered his house in California and held him and his daughter at gunpoint. "That changed me," he said. It taught him "that there really are events that are going to take place about which you can do nothing — things that really do happen."

"But I think it heightened my attunement," he continued. "I mean, if that was a real fear — then what about all the other fears that maybe weren't so real?"

Mr. Crichton also said that in his opinion the message of "State of Fear" is cautionary. "What you're reading may not be right," he explained. "Take it easy, just be careful. Could be overstated, could be not entirely accurate."
New Climate Thriller: Scary, but Is It Science?

BY ANDREW C. REVKIN

On the surface, Michael Crichton’s "State of Fear," can be seen simply as a thriller in which environmentalists happen to be the villains. Mixed with the story, however, are lengthy, annotated attacks on the scientific consensus that the globe is warming, human activity is a cause, and accumulating emissions of greenhouse gases may dangerously disrupt the climate system.

While Mr. Crichton includes a note emphasizing that most of the book is a "product of the author's imagination," he adds that "references to real people, institutions and organizations that are documented in footnotes are accurate. Footnotes are real."

Just one week after the book's release, it has stirred intense reactions not only among scientists, but also from people at every corner of the debate over what to do, or not do, about climate change. Several climate scientists, whose work is attacked by Mr. Crichton's characters, read the book at the request of The New York Times and contended that it did exactly what Mr. Crichton blamed his villains for doing: ignoring or distorting findings that do not fit a thesis and hyping those that do.

Dr. James E. Hansen, the director of NASA's Goddard Institute for Space Studies, said that where Mr. Crichton’s main character, Dr. John Kenner, says flatly that one of Dr. Hansen's climate predictions in 1988 "was wrong by 300 percent," it could not be further from the truth.

"Crichton has taken what is actually a triumph of climate science prediction and pretended that it is a failure," Dr. Hansen said.

He said that the 1988 study looked at potential climate impacts of three possible tracks for emissions of the heat-trapping gases: Possibility A, in which they grew at an exponential rate; Possibility C, in which they were severely curtailed; and a most realistic Possibility B in which emissions essentially stayed at the 1988 rate.

Mr. Crichton, through Dr. Kenner, mentions only the unlikely high-emissions possibility, Dr. Hansen said. In the intervening years, he added, "the real world is falling right on the projections for Scenario B."

Myron Ebell, who since the late 1990’s has fought emissions restrictions for groups aligned with industry, most recently the Competitive Enterprise Institute, said the novel was marginal literature but a great poke at environmentalists.

"As a novel it looks somewhat didactic, but as an anti-global-warming alarmism, anti-Malthusian diatribe it is going to drive the forces of darkness into a rage," Mr. Ebell said.

Indeed, David G. Hawkins, who runs the climate program at the Natural Resources Defense Council, a private Washington conservation group, called the book "a scurrilous smear." His group is clearly a model for Mr. Crichton's National Environmental Resource Fund, which sends agents in Prius hybrid cars to kill fobs with bites from blue-ringed octopuses carried in sandwich bags.

Mr. Hawkins, like Dr. Hansen, said his biggest concern was that Mr. Crichton’s "selective citation of isolated data" gave the book an underved aura of authority. "The irony," Mr. Hawkins wrote, "is that to make his case that enviros, 'establishment' scientists and the media are abusing the scientific method, he tramples it himself."

In an interview last week with The Times, Mr. Crichton said he presumed that there would be criticism from scientists. But he insisted that scientists trying to divine where conditions will be in coming decades face huge hurdles. "There's a lot of people in modern society who really think they can see the future; they don't think they're psychics, but they think they can see the future. And they can't."

One undisputed fact seems to be that after many years in which books and movies dealing with climate largely failed, something has changed. Mr. Crichton's book was second on Amazon.com's best-seller list yesterday. And his publisher, HarperCollins, is part of News Corp., the media conglomerate owned by Rupert Murdoch that also, through 20th Century Fox, this year produced "The Day After Tomorrow," in which the environmentalists are heroes.
Legal action on CO2

July 2003: Lawsuits about climate change may start. --- Help ---

July 2004: Eight states file lawsuits against some big utility companies

Aug 2003: Demagoging utilities for fun & profit (Well it paid)

Apr 2004: Business wants to avoid global warming mandates

Nov 2004: Global warming. Activists buy shares in companies. Then they put big pressure on the companies about reducing CO2

Oct 2004: Companies get ready for greenhouse gas limits

Aug 2004: Climate modelers target politicians in California

May 2005: Dec 2004: Boulder CO10 pushes for Kyoto style goals

Dec 2004: One company backs US emissions cap
Worth discussing in Portland

The Financial Post has this today

http://search.ft.com/search/article.html?id=030714000196

or read it here: July 2003

FEATURES LAW & BUSINESS: Climate change could be next legal battlefield
By Vanessa Houlder
Financial Times; Jul 14, 2003

First it was tobacco and asbestos. Then it was the turn of the food sector. Now litigators have yet another target in their sights: those responsible for climate change.

Two cases have already been launched in the US courts. More are in the pipeline, according to the newly formed Climate Justice Programme. This is a collaborative venture involving lawyers, scientists and more than 40 civil groups supporting the use of the law to combat climate change.

It believes that international and domestic laws - covering human rights, product liability, public nuisance, pollution and harm to other states - will be an effective weapon in forcing emission cuts and make perpetrators liable for the consequences of their actions.

"The potential compensation for climate change impacts would make the tobacco pay-outs look like peanuts," says Peter Roderick, a lawyer working for the Climate Justice Programme.

There is no shortage of potential plaintiffs. If predictions of rising temperatures, floods, droughts, forest fires, rising sea levels, disease epidemics, thawing permafrost and damage to crops and water supplies prove correct, global warming is likely to be the most damaging environmental problem in history.

Their case may have been strengthened by the 2001 scientific report from the intergovernmental panel on climate change, appointed by the United Nations. It concluded that: "Most of the observed warming over the past 50 years is likely [defined as a better than two-in-three chance] to have been due to the increase in greenhouse gas concentrations."

Companies that delay taking action on climate change are also at risk of being sued by their investors. They could be accused of incurring higher costs as a result of unduly delaying emission reductions, damaging a company's reputation and failing to disclose investment-relevant information.
States Sue Over Global Warming

In a legal gambit aimed against global warming, the attorneys general of eight states last week sued the five largest emitters of carbon dioxide in the United States for creating a public nuisance. The states are asking that the electric utility companies cut emissions by 3% each year for a decade. Legal experts predict the states' case will be an uphill battle.

Carbon dioxide litigation is heating up. In 2002, environmental groups sued the Overseas Private Investment Corp. and the Export-Import Bank of the United States for not conducting environmental reviews on the power plants they financed. And last year, Maine, Massachusetts, and Connecticut sued the Environmental Protection Agency for not regulating CO₂ as a pollutant under the Clean Air Act. Now, the states have taken the first legal action directly against CO₂ emitters.

The plaintiffs—California, Connecticut, Iowa, New Jersey, New York, Rhode Island, Vermont, and Wisconsin, along with the City of New York—claim that the CO₂ that utility companies release contributes to global warming, which will harm state residents. The alleged ills include increased numbers of deaths from heat waves, more asthma from smog, beach erosion, contamination of groundwater from rising sea level, and more droughts and floods. "The harm to our states is increasing daily," Eliot Spitzer, the attorney general of New York state, said at a press conference.

The defendants together spent about 650 million tons of CO₂ a year. Their 174 fossil fuel–burning plants contribute roughly 10% of the anthropogenic CO₂ in the United States. The suit maintains that annual cuts of 3% are feasible through making plants more efficient, promoting conservation, and using wind and solar power—without substantially raising electric bills. "All that is now lacking is action," Spitzer said.

That claim irks American Electric Power of Columbus, Ohio, a defendant. Spokesperson Melissa McHenry says that the company had already committed to reducing its emissions by 10% by 2006. "Filing lawsuits is not constructive," she says. "It's a global issue that can't be addressed by a small group of companies."

It will also be a tough suit to win, says Richard Brooks of Vermont Law School in South Royalton, who studies the legal issues of air pollution. The fact that global warming is a planetwide phenomenon will make it difficult to establish how much these companies are contributing to the claimed harm. And under public-nuisance law, the plaintiffs must show that their citizens are suffering significantly more than the nation as a whole. "I would be totally amazed if the court gave this a serious response," Brooks says. "This makes me imagine that this is more of a symbolic suit."

—ERIK STOKSTAD
A big lawsuit about carbon dioxide

Eight states sue five major companies that produce electricity

Many environmentalists would like to see the heads of power plants squirm in the dock, and may get their wish. Some experts predict an imminent wave of lawsuits against greenhouse-gas producers, much like those against the tobacco industry, from people claiming damages for property or loved ones lost to floods or droughts.

But acrimonious court battles are not the best way to resolve issues that affect the future of the planet. Negotiation, legislation and regulation are.

States versus gases

A state-led lawsuit against greenhouse-gas emitters highlights a forceful regional movement in US climate policy.

If you had to predict who would save the world, city lawyers may not instantly spring to mind. So many people were surprised last week when US lawyers launched a strike against global warming.

Attorney-generals from eight states and lawyers from New York City filed a lawsuit demanding cuts in emissions from the five major power companies that they say belch out about 10% of the nation’s carbon dioxide (see www.nature.com/news/2004/040719/full/040719-12.html). The move is an unmistakable dig at the Bush administration for shirking strict curbs on greenhouse-gas emissions in favour of voluntary reductions.

Much of the lawsuit is sheer showmanship from the ambitious legal team behind it. When they get their day in court, they may struggle to win a guilty verdict. It may be tough to prove that a few companies should shoulder the blame for their share in a global problem, or that the modest cuts the lawsuit seeks would help.

But the trial signals that the fight against global warming in the United States is far from over. Lawyers and policy-makers in individual states are willing to take the issue into their own hands — even if President George Bush is sitting on his. And the states can force the federal government to deal with issues where activists have failed.

The Regional Greenhouse Gas Initiative, for example, is an effort by nine northeastern and mid-Atlantic states to build a system to cap greenhouse-gas emissions. California, meanwhile, is developing legislation demanding curbs in carbon dioxide from vehicles. Such initiatives could drive a change in national policy simply by showing that it can be done, or because companies reined in by conflicting state laws may turn to the federal government for clarity.

Many environmentalists would like to see the heads of power plants squirm in the dock, and may get their wish. Some experts predict an imminent wave of lawsuits against greenhouse-gas producers, much like those against the tobacco industry, from people claiming damages for property or loved ones lost to floods or droughts.

But acrimonious court battles are not the best way to resolve issues that affect the future of the planet. Negotiation, legislation and regulation are. State lawmakers should unite and act where the federal government has not; scientists and activists should support them.
Upstaging the Eiffel Tower

The Millau Viaduct in southern France, the world's tallest bridge, was dedicated yesterday by President Jacques Chirac in the Tarn River valley. It opens a new highway link between Paris and the Mediterranean.

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**Eskimos Seek to Recast Global Warming as a Rights Issue**

By ANDREW C. REVKIN

The Eskimos, or Inuit, about 155,000 seal-hunting peoples scattered around the Arctic, plan to seek a ruling from the Inter-American Commission on Human Rights that the United States, by contributing substantially to global warming, is threatening their existence.

The Inuit plan is part of a broader shift in the debate over human-caused climate change among participants in the 10th round of international talks taking place in Buenos Aires aimed at averting dangerous human interference with the climate system.

Inuit leaders said they planned to announce the effort at the climate meeting today.

Representatives of poor countries and communities—from the Arctic fringes to the atolls of the tropics to the banks of the Himalayas—say they are imperiled by rising temperatures and seas through no fault of their own. They are casting the issue as no longer simply an environmental problem but as an assault on their basic human rights.

The commission, an investigative arm of the Organization of American States, has no enforcement powers. But a declaration that the United States has violated the Inuit’s rights could create the foundation for an eventual lawsuit, either against the United States in an international court or against American companies in federal court, said a number of legal experts, including some aligned with industry.

Such a petition could have precedent prospects now that industrial countries, including the United States, have concluded in recent reports and studies that warming linked to heat-trapping smokestack and tailpipe emissions is contributing to big environmental changes in the Arctic, a number of experts said.

Last month, an assessment of Arctic climate change by 300 scientists for the eight countries with Arctic territory, including the United States, concluded that “human influences” are now the dominant factor.

Inuit representatives attending the conference said in telephone interviews that after studying the matter for several years with the help of environmental lawyers they would this spring begin the lengthy process of filing a petition by collecting videotaped statements from elders and hunters about the impacts they were experiencing from the shrinking northern landscape.

The lawyers, at EarthJustice, a nonprofit San Francisco law firm, and the Center for International Environmental Law, in Washington, said the Inter-American Commission, which has a record of treating environmental degradation as a human rights matter, provides the best chance of success. The Inuit have standing in the Organization of American States through Canada.

Sheila Watt-Cloutier, the elected chairwoman of the Inuit Circumpolar Conference, the quasi-governmental group recognized by the United Nations as representing the Inuit, said the biggest fear was not that warming would kill individuals but that it would be the final blow to a sturdy but suffering culture.

“We've had to struggle as a people to keep aloft, to keep our indigenous wisdom and traditions,” she said. “We’re an adaptable people, but adaptability has its limits.

“Something is bound to give, and it’s starting to give in the Arctic, and we’re giving that early warning signal to the rest of the world.”

If the Inuit effort succeeds, it could lead to the eventual stream of litigation, somewhat akin to lawsuits against tobacco companies, legal experts said.

The two-week convention, which ends Friday, is the latest session on two climate treaties: the 1992 framework convention on climate change and the Kyoto Protocol, an addendum that takes effect in February and for the first time requires most industrialized countries to curb such emissions.

The United States has signed both pacts and is bound by the 1992 treaty, which requires no emissions cuts. But the Bush administration opposes the mandatory Kyoto treaty, saying it could harm the economy and unfairly excises big developing countries from obligations.

That situation makes the United States particularly vulnerable to such suits, environmental lawyers said.

By embracing the first treaty and signing the second, it has acknowledged that climate change is a problem to be avoided; but by subsequently rejecting the Kyoto pact, the lawyers said, it has not shown a commitment to stemming its emissions, which constitute a fourth of the global total.

The American delegation at the Buenos Aires conference declined to comment on Tuesday on the petition or the arguments behind it. “Until the Inuit have presented a complaint, we are not responding to that issue,” a State Department official said.

“Whether they will go ahead and file the suit is something they have to say, consider it and then respond,” said Christopher C. Horner, a lawyer for the Cooler Heads Coalition, an industry-financed group opposed to cutting the emissions, said the chances of success of such lawsuits had risen lately.

From his standpoint, he said, “The planets are aligned very poorly.”

Delegates who flew to the conference from the Arctic’s far-flung communities, where retreating sea ice imperils traditional seal hunts, said they planned to meet in Buenos Aires with representatives from small-island nations that could eventually be swamped by rising seas, swelled by melt water from shrinking glaciers and Arctic ice sheets.

Enele S. Sopoaga, the ambassador to the United Nations from Tuvalu, a 15-foot-high nation of wave-pounded atolls halfway between Australia and Hawaii, said he still saw legal efforts as a last resort.

Tuvalu had threatened to sue the United States two years ago in the International Court of Justice, but held off for a variety of reasons.

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**THE NEW YORK TIMES**

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New York Times

**2004**

**REMEMBER THE NEEDIES!**

Dec 15 - 2004

New York Times
Power Partisanship

The timing appears purely coincidental. But the Bush Administration couldn’t have picked a better first response to the Great Northeast Blackout than the regulatory clarification the EPA is slated to unveil tomorrow. The refinements to the “new source review” (NSR) provisions of the Clean Air Act mean power generators will be able to maintain their facilities without fear of being hauled into court.

Democrats and their environmentalist allies, of course, are pretending that Armageddon is upon us. New York State’s busybody Attorney General Eliot Spitzer and his counterparts are threatening to sue. Presidential candidate Joe Lieberman says “the Bush Administration is giving polluters a green light to dirty our air with impunity.” John Kerry calls the move a “get out of jail free” card for “our nation’s dirtiest power plants,” and predicts “more childhood asthma and an increase in respiratory disease.”

Puh-leeze.

Somehow we don’t think such demonization of the folks who keep our lights on will have as much resonance as it would have two weeks ago—especially when it is so unhinged from the truth. In essence, the new rule merely restores the pre-Clinton interpretation of NSR and the Clean Air Act. Moreover, all power plants will still be subject to strict emissions controls, with more planned under the Bush Administration’s Clear Skies initiative.

New Source Review dates back to the 1977 Clean Air Act amendments. In that era of petroleum shortages and fear of nuclear power, Congress realized the coal would continue to be a major source of American energy. So it wrote rules to ensure that any new power plants or other major pollution sources be fitted with the latest emissions-control technology. It did not, says Carter Energy Secretary James Schlesinger, intend for existing plants to make the upgrade. So everyone else believed and behaved for two decades.

But then the Clinton Administration, with its famous regard for the rule of law, got mad that utilities weren’t reducing emissions beyond what Congress had required. Dozens of companies were brought to court on the novel charge that routine maintenance like replacing a steam duct or a turbine blade amounted to “major modification,” triggering NSR and requiring the installation of expensive scrubbers. The alleged scofflaws included the Feds’ own Tennessee Valley Authority, as well as Detroit Edison, whose crime was installing more efficient (i.e., less polluting) turbines.

The Clinton actions were so outrageous that the utilities, which would normally be inclined to settle and preserve cozy relations with the government, stood their ground. But as the cases wound their way through the courts, they’ve been deferring maintenance and putting the nation’s electricity supply at risk.

From day one most of the Bush Administration understood the threat posed by this retroactive rewrite of the law. But it moved slowly to correct the Clinton-era NSR standard for fear of angering environmentalists. Tomorrow’s clarification of “routine maintenance” will be long overdue. One has to hope the Justice Department will soon drop the dozens of ongoing Clinton-era “enforcement actions” too.

This episode shows that the political left is never going to give Republicans credit for environmental policy. Nixon didn’t get any for the original Clean Air Act, nor did President Bush’s father for the 1990 update. But after a few years that have seen serious power disruptions on both coasts, we imagine the American public is open to a sensible balance between electricity generation and environmental goals. The issue might even be a winner for Mr. Bush in 2004, especially if his opponents keep acting as if our power generators are the moral equivalent of common criminals.

Moore’s Commandments

Alabama Chief Justice Roy Moore is the media’s summer whipping boy. His refusal to remove a Ten Commandments monument from the rotunda of the state court building has drawn ridiculous comparisons to, among other things, George Wallace circa 1962. Woe to the Southern official facing a Yankee press in August with too much time on its law,” he said last week. “We all must obey the orders of these courts even when we disagree with those orders.” By the way, Mr. Pryor, a nominee for a federal judgeship, is currently being blocked by Senate Democrats who claim he can’t be trusted to uphold the law on the federal bench. His willingness to stand against Justice Moore in the face of public anger gives
Businesses Aim to Avoid Global-Warming Mandates

By JEFFREY BALL

U.S. businesses are launching a new push to persuade the public that they are doing an adequate job of voluntarily addressing global warming and shouldn't be hit with a government mandate. But even leaders of the effort said business must toughen its standards to be seen as environmentally credible.

The Business Roundtable, a Washington group that represents some of the nation's biggest companies, plans to announce in a report and in newspaper ads in Washington tomorrow that 70% of its about 150 member companies are taking part in a voluntary effort to combat global warming that the group launched in 2003.

It touts that figure as evidence that U.S. business is heeding President George W. Bush's call for companies to voluntarily help the nation slow growth in global-warming emissions. As a result, the Business Roundtable has argued, there is no need in the U.S. for the kind of mandated emissions cuts that have been proposed in Congress and that are being implemented in Europe as a precursor to the Kyoto Protocol, the pending international treaty on global warming.

Business Roundtable officials said they don't know how many tons of global-warming emissions their program actually has kept out of the air. Some companies counted as participating in the program have done little more than take part in telephone conference calls about ways they might reduce their emissions in the future. Others have publicly committed to reduce their emissions by a specific percentage by a specific date.

The program is intended to "represent a good-faith effort by these many companies to move in an appropriate direction," said Michael Morris, a leader of the Business Roundtable's global-warming effort. "But, for the real win, it has to have more rigor," added Mr. Morris, chief executive of American Electric Power Co., of Columbus, Ohio, which emits more global-warming gases than any other U.S. utility.

The Kyoto treaty would force industry to make actual emissions cuts. The Bush plan, by contrast, asks industry to help the U.S. cut its global-warming "intensity"—the level of global-warming emissions per unit of economic output. Even if, as President Bush has proposed, the U.S. cuts that intensity 18% during the decade ending in 2012, its emissions of carbon dioxide and other suspected global-warming gases could keep rising—though at a slowed rate—as the economy expands.

Advocates for the U.S. to mandate actual reductions in global-warming emissions said the Business Roundtable effort fell short. It's "better than nothing," but "it's nowhere near what needs to be done," said Eileen Claussen, president of the Pew Center on Global Climate Change, a nonprofit group that represents 38 companies, many of them Business Roundtable members, which have pledged to try to cut their global-warming emissions.

James L. Connaughton, chairman of the White House Council on Environmental Quality, called the Business Roundtable's program significant. "This is more than a start," he said. "It's a big jump forward. Not just the nation's, but the world's, leading manufacturing organization has begun to find a discipline for reducing the greenhouse gases from their operations, and a commitment to carry that forward."

The Business Roundtable says its program uses workshops and consulting sessions to try to teach companies how to curb their global-warming emissions in a way that doesn't hurt their profitability. It said 89% of its industrial members are participating in the program, while just 54% of its service-sector companies are participating. The group said it will try to get more service companies to participate.

Go to 2

Pew Center

A big jump forward

The Business Roundtable

Sept 22, 2004
Wall St. J.
GLOBAL WARMING: Global warming activists have not given up on creating a socialist global economy through controls on energy use. They are taking their grievances and scare tactics to the corporate boardrooms of America, says author Steven Milloy. By becoming shareholders of publicly owned companies and pushing for changes in corporate disclosure and SEC rules, activist-shareholders are attempting to steer corporate policy:

• American Electric Power will now report on the risks of its greenhouse gas emissions and the steps they are taking to reduce them.

• Cinergy Corporation, a coal-burning utility, caved to demands from church and state pension funds to report on its greenhouse gas emissions.

• About 40 large companies support the Pew Center on Global Climate Change.

• The Carbon Disclosure Project, consisting of 87 investors managing $9 trillion in assets, is asking 500 large companies to start disclosing their “carbon risks” and the plans they have for reducing greenhouse gases.

Moreover, activist-shareholders filed resolutions with over 25 companies in 2003, urging them to reduce greenhouse gases. While none of the resolutions passed, many of them were significantly supported by shareholders with tallies as high as 32%. Activists are also pressuring the SEC to allow for “cumulative voting,” whereby minority shareholders can elect members of boards of directors by throwing multiple votes toward one or more candidates. The idea is to get their own “green” members elected to push through more activist policies. Corporations seem unaware of what is going on. The majority of the 690 public comments regarding the SEC rule change were from activists supporting the proposal—only ten were from corporations or corporate executives. So reports Steven Milloy in “Global Warming Extremists Use Shareholder Actions to Pressure Corporations,” Environment and Climate News, August 2004, Heartland Institute (http://www.heartland.org/).
Companies Get Ready for Greenhouse-Gas Limits

BY JOHN I. FIALKA
AND JEFFREY BALL

WASHINGTON—Some major corporations, anticipating that they may soon be facing government regulations on so-called greenhouse gas emissions at home as well as abroad, are already taking steps to reduce the financial risks of tighter controls and searching for ways to make money on them.

A new study of nine corporations by World Resources Institute, a nonprofit, environmental group based here, concludes that "proactive work" by companies to measure emissions and minimize the costs of the coming rules could be much less expensive than "reacting to events at a later date."

The Kyoto Protocol, the international treaty that will regulate carbon dioxide and other emissions believed to be causing global warming, could be imposed on U.S. multinationals operating in other industrial nations early next year after Russia, as expected, ratifies the treaty. Meanwhile, efforts by state and regional officials in the U.S. Northeast and in California could result in new regulations on power-plant and vehicle emissions.

The bulk of U.S. industry remains opposed to the notion of mandatory government limits. Next week, officials from the utility, auto and oil industries are expected to file a legal brief supporting the Bush administration's decision that the administration has no authority to limit emissions of carbon dioxide and other global-warming gases unless Congress gives it that authority. The decision, reached last year, prompted a lawsuit from several state attorneys general and environmental groups that want the federal government to cap such emissions.

Still, the report shows that some corporations are aware that there will be winners and losers under stiffer emissions rules, and are trying to position themselves to be among the beneficiaries. The report's author, WRI, is a centroid environmental group that tries to persuade companies that such moves can help their bottom lines.

Utilities, such as Consolidated Edison Inc., in New York, will feel the direct brunt of emissions controls being planned in the Northeast, which will be focused on emissions from coal-fired power plant starting as early as 2006. Consolidated Edison's effort to get a better measure of its emissions, according to the study, has already yielded about $5 million in savings by pinpointing and eliminating leakage of natural gas, which is believed to be 20 times more potent as a global-warming gas than carbon dioxide. In addition, the utility is marketing and selling—at a premium—wind-generated "green power" to customers from a partner in upstate New York.

Non-utility companies, such as Johnson & Johnson, the consumer products company based in New Brunswick, N.J., will feel the impact of new regulations in the Northeast and the West indirectly, because emissions cuts on power plants mean that its electricity costs will rise. "The energy efficiency projects we have underway are by far the biggest," said Dennis Canavan, director of the company's world-wide energy management program, referring to projects that have cut emissions. Johnson & Johnson, according to the study, has also become the nation's second-largest user of solar panels that produce electricity.

Pfizer Inc. has been working since 1993 to lower energy consumption, based on a goal of reducing greenhouse-gas emissions by 35% per dollar of revenue by 2007, according to the study. So far the pharmaceuticals company, which operates 102 facilities world-wide, has identified more than 600 energy-saving projects, ranging from new solar and wind-powered projects to finding ways to prune costs of existing lighting, heating and cooling systems.

"There's a competition for capital within the company," explains Al Forte, Pfizer's assistant director of environmental affairs. "These guys have other priorities at plant sites, mainly getting products out the door. Having a company-wide goal allows us to have a greater amount of visibility for a lot of these projects."

General Electric Co., the conglomerate that operates 6,000 facilities in 56 countries, has focused its reduction efforts on the 11% of its operations, plants and offices that produces 95% of the company's emissions. In addition, it is preparing a variety of products including wind-powered turbines and equipment for coal-gasification plants.

"We think these are real businesses and we think there will be a real return for our shareholders," said John Rice, president and chief executive of GE Energy, an Atlanta-based unit of GE. "We also think we can change the game. We have the scale to make these investments when we need to, and move the technology forward." GE says it spends hundreds of millions annually on clean-energy, though a GE spokesman declined to give a more specific number.

Citigroup, which operates more than 270 retail branch banks in the New York City area, has developed an automated system to monitor their energy usage using computerized sensors with a wireless satellite link. It allows a central office to tailor maximum energy use to business hours and to reduce maintenance and service calls by spotting problems early. The system, which cost $2.5 million to install, has resulted in almost $500,000 in energy efficient rebates from area power authorities, according to Stephen Lane, director for global projects for the company.

Emissions controls are being planned in the NE USA.

Oct 26, 2004

Wall Street Journal
Why the Clean Air Fight Is Likely to Be a Draw

AS ACTIVISTS SEE IT, THE NATION’S basic environmental laws are lined up like old-growth trees before a GOP chain saw. Key regulations—from clean-air rules to the Endangered Species Act—are coming under attack by staunchly pro-industry Republicans at both ends of Pennsylvania Avenue. “We’ve got a lineup [of lawmakers] never really seen before in history,” worries Frank O’Donnell, head of Clean Air Watch. “There is a great deal of potential for bad things to happen.”

But rolling back enviro regulation may be tougher than the GOP expects. Not all Republicans are signing on. In some cases, environmental activists are able to use industry’s favorite weapon, the cost-benefit analysis, to boost regs rather than block them. And the need to fight global warming—which is finding growing acceptance even in Corporate America—will undercut hard-liners like James M. Inhofe (R-Okla.), chair of the Senate Committee on Environment & Public Works, who has argued that it’s all a hoax. The probable result: stalemate. “2005 is likely to resemble the middle of World War I: five steps forward, then back into the trench,” says Philip Clapp, president of the National Environmental Trust.

Take the coming fight over clean air. After the election, the Bush Administration postponed its so-called clean air interstate rule (CAIR) requiring cuts in power-plant emissions. The reason: to give Congress a chance to pass a more sweeping overhaul of the Clean Air Act. For enviros, that was a setback. Although they consider CAIR’s limits too weak, they like its general approach—and would rather have rules than a legislative rewrite that could reopen and undermine existing protections.

But the activists’ nightmare scenario now seems unlikely. While Inhofe has vowed to move legislation from his Senate committee by early February, he may not have the muscle. The GOP has only a two-vote edge on the panel—and one vote belongs to Senator Lincoln D. Chafee (R-R.I.), who says he won’t support new clean-air laws unless they limit carbon dioxide emissions, blamed for climate change. Inhofe so far has refused to do that.

CAMPAIGN PROMISE

IN THE LEGISLATIVE trenches, activists are also turning the GOP’s insistence on “sound science” and cost-benefit analysis back on industry. When the Environmental Protection Agency set standards for levels of fine particles in the air, in 1997, business and its Republican allies attacked the rules as based on bad science and too costly for the benefits. But since then, studies have shown that reducing such pollutants by cutting power-plant emissions would save lives at a relatively modest cost. So in an ironic reversal, it’s the enviros who are now talking up cost-benefit analysis—not the foes of regulation.

Given the hurdles, clean-air experts say there’s little chance that the Senate can pass a bill before the mid-March deadline for the Administration’s CAIR provisions. Although the White House may delay CAIR further to boost the legislation’s chances, it risks being accused of reneging on George W. Bush’s campaign promise to reduce air pollution.

GOP leaders, flush with bigger majorities in both the House and Senate, won’t stop their efforts to roll back regs. And the fights will be intense. But when the smog of warfare finally clears, clean air rules and other key environmental protections probably will still be standing.

—By John Carey

Jan 31, 2005 Business Week
Kyoto ‘Capitalists’

As the world gathers in Argentina this week for its latest group hug over the Kyoto Protocol, joining in the merriment are a few new faces: U.S. energy companies. We thought readers might want to know what’s behind this budding corporate enthusiasm for mandatory reductions in greenhouse gases.

The Kyoto idea is 10 years old now, and no better for its age. The U.S. wisely chose to forgo the pact, as the long-term costs add up to hundreds of billions a year across the world economy, not to mention untold lost economic opportunities. The energy industry has heretofore backed this U.S. decision, noting that even Kyoto’s defenders have admitted the pact wouldn’t slow climate change.

Yet suddenly business pooh-bahs are claiming they’ve seen the eco-light. Cinergy, the big Ohio utility, issued a report this month fretting that human activity is “likely contributing” to global warming and endorsing a national CO₂ program. The nation’s largest utility, AEP, says what’s needed to address this “serious challenge” is a “committed policy response.” The media are meanwhile making hay about the self-appointed “National Commission on Energy Policy,” a panel containing energy executives from the likes of Exelon and Conoco-Phillips, which last week called for CO₂ limits.

These executives are thinking green all right—as in greenbacks. The real story behind their conversion is that the industry has figured out that a U.S.-based climate program holds profit opportunities, while any costs can be foisted on the backs of others—consumers, taxpayers or competitors. This new cynical approach to regulation is worrying, if for no other reason than that the quickest way to bad policy is a co-opted business community.

What’s changed the industry’s tune at the broadest level may be the Bush Administration’s Clear Skies program, a smart pollution-reduction proposal that may pass Congress next year. That program, about to be partially instituted via regulation, requires energy producers to reduce sulfur dioxide and nitrogen oxide emissions 70%. But a natural consequence of reducing these pollutants can be fewer greenhouse gas emissions. A “cap-and-trade” program—creating a property right in CO₂ reductions that can be traded for cash—would thus allow companies to get paid for simply complying with other air-quality rules.

For example, both Cinergy and AEP rely heavily on old coal plants that are big polluters and CO₂ emitters. But many of those plants are nearing the end of their shelf lives, and will soon need replacing with cleaner alternatives. Since a climate program rewards companies that make the biggest CO₂ reductions, Cinergy and AEP would stand to rake in cash from a cap-and-trade regime simply by enacting their business plans.

Other firms will benefit by virtue of their niche markets. Exelon CEO John Rowe is only too happy to root for a mandatory program, as his firm is a big nuclear producer that can watch more fossil-fuel-dependent competitors struggle to meet climate requirements. Wind and solar producers are also sitting pretty, since utilities will have to turn to these more expensive renewables to hit their targets.

Finally, many utilities that are still highly regulated by the states simply don’t care. They know regulators will pass along any CO₂ reduction costs to consumers via rate hikes. They also view public support of a CO₂ program as a low-risk way of soothing environmental antagonists and “socially conscious” investors.

We have nothing against companies exploiting the business opportunities that regulation sometimes creates; that’s capitalism. The difference here is that because CO₂ isn’t even a pollutant, and because no realistic program will even slow global warming, any market for trading CO₂ emissions would be entirely unnecessary. There’s nothing capitalist about lobbying government to erect a program that serves no other purpose than the redistribution of wealth, whether it be from one company to another, or from consumers to corporations.

These business potentates might also remember that, whatever the short-term gains for select players, the long-run costs to the economy will hurt everyone. As CO₂ emissions targets are inevitably ratcheted down, all companies will eventually have to pay the piper.

If these CEOs get their way, they may also find that costs for a national program exceed anything imposed by the increasingly failing Kyoto rules. Much was made of Russia’s recent decision to sign the pact, officially putting Kyoto into effect. But Russian officials made clear this was pure quid pro quo: its signature in return for European support of its WTO bid. Russia also stands to make an enormous amount of money from the pact in the short term.

As for the long run, let’s not forget that all those supposedly enlightened countries that joined Kyoto also insisted there be no penalties for missed targets. Most are already failing to make promised cuts, with many actually increasing emissions. About the only effect the pact has had is to enrich thousands of consultants and companies whose job it is to advise and set up the program. Hmm, more Kyoto capitalists. Anyone see a theme here?
Arnold’s Greenhouse

California’s Arnold Schwarzenegger has built his popularity by sticking up for average voters tired of interest groups running Sacramento. So here’s another opportunity: How about opposing those groups imposing huge new costs on car drivers in California and the rest of America?

We’re referring to the recent decision by regulators to force automakers to reduce “greenhouse” gas emissions from cars and trucks sold in the state. The only way the industry can meet those standards is to begin making dramatically smaller and more fuel-efficient cars, which will cost Californians something like $6 billion a year. And since Detroit and Japan can’t make a new fleet merely for the Golden State, chances are the rest of us will be stuck with these higher costs, too.

And to what purpose? The rules call for new vehicles in 2012 to emit 22% less carbon dioxide than today’s vehicles, and up to 30% less by 2016. But CO₂ is not a “pollutant.” It is, literally, the air you exhale. It doesn’t cause smog, acid rain or do any other harm to human health. Quite the opposite, CO₂ is a natural gas vital to Earth chemistry.

Instead, the ostensible justification for these rules is that they somehow combat “global warming.” Yet even if you accept the debatable evidence that this is a problem, California’s rules will only reduce world-wide CO₂ emissions by 0.1% once they are fully implemented. As a cure for warmer climates, this is pure symbolism.

What’s really going on here is an attempt to impose tougher fuel standards on the politically. The green lobby has been pressing Congress to do this for some time, but with no success because most Americans don’t want to drive smaller cars. As governments ratcheted up such standards in the past, U.S. drivers moved to vehicles that didn’t have such tough restrictions. In 1980, light trucks (which include SUVs, minivans, and pickups) made up 22% of total U.S. vehicle sales. Today, they account for 56% and are the majority of sales in 46 states.

The “global warming” guise gives the small-car lobby another avenue to get what it wants—albeit at substantial cost to consumers. One analysis, by Sierra Research, has estimated the reg will add at least $3,000 to the cost of new cars. Even the California Air Resources Board, which created the rule and isn’t known for realistic cost estimates, is predicting it will add $1,050 per vehicle.

There’s also the question of jobs. California has the third-highest auto industry employment among U.S. states, with 680,000 employees in 106 facilities. What regulators haven’t told Californians is that reaching the new CO₂ targets will require cars averaging about 44 miles per gallon, which given current technology means roads filled with subcompacts and hybrids. Entire lines of large-vehicle production may be shut down, including some in California.

These unpopular realities explain why the rules’ promoters had to sneak it through. A bill requiring the air board to write new regulations was originally written by a hardline green group known as the Bluewater Network and introduced in the state legislature in 2002. After a fierce debate and public outcry, Democrats resorted to disguising the bill under a new number and passing it by one vote in the dead of a Saturday night. Former Governor Gray Davis signed it immediately, and the new rules are the result. They now must be approved by the legislature.

Which is where Mr. Schwarzenegger comes in. Even though the CO₂ rules are yet another example of the liberal, special-interest-dominated Davis era, the new Governor has declared he’ll defend them. Mr. Schwarzenegger has been reluctant to tackle his state’s green lobby—perhaps the most radical in the country—with the same fervor that he has unions or lawyers. He seems to be hoping that an auto industry lawsuit against the rules as a violation of interstate commerce will get him off the political hook.

That’s not leadership. If Mr. Schwarzenegger is serious about restoring California’s reputation as a dynamic economy, he can’t let environmentalists run roughshod over business and consumers.
California caves on Kyoto

President Bush rejected the Kyoto Global Warming Protocols, but California now has a law whose stated goal is to make California the front-runner in complying with them, anyway. It sets up a "voluntary" carbon dioxide (CO2) emissions reporting system and registry, and provides for the granting of emission-reduction credits, a la Kyoto.

The Kyoto Protocols gave the Executive Board of the United Nation's Framework Convention on Climate Change (UNFCCC) the authority to enforce greenhouse gas emissions reductions. California-Kyoto gives quasi-enforcement authority to the State Air Resources Board.

Congress has already established — with the 1990 amendments to the Clean Air Act — a similar system for enforcing the reduction of sulfur dioxide and nitrous oxide emissions. The Environmental Protection Agency (EPA) was given the authority to allocate emission "rights" to operators of carbon-fuel plants.

Furthermore, Congress directed that EPA set up an emissions "cap-and-trade" system. If power plant operator Alpha needed to emit more sulfur dioxide than EPA allowed, he could — with EPA's blessing — buy the rights to emit more from operator Beta.

After being assigned his cap, Beta may have switched from coal to natural gas, which produces almost no sulfur dioxide when burned. After the switch, Beta has emission rights he no longer needs. So, with EPA's blessing, Beta can sell them to Alpha or to the highest bidder on the open market.

California-Kyoto focuses on operators of passenger vehicles and light-duty trucks who are allegedly responsible for approximately 40 percent of California's total annual greenhouse gas emissions. It turns out that, if Californians can cut their use of mobility carbon-fuels — gasoline, diesel, methane, propane, methanol, ethanol — by about two-thirds, they will be in compliance with California-Kyoto.

California-Kyoto requires the State Air Resources Board (SARB) to develop and adopt, by Jan. 1, 2005, regulations that will achieve "the maximum feasible model SUV to get 30 mpg. Then, if driven the same distance, the new SUV will have only produced about a third as much CO2.

To encourage automakers to comply with California-Kyoto, a voluntary Kyoto-like CO2 emission-reduction credits cap-and-trade program will be established. Here's how it would work. Suppose automakers were able to turn pumpkins into fairy-tale SUV's that run on moonbeams. Because the SARB regulators are considering — among other things — slapping a huge annual licensing tax on post-2008 vehicles, based upon the amount of carbon-fuel burned that year. But the tax could be offset with emission-reduction credits purchased from vehicle owners who came in under their cap.

Now, administering such a cap-and-trade system, involving millions of vehicle owners, would be almost impossible. So, the way the California-Kyoto cap-and-trade system is apparently going to work is that the automaker will get both the "cap" on its fleet of 2009 vehicles plus the "emission-reduction credits" for every fairy-tale SUV it sells. California-Kyoto will then allow the automaker to sell one 10 mpg SUV for every two fairy-tale SUVs. The "fleet average" for those three SUVs will be 30 mpg, three times what it is today.

But there are two problems. First, not even your fairy godmother can turn pumpkins into SUVs that run on moonbeams. Automakers can't even double — much less triple — the mpg for a SUV. If automakers want to comply with California-Kyoto, they'll have to make mopeds rather than SUVs.

But the second is that the California-Kyoto system is at present "voluntary." Now, what automaker would voluntarily subject itself to such a system? Of course, if Gov. Gray Davis is re-elected, California-Kyoto's CO2 cap-and-trade program may not be voluntary for long.

Gordon Prather is a former national security adviser with several federal agencies, and he worked as a nuclear weapons specialist at Lawrence Livermore National Laboratory and Sandia National Laboratory.

1. Need to cut the use of transportation fuels by 1/3. This would be very hard.
Crisis foments as unstable lake builds in the Himalayas

K. S. Jayaraman, New Delhi

Landslides on the India–China border have created a lake holding millions of cubic metres of water. Scientists and engineers in the region are puzzling over how to avoid a catastrophic collapse of the lake wall, but Indian researchers say their plans have been hampered by China’s refusal to allow them to visit the site.

The Chinese government warned on 11 August that landslides had blocked the Pare Chu river in Tibet, creating a lake about 40 metres deep and holding 60 million cubic metres of water. China said it was evacuating people downstream and advised India to do the same. The river enters India about 35 kilometres from the lake and, as the Sutlej, continues past several towns in Himachal Pradesh.

According to Muthiai Perumal, a hydrologist at the Indian Institute of Technology (IIT) in Roorkee, the water will rush into a narrow gorge should the lake wall break. “It will not be like floods in the plains where water can spread out,” he says. “We expect a huge wave of water moving in bulk without its height diminishing.”

Creating tunnels in the lake wall could have provided an exit for the accumulating water had measures been taken when the landslides occurred in early July, says Manoj Datta, a civil engineer at the IIT in Delhi. “Now the dam is overflowing it is too risky to try anything,” he adds. The Indian government has evacuated 50,000 people from the danger zone.

Indian researchers regret that a joint strategy was not put in place early on, but the Indian government said on 13 August that a request to China for permission to send scientists and engineers to the site had been rebuffed. The Chinese government says the site is difficult to reach and is briefing Indian authorities on progress made by its own team at the lake.

Chinese hydrologists working on the lake could not be reached for comment.

Green remembered hills: the wine of the Napa valley could lose its edge if emissions are not reduced.

Climate modellers go local to target California’s politicians

Emma Marris

A “pioneering” example of a new breed of climate model, designed to plug the gap between academic research and political decision making, has been published.

The analysis of California’s climate by Katharine Hayhoe and colleagues outlines how conditions in the state will change under two alternative scenarios: one models the state’s future under aggressive policies to reduce carbon dioxide emissions; the other predicts its fate without them. The result is an analysis of the implications for heat-related human mortality, the water cycle and agriculture. It is designed to influence the state’s policy-makers.

“Other researchers looked at just one scenario, which is kind of fatalistic,” says Hayhoe, who is based at the University of Illinois at Urbana–Champaign. “This way you have a choice.”

Rajendra Pachauri, chairman of the Intergovernmental Panel on Climate Change (IPCC), has flagged up such regional studies as a vital part of the panel’s next assessment (see Nature 417, 106; 2002). In this case, the project was suggested to Hayhoe by the Washington-based Union of Concerned Scientists (UCS), which fears that the findings of climate-change science are not being disseminated in a useful form.

The study, which is published in print on 16 August (K. Hayhoe et al. Proc. Natl Acad. Sci. USA doi:10.1073/pnas.0404500101), uses data from two global climate models, along with local weather histories. In the high-emissions scenario, there will be six to eight times more heat waves and five to seven times more heat-related deaths in 2100 than there are now. Alpine forests will practically disappear, snow packs will shrink and the vineyards will move from producing gourmet wine to plonk.

“What we did is a model for a regional assessment,” says Hayhoe, who adds that the team chose California because the state is both tough and potentially responsive. “It has a lot of different climate zones, so it is challenging. Also, California is a leader in terms of reduction of emissions. It might actually use our findings.”

Hayhoe hopes her forecasts will be politically effective, but says she wants the science to be unbiased and to be perceived as being so. She adds that her team used low estimates for emissions and their effect on the climate: “We tried to err on the conservative side.” She also says that after the initial suggestion, the UCS stepped aside, although two authors do list the UCS as an affiliation. State officials declined requests to comment on the paper.

The study is “pioneering”, according to Warren Washington, a climate researcher at the US National Center for Atmospheric Research in Boulder, Colorado, who provided tailored data from the centre’s global climate model. He predicts that the format will be popular. “This type of paper and analysis will be repeated for many regions around the world,” says Washington.

Regional assessments are becoming more feasible as computing power improves, adds David Viner, of the IPCC’s Data Distribution Centre at the University of East Anglia in Norwich, UK. The regional models, although huge, can now be done on off-the-shelf computers. “I’ve got a G5 Power Mac on my desk, which has the capability of a supercomputer from five or ten years ago,” says Viner. “There are lots of people doing this now.”

He adds that moving the data around is probably more problematic than producing it. Global models, which can require up to 5,000 gigabytes of memory, are starting to become publicly available on the Internet. However, they do not yet provide the detail needed for a rigorous local model.
Cinergy Backs U.S. Emissions Cap

By JEFFREY BALL
And ANTONIO REGALADO

Cinergy Corp., one of the nation's biggest electric utilities, endorsed the idea of a national cap on global-warming emissions and said that such a cap probably won't hurt the company's bottom line.

The Cincinnati utility said it believes the U.S. ultimately will limit emissions of carbon dioxide and other suspected global-warming gases, and that Congress should do so to "take the unnecessary uncertainty out of national environmental policy." Cinergy is one of the nation's biggest emitters of carbon dioxide because it burns so much coal to make electricity.

Cinergy's statement comes as negotiators from around the world prepare to gather in Argentina next week for an annual United Nations conference on the Kyoto Protocol, the global treaty that encourages industrialized nations to cut their global-warming emissions. The U.S. has rejected the treaty, saying it would unduly crimp the nation's economy. But Cinergy's statement shows that some major U.S. emitters believe it is only a matter of time before the U.S., too, imposes a cap on global-warming emissions.

Cinergy Chief Executive James Rogers has said that he foresees a "carbon-constrained world." His company's new report goes further, saying Cinergy is confident that its profitability isn't likely to be hurt by any emissions mandate that the U.S. is likely to adopt.

To be sure, Cinergy said in its report, a severe carbon-dioxide cap could lead Cinergy and other utilities to significantly raise their electricity rates to recoup the cost of producing cleaner energy. But such a cap "would not last long because of political reaction," it said. It called a "moderate" cap more likely.

In its report, Cinergy endorsed the notion that human activity "is likely contributing" to global warming. And, though several states in the U.S. are moving more aggressively than the federal government to mandate reductions in global-warming emissions, "it makes sense that any U.S. solution be national in nature, and that Congress should be the vehicle through which a policy is developed," Cinergy said.

As part of its strategy to comply with a potential future global-warming cap, Cinergy noted that it is considering building, in Indiana, a power plant that uses advanced technology to more cleanly turn coal into electricity by first converting the coal into a gas. The technology is known as "integrated gasification combined cycle." American Electric Power Co., the U.S.'s biggest utility by generating capacity, announced in August that it, too, intends to build such a plant. But neither Cinergy nor AEP has received regulatory approval.

Shareholder activists have filed resolutions against Cinergy, AEP and other firms arguing that the threat of government caps on global-warming emissions presents the companies with a potential financial liability that they need to address. Cinergy, AEP and other big utilities also have been sued by several states that are trying to force the companies to reduce their global-warming emissions on the theory that those emissions are a "public nuisance."

Cinergy filed a motion to dismiss the lawsuit, as did AEP and other utilities. Cinergy called the suit "a publicity stunt by the plaintiffs," saying global warming is a matter for Congress and the president to consider.

A study to be published today in the journal Nature presents potential further fodder for lawsuits against major global-warming-gas emitters, says Myles Allen, the Oxford University atmospheric physicist who led the study. The study estimates that greenhouse gases emitted by human activity at least have doubled the chance of heat waves such as those that struck Europe during the summer of 2003. The heat waves killed more than 14,000 people in France, most of them elderly, and resulted in more than $12 billion in agricultural losses.

Dr. Allen said the study is one of the first to link global warming to specific injuries. "You can't say every lung cancer is caused by smoking, but you can say smoking greatly increased the risk," he said. "Here we have a statistical link between greenhouse gases and something which causes harm to people."
States Lead Renewable-Energy Push

As Federal Efforts Stall, Debate Over Foreign Oil Has Intensified Locally

By REBECCA SMITH

With the federal drive toward alternative energy stalled for now, the move to adopt renewable energy resources is gaining momentum in key state and local jurisdictions, lifted in part by fossil-fuel prices that are hovering at new highs.

The state governments are pursuing policies that call for greater use of alternative energy generated by harnessing the wind, sun, water and other renewable sources. The state of New York, for example, is poised to adopt one of the most ambitious goals so far. A proposal that could be approved by the New York Public Service Commission as early as today would require utilities to obtain 25% of their electricity from renewable sources by 2013.

In Los Angeles last month, Mayor Jim Hahn ordered the nation’s biggest city-owned utility, the Los Angeles Department of Water and Power, to stop spending money on a $2.1 billion project to construct a coal-fired generating plant in Utah. The decision was shaped by research showing the city could garner 20% of its energy from renewable sources by 2017, satisfying a state target, by shifting investments away from fossil fuels. The city currently gets about 3% of its power from renewable energy—such as solar, wind, and small hydropower—and about half from coal. In Los Angeles, as in New York, studies show the measures would have little or no impact on rates.

"States are taking the lead in requiring renewable energy," says Katherine Kennedy, senior attorney for the Natural Resources Defense Council in New York. "If enough states act, the federal government may act as well."

The moves come amid an election-year debate over how to lessen the nation’s dependence on foreign fuels. Scientists say renewable energy sources are needed to fend off dire climate shifts from global warming, which is exacerbated by the electric-power industry’s reliance on fossil fuels. Meanwhile, some consumer polls show widespread public support for energy alternatives.

President Bush opposes a national mandate for use of renewable energy resources, though he favors state programs. Sen. John Kerry, the Democratic nominee, says his goal is a federal law requiring that 20% of the nation’s electricity come from renewable power by 2020. Mr. Kerry says the U.S. must achieve “energy independence,” while Mr. Bush supports “less dependence on foreign sources of energy.”

Yet there currently isn’t much federal action that would force such a shift, even though the federal government has invested billions of dollars in renewable-energy research and development. An omnibus energy bill that would provide tax support and low-interest loans for renewable-energy resources, sponsored by Rep. Billy Tauzin (R., La.), passed the House but stalled in the Senate last year.

As local governments grow impatient waiting for federal mandates, they are springing into action themselves. If the New York commission measure is approved, New York will become the 17th state with so-called renewable portfolio standards—requirements that utilities garner more electricity from wind, sun, water, geothermal and other less-polluting sources. And if all of those states meet their goals in the coming decade, more than 22,000 megawatts of new renewable generation could come on line, eliminating the need for 44 large fossil-fuel plants.

Economists say the effort would take some price pressure off natural gas, the favored fuel in recent years, which would constrain costs for the chemicals and plastics industries, as well as electric utilities. Such findings have helped make proactive alternative-energy programs palatable to pro-business politicians. California Gov. Arnold Schwarzenegger, for instance, is supporting legislation to require home builders to offer solar panels in all new subdivisions of 25 houses or more by 2008.

State officials are seeking change in other ways as well. Officials in New York, California and six other states recently sued a group of utilities that are the biggest emitters of carbon dioxide. The states acted because of the “lack of federal action on global warming and carbon-dioxide pollution,” said Peter Lehner, chief of environmental protection for the New York attorney general’s office.

But it isn’t smooth sailing everywhere. In Colorado, renewable-power legislation has gone down to defeat three times in the past three years—twice by a single vote. Proponents are trying once again. They have gathered enough signatures to qualify a measure for the November ballot that would require 10% of the state’s electricity to come from renewable sources by 2015.

Boosters are apprehensive even though polls show large support for the initiative. “Many initiatives start out strong, but after utilities spend advocates by 10-to-1, the situation changes,” notes Alan Nogee, energy program director for the Union of Concerned Scientists in Cambridge, Mass.

Xcel Energy Inc., which owns the biggest utility in Colorado, opposes the ballot measure, as do many rural electric cooperatives. Xcel says it is already beefing up a wind-power program through its Colorado utility. Wayne Bruenner, Xcel chief executive, complains that the ballot measure would require utilities to subsidize solar-power installations by $2 per watt of capacity, or about $4,000 on a typical $12,000 home installation. The solar folks “got greedy,” he says.

Solar-energy advocates counter that the rebate is no more generous than the amount offered by utilities in many other states pushing renewable energy.

In Colorado, as elsewhere, policy makers often wonder how much public support really exists for renewable power—and at what price to consumers? But a new kind of polling process is challenging some basic assumptions about what consumers want. Instead of relying on public hearings that mostly attract special interests, the Texas utilities commission went directly to consumers. It used something called “deliberative polling.”

Businesses Aim to Avoid Global-Warming Mandates

By JEFFREY BALL

U.S. businesses are launching a new push to persuade the public that they are doing an adequate job of voluntarily addressing global warming and shouldn’t be hit with a government mandate. But even leaders of the effort said businesses' biggest companies, plans to announce in a report and in newspaper ads in Washington tomorrow that 70% of its about 150 member companies are taking part in a voluntary effort to combat global warming that the group launched in 2003.

It turns that figure as evidence that U.S. business is sheeding President Bush, there is no need in the U.S. for the kind of mandated emissions cuts that have been proposed in Congress and that are being implemented in Europe as a precursor to the Kyoto Protocol, the pending international treaty on global warming.

Business Roundtable officials said
Governors endorse energy goals

Plan calls for development of renewable resources

By Barry Massey
Associated Press

SANTA FE, N.M. — Western governors agreed Tuesday to a long-term goal of increasing the region's production of renewable energy, ranging from solar and wind power to biomass and geothermal projects.

The governors, wrapping up a three-day meeting of the Western Governors' Association, approved a resolution that establishes a goal in the West of producing 30,000 megawatts of so-called clean energy by 2015 and improving the efficiency of energy usage by 20 percent by 2020.

About 800 households can be served by one megawatt of electricity, according to the U.S. Energy Information Administration.

"The time has come to effectively increase the use of the West's vast renewable resources while we create cleaner technologies for using coal and other traditional resources," said New Mexico Gov. Bill Richardson, the outgoing chairman of the WGA.

Colorado Gov. Bill Owens, who was elected as the association's chairman for the next year, said it will be left to individual states and governors to implement policies and projects to meet the energy production goals.

"Many of our states are already aggressively moving toward more renewable energy resources," Owens said.

In New Mexico, for example, a wind farm opened last year that can produce up to 200 megawatts of electricity.

Nevada Gov. Kenny Guinn, a former utility and banking executive, described the 30,000 megawatt production goal as "extremely aggressive."

He cautioned that developing greater renewable energy resources will take time and will require large amounts of financing, which can be difficult to attract.

"The average person ... thinks, 'Why don't we just move to alternative fuels?' It sounds simple. It looks simple. But it's long-term and it's costly," said Guinn.

Interior Secretary Gale Norton, who spoke to the governors on a range of issues, said the nation also must increase domestic production of natural gas along with other traditional sources of energy.

She applauded the governors for promoting the development of renewable energy resources. However, she said alternative energy "is not the silver bullet" for the nation's future energy security.

The Rocky Mountain West has the greatest onshore reserves of natural gas, she said, but private lands are being tapped out.

"It is more and more to federal lands where we'll look for the future of natural gas production," Norton said.

U.S. gas consumption is projected to grow by more than 50 percent during the next two decades but production is forecast to increase by 14 percent, she said.

The growing imbalance between domestic supply and demand, she said, will translate into higher gas prices and create economic problems — increasing costs to generate electricity, heat homes and for industries to produce goods.

Owens said one of his goals as WGA chairman will be to work with Congress on the Endangered Species Act "to fashion reforms that establish recovery goals for endangered species."
Trash tax increase to fight global warming

Boulder plan OK'd; businesses skeptical

By Bern Morson
ROCKY MOUNTAIN NEWS

BOULDER — If America won't fight global warming, this city will.
The City Council on Tuesday voted to nearly triple the tax on trash collection for homeowners, mostly to fund programs aimed at reducing greenhouse-gas emissions.
The tax on a single 65-gallon trash can used by most homeowners will go from 85 cents to $2.20 a month. The tax on businesses will jump by 89 percent, from 45 cents per cubic yard to 85 cents.
The vote was 5-3.
Council members who supported the increase cited the lack of action by the federal government in addressing global warming.
"The United States is essentially isolated among advanced industrial countries," said Councilman Will Toor.
"I would argue (global warming) is the urgent issue that faces humanity," Toor said. "We are fiddling while the Earth burns."
Taking the initiative on global warming is a way "to meet that leadership void in the country," said Mayor Mark Ruzzin.
Although the United States has not signed the Kyoto Protocol limiting greenhouse gas emissions, Boulder adopted the treaty in 2002.
Opposition to the tax increase Tuesday came from Councilman Gordon Riggle.
He noted that the city's effort on global warming comes at a time when Boulder is cutting other services.
Boulder has shed 83 city positions in the past two years amid revenue declines. The trash tax money could be used to restore lost services, Riggle said.
"It's time to slow this down and think this through," he said.
The increase will raise $468,000 a year.
About $310,000 will go to traditional trash-related programs, such as recycling. The rest will go to the greenhouse gas program, including the addition of 1.5 staff positions.
Much of the effort will be to reduce energy consumption in commercial buildings, said Sarah Van Pelt, the city's environmental sustainability coordinator. Because most energy comes from burning coal, that will reduce greenhouse gases, Van Pelt said.
It also could save money for businesses, she said.
Most of the opposition Tuesday came from business groups.
Businessman Lou Della Cava, a leader of the group Boulder Tomorrow, said the city should have consulted members of the business community.
He said city officials "made their case to (their) choir, not to skeptics."
"It will have negligible effect on greenhouse-gas emissions, contributing very little to Boulder or to the world," Della Cava said.
The increase will be in effect for two years, after which homeowner rates will drop to $1.10 per month and commercial rates will drop to 74 cents per cubic yard.

"Business does not like this..."
Plan’s cost: Penny a month

Ballot initiative would require greater use of renewable power

By Todd Neff
Camera Staff Writer

GOLDEN — The renewable-energy initiative going before voters on Nov. 2 would add about a penny a month to Xcel Energy customers’ household electric bills through 2025, according to a new analysis.

But — depending on the price of natural gas and whether the federal government renews an expired tax break for producers of wind energy — electric bills could be anywhere from 19 cents less per month to nearly 50 cents more per month, the study says.

Ronald Binz, an independent utilities analyst, did the study, which had yet to be released Thursday. Binz presented his findings late Thursday at a Colorado Renewable Energy Society forum at the National Renewable Energy Laboratory in Golden.

Binz published a similar study in February to analyze a renewable-energy standard put before the Colorado state legislature. Despite support from Xcel Energy, the legislature voted down that proposal, as it had rejected similar bills in the previous two years.

State House Speaker Lola Spradley, R-Beulah, who repeatedly has sponsored the legislation, and U.S. Rep. Mark Udall, D-Eldorado Springs, decided to take the issue to voters. They are heading the Coloradans for Clean Energy campaign supporting Amendment 37.

If the amendment passes, electricity providers serving more than 40,000 customers would have to provide at least 10 percent of power from renewable sources — solar, wind, geothermal, biomass-based power and small hydroelectric plants — by 2015. Today, about 2 percent of Colorado’s power comes from renewable sources.

Sixteen states now have renewable-energy standards. Colorado would be the first to get one through a ballot initiative.

The basis of Binz’s analysis was to consider nine scenarios that differed based on natural gas prices and the fate of the federal production-tax credit.

Natural-gas prices are important because natural gas is the highest-cost fossil fuel for utilities, and would be the first substituted by renewable energy, Binz said.

The production-tax credit gives wind-energy producers a 10-year tax break for putting up turbines. The savings amounts about 1.5 cents per kilowatt hour, said Brian Parsons, NREL’s senior project manager for wind applications.

Without the tax credit, wind power is more expensive per kilowatt hour than natural gas, said Xcel spokesman Steve Roalstad.

Binz’s report showed that combining high natural-gas prices with no production-tax credit, the renewable-energy standard would cost Xcel customers $535 million through 2025, or about 50 cents a month on utility bills. The best-case scenario, with high natural-gas prices and a production-tax credit extending through 2010, would save Xcel $291 million, or about 19 cents per month.

Binz said he assumed fluctuating natural-gas prices (as has been the case in recent years) to derive an “average” scenario with a 1-cent monthly increase.

Amendment 37 caps the monthly electric-bill increase Xcel customers would face because of renewable energy requirements at 50 cents per month.

“I find it very hard to believe that the 50-cent cap will be approached,” Binz said.

Xcel’s Roalstad said the price uncertainties involved in Amendment 37 are one reason for his company’s opposition, despite its support of the failed legislation.

“Ultimately, nobody knows what this will cost because there are so many factors that are involved,” he said.

Contact Camera Staff Writer Todd Neff at (303) 473-1327 or nefft@dailycamera.com.

*An initiative in State of Colorado*
City backs Kyoto-style goals

Boulder to develop plan to reduce greenhouse gas emissions

By Greg Avery
Camera Staff Writer

Boulder is going where the federal government has feared to tread — applying clean air standards from the proposed international 1997 Kyoto Protocol agreement.

Over the next eight years, the city government will try to reduce greenhouse gas emissions generated by Boulder to 7 percent below 1990 levels.

The standards mirror those suggested in the international pact on global warming developed in Kyoto, Japan. The United States last year refused to ratify the treaty, judging that enforcement of the proposal could send the nation's economy into a tailspin.

On Tuesday, the Boulder City Council unanimously backed setting Kyoto-style goals locally.

More than 100 cities around the country, and more than 400 internationally, have committed to similar programs, which are being encouraged by a coalition called Cities for Climate Protection and the International Council for Local Environmental Initiatives.

Boulder's action commits the city to developing a plan to reduce greenhouse gas emissions, which are most commonly produced by coal burning, vehicles and landfills. Encouraging the use of alternative fuels and transportation, and reducing the amount of trash sent to landfills will be at the core of Boulder's plan.

Councilman Mark Ruzzin remarked that the European Union nations are reportedly close to meeting the Kyoto Protocol greenhouse emission goals.

"These kind of things can be done," Ruzzin said. "Please see BOULDER on 6B"

May 9, 2002
Daily Camera
(Boulder, Colo)

Continued from 1B

Meeting the standards locally will mean increasing city efforts to help change the energy, transportation and waste disposal habits of local companies and other entities, said Mike Weil, city director of environmental affairs.

Living up to it will first mean figuring out how much carbon dioxide was produced in Boulder in 1990.

Fort Collins enacted similar programs two years ago when it joined the Cities for Climate Protection, vowing to reduce its greenhouse gas emissions to 30 percent below what it was projected to generate by 2010.

So far, the city estimated that waste diversion and energy use reduction trimmed carbon dioxide and methane emissions by 190,000 tons citywide in 2000 — a 9 percent reduction in the city's overall output of 2 million tons.

"To my awareness there's been no negative economic impact," said Lucinda Smith, a Fort Collins city environmental planner. "If anything, we'd hope that down the road there would be some associated benefits."

Still, meeting Fort Collins' overall goal of trimming 603,000 tons of carbon dioxide from the city's emissions would require the city-owned power company to increase alternative energy production, as well as higher average fuel efficiency for cars in the city, and a commuter train to Denver.

Similar steps might be needed for Boulder to meet its greenhouse gas reduction goals, said Boulder Mayor William Toor, who is also director of the University of Colorado's Environmental Center.

Even if cities meet their emission goals, it won't solve the global warming problem associated with greenhouse gases, he said.

"While it's an ambitious goal, it's actually not far enough. ... We need a lot more than Kyoto (Protocol standards) to do it," Toor said.

In related news delivered to the council Tuesday, a city study about the feasibility of mimicking a solar power initiative in San Francisco — which last year got voter approval to borrow $100 million to add solar power collection equipment to city-owned buildings — found that Boulder could not follow that model.

According to Deputy City Manager Christine Andersen, the high energy efficiency of Boulder-owned buildings and the low cost of energy in Colorado, would make such a financing method unrealistic for Boulder.

Contact Greg Avery at (303) 479-1307 or averyg@thecameral.com.
The Next Several Stories

- United for Jobs (a group)
  - Be careful of Kyoto

- There are several big world problems
  - Economists rate greenhouse gas curbs a poor investment.

- The world has needs for adequate energy, enough water, less poverty, etc.

- *The Economist*: The world’s finance ministries are not paying attention to the economic effect of big spending on climate.

- The meeting of economists in Copenhagen
  - Priorities for spending on world problems.
  - Problems of the poor (they try a cost-benefit analysis)

- Climate change and malaria
  - Fairly cheap to fix malaria
  - We could wait 30 years to decide what we need to do about climate change.
United for Jobs

Somehow, liberals, and particularly Democrats, have made it an article of conventional wisdom that they are on the side of the working class. They care about protecting the jobs of manual laborers from the excesses of the free market and the heartless attitudes of conservative businessmen, or so they say. This success is odd considering the baleful effect of so many liberal favorites—environmental policies, excessive government regulation, and higher taxes—on business and therefore American working-class jobs.

United for Jobs is a new coalition of conservative public policy groups making the case that conservative, free-market policies best preserve and expand the number of jobs in America. Exhibit No. 1: Opposition to the Kyoto protocol, which would devastate the American economy by severely restricting the amount of carbon dioxide that may be emitted into the atmosphere by developed nations. Carbon dioxide is produced by the burning of any organic substance, including oil and its derivatives and coal and wood. Manufacturing activity in particular generates a large amount of carbon dioxide.

Karen Kerrigan, president of the Small Business Survival Committee (SBSC) and one of the lead activists with the United for Jobs coalition, said, "That protocol would have been a huge barrier to entry into the market." Opposition temporarily killed the Kyoto protocol, negotiated by Al Gore, but renascent versions of it continue to threaten Americans' standard of living. After forming in April, United for Jobs' first agenda item was the McCain-Lieberman bill to set up a "cap and trade" system to reduce carbon dioxide emissions, which might as well have been called the Permanent Anti-Prosperty Act. "The bill was considered by the Senate on Oct. 29-30, 2003, and received a strong 43 votes in initial support," says Lieberman's website. "Senators Lieberman and McCain have pledged to bring the legislation back to the Senate floor for another vote as soon as possible."

"We take an entrepreneurship and economic growth perspective," said Kerrigan. "We were looking at what's happening in the environmental community and MoveOn.org and how they're mobilizing, and wanted to form a response to that." McCain-Lieberman "was really our first target," she said. "We wanted to form before that hit the [Senate] floor because we needed to educate the public. It's a domestic version of the Kyoto protocol that would ration energy by capping CO2 emissions. It's precisely the same type of regulation. It will drive jobs overseas."

It can be hard to combat those who promise Americans something wonderful at little cost to themselves, said Kerrigan. "It's something that sounds nice," she said. "Everyone will get health care for free. We will have a clean environment." But, she said, "When you get into the specifics of what those things will cost, we've always won.... The left always comes back with bite-size proposals."

"America's dynamic economy depends on one thing more than any other—energy," says United for Jobs' website. "It feeds industry, keeps the information bits flowing, transports our goods, promotes our mobility and enables Americans to enjoy the highest standard of living in the world. Over the decades, as technology has become available, the pollution produced by these activities has diminished dramatically. Despite these gains, though, some environmental groups continue to attack America's energy consumption. They view the use of fossil fuels not as soon to be well-being but as a threat to the world's climate and its oceans."

The previous justification for requiring automakers to improve the fuel economy of their cars was the scarcity of oil and the prevalence of air pollution. Now, carbon dioxide—which is not a pollutant but a harmless and naturally large part of the atmosphere—is a further buttress to CAFE standards. "Corporate Average Fuel Economy standards were imposed on American automakers in the 1970s in an attempt to make America energy independent," says United for Jobs. "They failed. Instead, according to the National Research Council, they cost more than 7,700 lives a year as they forced automakers to make lighter, smaller, less safe vehicles. Further, other studies indicate they also increased driving, thus resulting in more energy usage, not less. They also encouraged people to keep older, polluting vehicles longer, as well as those interested in safety and the convenience of size to buy sports utility vehicles and small trucks that have far lower mileage requirements."

United for Jobs' other lead coalition partners are the National Black Chamber of Commerce and the United Seniors Association. The environmentalist agenda will kill jobs, said Kerrigan, and that's what people need to know. "There will be enough for us to do just between now and the election, to set the terms of the debate, which is that this will cost jobs," she said.

United for Jobs may be reached at 1920 L St. N.W., Suite 201, Washington, D.C. 20036 (202-785-0238; e-mail: info@unitedforjobs.org; website: www.unitedforjobs.org).
Kyoto and climate

Economic Issues

And Lomborg

Jun 13, 2004
Roy James

Page 96
Economists Rate Greenhouse Gas Curbs a Poor Investment

COPENHAGEN—Feel like throwing your tax money away? Invest in measures to rein in global warming. That's the controversial conclusion, at least, of a workshop here last week that brought together a varied group of economists, including three Nobel laureates, to analyze spending on global problems.

Participants of the "Copenhagen Consensus" weren't purely naysayers: They lauded, as money well spent, initiatives proposed to combat AIDS, malaria, and malnutrition, for example. "This will help us focus on the more important problems," says workshop organizer Bjorn Lomborg, director of the Environmental Assessment Institute in Copenhagen.

Many scientists don't buy that argument, however. "We shouldn't be spending less on climate change so we can spend more on sanitation. The problems are interrelated," says Stephen Schneider, a climatologist at Stanford University, who labels the workshop's premise "phony and a distortion."

The stated premise was that the industrialized world has limited funds—about $50 billion a year—for aid to developing countries and no objective way to set priorities. According to Lomborg, author of The Skeptical Environmentalist—a 2001 book that sought to discredit a host of environmental concerns (Science, 2 January, p. 28)—"eco-myths" such as global warming "prevent us from acting rationally" when committing resources to improving the world. It would be better, he argues, to base spending on cost-benefit ratios. Measures to stem climate change should compete for development aid, Lomborg suggests, because according to predictions "the developing world will suffer most of the damage from climate change."

With backing from the prime minister of the right-leaning Danish government, Lomborg invited the nine economists who attended—including Nobelists Robert Fogel of the University of Chicago, Douglas North of Washington University in St. Louis, Missouri, and Vernon Smith of George Mason University in Fairfax, Virginia—to rank solutions to pressing problems according to their likely return on investment. Experts, chosen by Lomborg, argued for and against each of 10 "challengers" (see table).

Laying out the case for climate change was William Cline, an environmental economist at the Center for Global Development in Washington, D.C. His primary evidence was the 2001 report of the Intergovernmental Panel on Climate Change (IPCC), which predicts an increase in average global temperatures of between 1.4° and 5.8°C by the year 2100. Lomborg acknowledged that the report is "the best of our knowledge on climate change." The economic benefits of stemming global warming include protecting the lives of income-generating human beings as well as arable land. Steps to limit warming center on reducing emissions of greenhouse gases such as carbon dioxide, a tenet of the Kyoto Protocol. The most cost-effective strategy, Cline argued, would be a global carbon tax, more aggressive than the one called for under Kyoto, that would halve greenhouse emissions by the end of the century.

The panel rejected that line of argument, concluding that Cline's proposals would be "very bad" investments. Panelist Nancy Stokely, an economist at the University of Chicago, explains that the solutions would require "large expenditures for benefits that would come far in the future." Even with a less limited budget, the Kyoto Protocol, in the panel's view, is not worthwhile.

That leaves scientists such as Schneider, a lead author of the IPCC report, fuming.

"Climate change is not an economics problem. It's an ethics problem," he says. Adds John Holdren, an environmental policy expert at Harvard University, "One can't help suspecting ... that Lomborg has stacked both the participants list and the framing of the questions to achieve this result."

Lomborg rejects that charge, arguing that the workshop's organization was "unbiased." He acknowledges, though, that the panel was short on environmental expertise. "I invited other economists," who declined to come, he says, dismissing his critics as "conspiracy theorists." Lomborg plans to distribute the panel's conclusions to governments and to the United Nations.

Illustrating how influential Lomborg is perceived to have become, environmental economists convened an alternative conference, "Global Consensus," in Copenhagen last week to discuss sustainable development. "We shouldn't choose between poverty eradication and prevention of climate change," says co-organizer Christian Jørgensen, chair of the nonprofit Danish Ecological Council. "Prevention of climate change will pay off; it will reduce our dependence on Middle East oil, and it will create a new industrial sector for renewable energy and energy conservation." Clearly, economies alone won't reconcile these sharply divergent world views.

—Johannes Bohannon
John Bohannon is a writer based in Berlin.
World needs for energy, water, etc

Note: These ideas by Richard Smalley are similar to work by Lomborg. See other stories here.
-Roy Penne

Rene Munoz wrote:

From an interesting article in the New York Times, Sept 2, 2003, which profiled Richard E. Smalley, Rice University chemistry professor and 1996 Nobel Prize winner (for his role in discovering a new form of carbon), who has now turned his attention to the world's energy needs:

1. Energy
2. Water
3. Food
4. Environment
   *items 2, 3, and 4 can be dealt with only if the world has adequate clean energy supplies*
5. Poverty
6. Terrorism
7. Disease
8. Education
9. Democracy
10. Population

His ranking takes into account that by 2050, there will be 8 to 10 billion people on Earth (up from 6.3 billion today), and that it is likely that oil and gas production will be declining before 2050, perhaps as soon as 2020.

Sep 2, 2003
New York Times

Rene Munoz
NCAR
Dec 2003

12/5/2003 10:48 AM
Climate actions that may cost $100s of billions each year, in World

- A big policy issue
- Involves climate change, IPCC, Kyoto

Would the World's finance ministries be interested?*

- There is every reason to think that they should be interested.
- The Economist Mag (Nov 8, 2003, p 76) says that they are not interested.

The Economist says:

Nov 8, 2003

You might think that a policy issue which puts at stake hundreds of billions of dollars' worth of global output would arouse at least the casual interest of the world's economics and finance ministries. You would be wrong.

Global warming and the actions contemplated to mitigate it could well involve costs of that order. Assessing the possible scale of future greenhouse-gas emissions, and hence of man-made global warming, involves economic forecasts and economic calculations. Those forecasts and calculations will in turn provide the basis for policy on the issue. Yet governments have been content to leave these questions to a body—the Intergovernmental Panel on Climate Change (IPCC)—which appears to lack the necessary expertise. The result is all too likely to be bad policy, at potentially heavy cost to the world economy.

In our Economics focus of February 15th this year, we drew attention to (and posted on our website) telling criticisms of the IPCC's work made by two independent commentators, Ian Castles, a former head of Australia's Bureau of Statistics, and David Henderson, formerly the chief economist of the Organisation for Economic Co-operation and Development (OECD) and now visiting professor at Westminster Business School.

See the next page for the longer story.
Economics focus | Hot potato revisited

Climate Change - IPCC

A lack-of-progress report on the Intergovernmental Panel on Climate Change

[Slam - bang - slam]

You might think that a policy issue which puts at stake hundreds of billions of dollars' worth of global output would arouse at least the casual interest of the world's economics and finance ministries. You would be wrong. Global warming and the actions contemplated to mitigate it could well involve costs of that order. Assessing the possible scale of future greenhouse-gas emissions, and hence of man-made global warming, involves economic forecasts and economic calculations. Those forecasts and calculations will in turn provide the basis for policy on the issue. Yet governments have been content to leave these questions to a body—the Intergovernmental Panel on Climate Change (IPCC)—which appears to lack the necessary expertise. The result is all too likely to be bad policy, at potentially heavy cost to the world economy.

In our Economics focus of February 15th this year, we drew attention to (and posted on our website) telling criticisms of the IPCC's work made by two independent commentators, Ian Castles, a former head of Australia's Bureau of Statistics, and David Henderson, formerly the chief economist of the Organisation for Economic Co-operation and Development (OECD) and now visiting professor at Westminster Business School. Their criticisms of the IPCC were wide-ranging, but focused on the panel's forecasts of greenhouse-gas emissions. The method employed, the critics argued, had given an upward bias to the projections.

The IPCC's procedure relied, first, on measuring gaps between incomes in poor countries and incomes in rich countries, and, second, on supposing that those gaps would be substantially narrowed, or entirely closed, by the end of this century. Contrary to standard practice, the IPCC measured the initial gaps using market-based exchange rates rather than rates adjusted for differences in purchasing power. This error makes the initial income gaps seem far larger than they really are, so the subsequent catching-up is correspondingly faster. The developing-country growth rates yielded by this method are historically implausible, to put it mildly. The emissions forecasts based on those implausibly high growth rates are accordingly unsound.

The Castles-Henderson critique was subsequently published in the journal Energy and Environment (volume 14, number 2-3). A response by 15 authors associated with the IPCC purporting to defend the panel's projections was published in the same issue. It accused the two critics of bias, bad faith, peddling "deplorable misinformation" and neglecting what the 15 regard as proper procedure. Alas, it fails to answer the case Mr Castles and Mr Henderson had laid out—namely, that the IPCC's low-case scenarios are patently not low-case scenarios, and that the panel has therefore failed to give a true account of the range of possibilities. If anything, as the two critics argue in an article in the subsequent issue of Energy and Environment, the reply of the 15 authors gives new grounds for concern. This week the IPCC is preparing to embark on its next global-warming "assessment review"—and if the tone of its reply to the critics is any guide, it is intent on business as usual.

It is true, as the IPCC says in its defence, that the panel presents a range of scenarios. But, as we pointed out before, even the scenarios that give the lowest cumulative emissions assume that incomes in the developing countries will increase at a much faster rate over the course of the century than they have ever done before. Disaggregated projections published by the IPCC say that—even in the lowest-emission scenarios—growth in poor countries will be so fast that by the end of the century Americans will be poorer on average than South Africans, Algerians, Argentines, Libyans, Turks and North Koreans. Mr Castles and Mr Henderson can hardly be alone in finding that odd.

Tunnel vision

The fact that the IPCC mobilised as many as 15 authors to supply its response is interesting. The panel's watchword is strength in numbers (lacking though it may be in strength at numbers). The exercise criticised by Mr Castles and Mr Henderson involved 53 authors, plus 89 expert reviewers and many others besides. Can so many experts get it wrong? The experts themselves may doubt it, but the answer is yes. The problem is that this horde of authorities is drawn from a narrow professional milieu. Economic and statistical expertise is not among their strengths. Making matters worse, the panel's approach lays great emphasis on peer review of submissions. When the peers in question are drawn from a restricted professional domain—whereas the issues under consideration make demands upon a wide range of professional skills—peer review is not a way to assure the highest standards of work by exposing research to scepticism. It is just the opposite: a kind of intellectual restrictive practice, which allows flawed or downright shoddy work to acquire a standing it does not deserve.

Part of the remedy proposed by Mr Castles and Mr Henderson in their new article is to get officials from finance and economics ministries into the long-range emissions forecasting business. The Australian Treasury is now starting to take an active interest in IPCC-related issues, and a letter to the British Treasury drawing attention to Castles-Henderson (evidently it failed to notice unassisted) has just received a positive, if long delayed, response. More must be done, and soon. Work on a question of this sort would sit well with Mr Henderson's former employer, the OECD. The organisation's economic policy committee—a panel of top economic officials from national ministries—will next week install Gregory Mankiw, head of America's Council of Economic Advisers, as its new chairman. If Mr Mankiw is asking himself what new work that body ought to take on under his leadership, he need look no further than the dangerous economic incompetence of the IPCC.
Economists give troubles cold scrutiny

Eight of the sharpest minds were told to rank the world’s worst crises, then put emotion aside to prioritize spending.

By Christine Tatum
Denver Post Staff Writer

Copenhagen, Denmark — If you could spend $50 billion to help solve some of the world’s greatest problems — and no, your car repair and health care bills don’t count — how would you spend the money?

Amidst Danish statistician and environmental maverick Bjorn Lomborg recently put the question to eight of the world’s sharpest minds in economics, including three Nobel Prize winners.

Based on a list of global challenges identified by the United Nations, Lomborg instructed them to name the world’s top 10 worst problems, then rank more than 30 proposed solutions to those problems in terms of spending priority. Never mind politics and cultural differences, he said. Instead, use cost-benefit analysis: Crunch the numbers, and weigh benefits against costs to determine how to get the most bang for a buck.

“We need the cold-hearted scrutiny of an economist to make a warm-hearted contribution to the world,” Lomborg said at the opening

Lomborg tosses fuel on debate over global warming

By Christine Tatum
Denver Post Staff Writer

Copenhagen, Denmark — When Bjorn Lomborg speaks, a lot of people listen — and then complain vehemently.

The unflappable 39-year-old Danish statistician has incensed environmentalists, policymakers and scientists everywhere and generated tremendous controversy in this Scandinavian country with his claims that many environmental threats, such as global warming, are exaggerated.

The criticism isn’t stopping Lomborg from spearheading an international effort to influence global spending.

“The truth isn’t always easy to hear,” said Lomborg, who typically doesn’t bother to change out of his trademark short-sleeved polo shirts, jeans and sneakers when meeting with people such as Denmark’s prime minister. “People don’t have to like me, but they should consider what I have to say.”

The former Greenpeace member gets — and seeks — plenty of attention, which endears him to few in Denmark, where flamboyance and self-assuredness are frowned on. Named one of the world’s 100 most influential people by Time magazine in April, Lomborg is director of Denmark’s government-financed Environmental Assessment Institute — considered by critics to be a political tool to help the ruling administration justify spending cuts on environmental issues.

Lomborg won the plum job after writing “The Skeptical Environmentalist.” The 1998 book is a critical look at the internationally negotiated Kyoto Protocol — which the United States refuses to ratify — and many of the urgent claims launched by an array of environmental groups.

Scientists around the world ripped apart the book. One Danish panel scrutinizing scientific ethics last year charged Lomborg with “scientific dishonesty,” but dropped the accusation after the Danish Ministry of Science rebuked it for failing to produce sufficient evidence. The Observer of London recently reported that Lomborg’s book was mentioned in a “secret White House memo” designed to help Republicans respond to criticism about their environmental policies.

“My work is misrepresented all the time,” Lomborg said with a shrug. “Yes, the book says, ‘Kyoto is bad,’ but it also says, ‘We should do something better.’”

Yet Lomborg is far from convinced that the world should direct more resources to global warming than other pressing problems such as hunger and the spread of AIDS.

With fanfare rivaling Denmark’s recent royal wedding, Lomborg invited eight of the world’s most distinguished economists to this harbor city to determine how $50 billion could be spent to do the most good for the most people.

When the experts ranked initiatives to combat global warming at the bottom of their list, Lomborg’s critics suggested they had been manipulated by a sly media hound.

Not so, the economists said, noting that Lomborg rarely spoke during the week-long debate. And even if he had, his views wouldn’t have shaped their discussion much, said Swiss professor Bruno Frey, one of the economists who attended the conference.

“Perhaps Bjorn Lomborg is a central person in Denmark, but internationally there are other important people,” he said.

- end -
of the week-long endeavor, called "Copenhagen Consensus."

His brain teaser was based on a logical — but limited — approach to government spending that politicians rarely use. As a result, taxpayer dollars often fail to do the most good for the most people, many economists say.

"Today's political debates are shaped more by people saying, 'I feel this,' or 'I think that,' or 'This is my experience,'" said Tucker Hart Adams, president of The Adams Group, a Denver-based economics research and analysis firm that counts U.S. Bank Corp. among its clients.

"There's not really much systematic cost-benefit analysis that goes into a lot of very important decisions. And when you do see it, you can almost always bet that it was produced for a particular group pushing a particular agenda."

Adams is among legions of economists frustrated by politicians whose stump speeches and financial decisions are rooted in emotion and special interest, not in economic reality.

"We didn't hear about a bunch of economists being invited to analyze the war in Iraq to determine where every defense dollar goes," she said. "Or whether there might be a more effective way to fight terrorism."

Many of the eight economists who tackled Lomborg's challenge — each of whom was paid $10,000 for the effort — said they did so in part to demonstrate that it is possible to work without input from hordes of lobbyists to reach a mutual agreement about how best to spend the world's money.

The internationally renowned scholars also said they appreciated the opportunity to wade into discussions to which they're seldom invited.

"Economists are people who work on neat, little problems they invent themselves, and politicians are people who are very good at discussing problems away," said University of Zurich professor Bruno S. Frey, an economist who attended the conference. "At the end of all that research and talking, little is done. So I see no harm in making a list of priorities. It's a crazy enterprise, but the alternative is doing nothing."

After a closed-door jam session only geeky intellectuals could love, the economic "dream team," as Lomborg called it, announced its decision.

Efforts to control the spread of AIDS, estimated at $27 billion, should be tackled first to avert 30 million new infections by 2010, the economists said. Next, $12 billion should be spent on dietary supplements to fight malnutrition. Improving the world's health would dramatically increase its productivity, the economists said.

Relatively cheap policy reforms promoting free trade ranked third.

"Put a group of economists in a room, and the only thing they will absolutely agree on is that anything making trade among countries easier is good, and anything making trade more difficult is bad," said Jeff Thredgold, an economist for Vectra Bank Colorado.

The fourth and final expense to win endorsement as a "very good project" was $13 billion to prevent malaria.

The pecking order continued with other proposed initiatives aimed at curbing the world's ills labeled "good," "fair" and "bad." Guest-worker programs for unskilled laborers and efforts to prevent global warming ranked at the bottom of the list.

The economists agreed that trade liberalization — not the guest-worker programs for the unskilled that many politicians float to win minorities' votes — would do more to help ease burdens associated with migration for industrialized nations such as the United States and developing countries such as Mexico. People are less likely to leave home when they earn a decent wage — and free trade often leads to higher salaries, the experts said.

The experts also agreed that while it's important to address global warming, many of the approaches proposed for reducing carbon emissions — including the internationally negotiated Kyoto Protocol that the United States refuses to ratify — are needlessly expensive.

"Climate change is important, but not nearly as important as disease and malnutrition," said Nobel Laureate and University of Chicago professor Robert Fogel, who also attended the conference.

Thredgold questioned aspects of the economists’ methodology and the tight time-frame in which they made their decisions, but he agreed with many of the results. Similarly, if a group of economists examined ways to address the biggest problems in the United States, mental health care treatment and substance-abuse prevention — two issues politicians don't often discuss in depth — likely would rank near the top of the list, he said.

"From an economic perspective, the old saying, 'A stitch in time saves nine,' couldn't be a more appropriate expression whether you're talking about the nation or the world," he said.

Cost-benefit analysis has limitations.

"It is objective up to a point and can quickly become more art than science," Thredgold said. "At some point, you have to make a judgment call about what dollar value to assign something. That can be very difficult."

Indeed, many of the international experts who wrote papers on their particular specialty for the economists' consideration said they had a hard time boiling down their work into such stark terms. Many said they struggled, in part, because they couldn't attach value to human lives or to vast subjects such as the global impact of poor sanitation.

"How do you put a dollar value on a human life or an hour you can't spend with your family because you're stuck in a car, commuting to and from your job every day?" Adams asked. "These are not easy questions."

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Finding "Consensus"

Top global challenges
Based on data from the United Nations, eight of the world’s most distinguished economists, including three Nobel Prize winners, crafted a list of the world’s top 10 biggest challenges. Listed in alphabetical order, they are:

- Civil conflicts *
- Climate change
- Communicable diseases
- Education **
- Financial instability ***
- Governance and corruption ****
- Malnutrition and hunger
- Migration
- Sanitation and water
- Subsidies and trade barriers

Spending priorities
After applying cost-benefit analysis to more than 30 proposals aimed at addressing the 10 problem areas, here’s how the economists proposed to spend $50 billion to do the most good for the most people:

Very good investments:

- Diseases: Control of HIV and AIDS
- Malnutrition: Providing micronutrients
- Subsidies and trade barriers: Trade liberalization
- Diseases: Control of malaria

Good investments:

- Malnutrition: Development of new agricultural technologies
- Water and sanitation: Development and promotion of small-scale water technology for livelihoods
- Water and sanitation: Community-managed water supply and sanitation

Water and sanitation: Research on water productivity in food production

Governance and corruption: Lowering the cost of starting a new business

Fair investments

- Migration: Lowering barriers to migration for skilled workers
- Malnutrition: Improving infant and child nutrition
- Malnutrition: Reducing the prevalence of low birthweight
- Diseases: Scaled-up basic healthcare services

Bad investments

- Migration: Guest-worker programs for the unskilled
- Climate: Optimal carbon tax
- Climate: The Kyoto Protocol
- Climate: Value-at-risk carbon tax

* No proposals in this category ranked. "The human and economic costs of such conflicts are enormous — even larger, in fact, than is generally assumed," the economists stated. "Measures to reduce the number, duration or severity of civil wars would stand very high in the ordering if they could be expected with any confidence to succeed."

** No proposals in this category ranked in part because "experience suggests that it is easy to waste large sums on education initiatives." However, the experts endorsed externally supervised inspections to improve schools’ accountability and recommended further research of schemes that would reduce school fees for children in developing nations and pay grants to families that send their children to school.

*** Citing complexities and uncertainties in this area, the economists ranked no proposals in this category.

**** Four of five proposals under this category not ranked because reforms would involve implementation costs varying greatly by country.
Senate climate vote set for this month
Sponsor McCain touts economic benefits

Michael Schmidt

Senate leaders have agreed to debate and vote on legislation later this month that would cap carbon dioxide emissions and require CO2 credit trading, one of the sponsors of the bill, Sen. John McCain, said last week.

McCain, R-Ariz., told reporters after a Senate Commerce Committee hearing Wednesday — at which climate experts said there was much consensus among scientists that global warming is occurring — that the bill (S. 139) he introduced with Sen. Joseph Lieberman, D-Conn., earlier this year would be debated on the Senate floor during the second half of October. Senate leaders agreed July 31 to debate the climate change bill for six hours in order to get consensus to move a Democratic energy bill.

The bill would cap greenhouse gas emissions, requiring the electricity, industrial, commercial and transportation sectors to limit carbon dioxide emissions by 2010 to their aggregate level in 2000. McCain said his "very modest" bill would force U.S. companies to reduce CO2 emissions 1.5% over the next decade. The Bush administration opposes CO2 limits and has been advocating reducing greenhouse gas intensity, but not aggregate emissions, using a voluntary approach. While campaigning for president, then-Texas Gov. Bush said he would support mandatory CO2 reductions; he reneged on that promise soon after taking office.

McCain told Inside Energy the Bush administration has expressed no interest in the bill, even though the proposal would allow them to claim they had required industry action on climate change. "I think it would be absolutely wonderful if they supported S. 139 but I have a certain bias," he said.

The measure also would create a national database to record greenhouse gas emissions — something the Energy and Commerce departments have been developing; provide companies incentives for early action to reduce pollution; and require the government to report to Congress on the effect of not participating in the Kyoto Protocol, which required emissions reductions below 1990 levels. The Bush administration withdrew the United States from the negotiations in 2001, largely out of the fear that the Kyoto goals would harm the coal and manufacturing sectors, and the national economy.

The McCain-Lieberman bill as introduced would also have required companies to bring CO2 emissions to the 1990 level by 2016. McCain said he and Lieberman had agreed to eliminate the 2016 target, and that they would bring a modified bill with the change and others to the floor.

McCain said he did not know how much support S. 139 would garner; in May, he was doubted the bill would pass because "special interests" were "lining up against it."

On Wednesday, McCain said he and Lieberman were amending the bill in order to build support for it. "By modifying the bill, we expect to build momentum for the measure in the Senate," he said. The senator said he decided to make the changes in part because of a study of the bill by the Energy Information Administration. EIA said June 27 the bill would cause emissions to fall by 2010, and renewable and nuclear energy use to soar, but the economy would shrink 2% annually and coal production would decline.

McCain and Lieberman also asked the Environmental Protection Agency to analyze the effects of the legislation, but EPA has not responded, McCain said.

Climate experts testifying on the bill said most members of the scientific community were in agreement that global warming was occurring, and that human activity was prompting the change.

"Despite the uncertainties, however, there is widespread agreement that the observed warming is real and particularly within the past 20 years," said Anthony Busalacchi, chairman of The National Academies' Climate Research Committee. "The evidence is there; the time for action is now."

The recently discerned climate change, added Tom Wigley, a senior scientist at the National Center for Atmospheric Research, is "totally unprecedented in the last 2,000 years. Immediate action of some form is absolutely required."

Stephen Schneider, the co-director of Stanford University's Center for Environmental Science and Policy, said it was "overwhelmingly clear" that cli-
mate change is occurring. There is "very little debate among mainstream scientists" that there is a "substantial likelihood" that human activities are having a "strong" influence on the climate, he said.

Schneider said the trillions in estimated economic costs would be a "good insurance policy" for the potential dire effects and "severe events" described by a United Nations panel and others. A $10 trillion to $20 trillion investment -- considered the high end of the estimated cost to stop greenhouse gas emissions - over 100 years is not "unimaginably expensive," he said.

Wigley said the legislation was "beneficial to the environment and potentially beneficial to the economy."

McCain called the economic reasons for reducing emissions important because Americans could be forced to pay higher insurance premiums because of the risks, or even be forced to move if they live in coastal areas due to weather, rising waters and erosion, because of climate change. The cost of compliance with emissions caps is always talked about but "rarely discussed is the impact of doing nothing," he said.

Schneider said a voluntary approach would not work. He argued that there must be a cost associated with greenhouse gas pollution, otherwise no one will stop emitting them into the atmosphere. Without Kyoto in effect, "it will be that much longer before" the "right signals" will be sent to the market, which would more actively develop clean energy technologies, he said.

Voluntary

A voluntary approach will also not work, said Ethan Podell of Orbis Energy LLC, because companies do not want to take steps and make investments to cut emissions that will hurt them vis-a-vis their competitors. Also, companies have no assurance that Washington will not change the rules, and that emissions reductions they may have made will count in whatever program is established, he said.

GAO: Bush plan flawed

A General Accounting Office official who testified said the administration's voluntary approach, which seeks to reduce GHG intensity 18% by 2012, has several flaws.

John Stephenson, GAO's director for natural resource and the environment, said the White House had not explained why it sought the 18% reduction in GHG intensity -- which would represent just a 4% cut below business-as-usual.

Stephenson also said the administration has no plans to monitor before 2012 whether the slowing of the growth in GHG emissions is occurring, and that it highlighted 30 initiatives that would help the United States achieve its goal, yet has no data on them nor any way to track them.

"GAO found that the administration provided estimates of the reductions associated with 11 of the 30 elements, but not with the remaining 19 elements. " Stephenson said in his written testimony. "Of these 11 elements, GAO found that three estimates represented future emissions reductions related to activities that occurred after the [voluntary] initiative was announced. However, the other eight estimates represented past or current emissions reductions or related to activities that were already underway before the initiative was announced. It is, therefore, unclear to what extent the 30 projects will contribute to the goal of reducing emissions ."

He added, "To help Congress credibly assess the likelihood that the initiative will achieve its stated goal, we believe it would be helpful if the administration would make readily available more current and complete information regarding the basis for establishing its emissions intensity goal, the elements intended to help achieve it as well as their expected contributions, and plans for monitoring interim progress toward the goal."
The scourge of the greens wins a round

NEW developments to report in the saga of Bjorn Lomborg and “scientific dishonesty”. Dr Lomborg, currently the director of Denmark’s Environmental Assessment Institute, is the author of “The Skeptical Environmentalist”, a global bestseller that embarrassed green groups by documenting their systematic exaggeration of the Earth’s environmental problems. Furious environmentalists brought a complaint about the book before a body called the Danish Committees on Scientific Dishonesty (DSCD), which, as we reported on January 11th of this year, found that: “Objectively speaking, the publication of the work under consideration [Dr Lomborg’s book] is deemed to fall within the concept of scientific dishonesty.”

This finding, and the total absence of evidence or argument to support it, struck many as bizarre. Having read the DSCD’s report, we ourselves concluded, “The panel’s ruling—objectively speaking—is incompetent and shameful.”

On December 17th, Denmark’s Ministry of Science, Technology and Innovation published its own response to the DSCD’s finding. It is more politely expressed than ours, but comes to much the same conclusion. The ruling is thrown back to the DSCD with instructions to think again. Among a long list of telling criticisms, the ministry says this:

“All smiles for Dr Lomborg

“the DSCD has not documented where [Dr Lomborg] has allegedly been biased in his choice of data and in his argumentation, and... the ruling is completely void of argumentation for why the DSCD find that the complainants are right in their criticisms of [his] working methods. It is not sufficient that the criticisms of a researcher’s working methods exist; the DSCD must consider the criticisms and take a position on whether or not the criticisms are justified, and why.”

Quite so. What kind of panel is it that purports to be concerned with scientific dishonesty, but needs somebody else to point this out?

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Quite so. What kind of panel is it that purports to be concerned with scientific dishonesty, but needs somebody else to point this out?
Problems of the poor set to face cost–benefit treatment

Jim Giles, London

Bjorn Lomborg was vilified by the green movement when he published The Skeptical Environmentalist, a 2001 book that questioned the validity of several widely held beliefs about the state of the planet. A furious activist went so far as to thrust a pie in his face, on at least one occasion. But his next big venture could see him rouse the ire of an equally passionate group: the international aid movement.

As part of Lomborg’s latest scheme, nine eminent economists will gather in Copenhagen on 24–28 May to rate solutions to the world’s ten largest problems, from financial instability to communicable diseases (see above). The panel intends to use cost–benefit analyses to evaluate between three and five rival approaches to each problem. The result, says Lomborg, will rank the most cost-effective ways of doing good.

It could also be the recipe for a major row. International charities say the scheme ignores established targets, such as those developed by the United Nations. Some economists say that Lomborg is overstating the usefulness of cost–benefit analysis — a technique that has long been used by conservative economists to support arguments against everything from clean-air rules to development aid for the poor. “To believe the problems of the world can be solved like this is absurd,” says Eric Neumayer, an expert in environment and development at the London School of Economics.

The economists planning to take part in the assessment mostly reside in elite universities in Europe and the United States, and four of them are Nobel laureates. They will each assign numbers to potential solutions, of which there are around 30; the numbers will represent the size of the benefits that come with the approach, such as fewer cases of disease, minus the costs of implementing it.

Cost–benefit analyses have become more common in aid planning over the past decade, but remain controversial nevertheless. Economists have to assign values to variables in the analyses, such as human life, and the numbers they use can vary widely. Critics such as Neumayer say that for some problems, such as climate change, the variability is far too great for the results to be meaningful.

Others point out that the quantitative approach, if it were adopted by aid agencies, would inevitably push effort away from the toughest problem areas — such as war-torn southern Sudan. “There is little chance of effective use of money there,” says Roger Riddell, international director of Christian Aid, a London-based charity. “But it should not be abandoned.”

Lomborg acknowledges that some countries could lose out, but argues that we already prioritize aid funding and that this is simply a better way of doing it. “There’s never an easy answer,” he says. “But if there are places where we can do relatively little then we should consider achieving more elsewhere.”

www.copenhagenconsensus.com

NATURE Vol. 428 | 11 March 2004 | www.nature.com/nature
Climate Change and Malaria

SIR DAVID A. KING'S CLAIM THAT "CLIMATE change is the most severe problem that we are facing today—more serious even than the threat of terrorism" ("Climate change science: adapt, mitigate, or ignore?", Policy Forum, 9 Jan., p. 176) is based, in part, on UK government-sponsored impacts analyses (1, 2) that estimate that by the 2080s, because "of continued warming, millions more people around the world may in future be exposed to the risk of hunger, drought, flooding, and debilitating diseases such as malaria. Poor people in developing countries are likely to be most vulnerable" (p. 176). But the very studies underlying the latter quote, and which King cites, show that, for the most part, many more millions would be at risk in the absence of climate change (2). For instance, the population at risk of malaria (PAR-M) in the absence of climate change is projected to double between 1990 and the 2080s, to 8,820 million (2). However, unmitigated climate change would, by the 2080s, further increase PAR-M by another 257 to 323 million (2).

Thus, by the 2080s, halting further climate change would, at best, reduce total PAR-M by 3.5% [=100 x 323/(323 + 8,820)] (3). On the other hand, reducing carbon dioxide emissions with the goal of eventually stabilizing carbon dioxide at 550 ppm would reduce total PAR-M by 2.8% (2) at a cost to developed nations, according to King, of 1% of GDP in 2050 (p. 177), or about $280 billion in today's terms (4). But malaria's current annual death toll of about 1 million could be halved at an annual cost of $1.25 billion or less, according to the World Health Organization, through a combination of measures such as residual home spraying with insecticides, insecticide-treated bednets, improved case management, and more comprehensive antenatal care (5). Clearly, implementing such measures now would provide greater malaria benefits over the next few decades than would climate stabilization at any level. It would also reduce vulnerability to malaria from all causes—man-made or natural—now and in the future (3). Similarly, reducing present-day vulnerabilities to the other risk factors mentioned by King (i.e., hunger, water shortage, and flooding) could well provide larger benefits at lower costs over.

—Some info in here

Fairly low cost to reduce malaria

More benefits at lower cost.

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the next few decades than would climate change mitigation efforts that go beyond so-called "no-regret" actions, that is, actions that are worth undertaking on their own merits unrelated to any climate change–related concerns (e.g., elimination of subsidies for fossil fuel usage or land clearance) (3).

The World Bank estimates that with additional annual expenditures of $40 to $60 billion, the United Nation's Millennium Development Goals to advance sustainable development could be reached by 2015 (6, 7). Comparing these goals (e.g., at least halving poverty, hunger, illiteracy, child and maternal mortality, and the proportions of populations lacking safe water and sanitation) (6) against what can be expected from halting further climate change (2) indicates that no matter how serious climate change is compared to terrorism, it pales by comparison with the more mundane problems poor people in developing countries face today and over the next few decades. Even advancing halfway toward those goals would provide greater benefits for environmental and human well-being from now through the 2080s, and do so more economically than would heroic mitigation efforts (2, 6). Thus, it would be far more beneficial, and cost-effective, at least for the next several decades, to reduce vulnerabilities to climate change, especially if they might be exacerbated by climate change (e.g., hunger, malaria, drought, and flooding) (3). Even with a lag time of 50 years to account for the inertia of the climate and energy system, the aforementioned analyses suggest we may have at least a quarter century window (2080s minus 50 years) before deciding on the depth and extent of mitigation. Meanwhile, we should focus on improving mitigation and adaptation technologies and our knowledge of climate change science, economics, and responses. This way we can advance sustainable development and solve the problems of today while furthering our ability to solve the problems of the day after tomorrow.

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*Views expressed here are the author's and not necessarily those of any unit of the federal government.

References


Response

There is no real choice between action on climate change and action on poverty, disease, hunger, and other millennium development goals. These are part of the same sustainable development agenda. Climate change is already affecting developing countries, and it is the poorest regions of the world—such as Africa and Southeast Asia—that are most at risk. The many people who have died and the millions now homeless through the monsoon flooding in Bangladesh will bear witness to that. This kind of event can be expected to become more frequent and more extreme as global warming accelerates, exacerbated by rising sea levels.

To meet the millennium development goals, serious investment is needed in areas such as public health and infrastructure for water and energy. The British government under Prime Minister Tony Blair's leadership is strongly committed to that. The total UK official development assistance (ODA) will rise to almost £6.5 billion by 2007/08, which will mean that our ODA will have risen from 0.26% of Gross National Income (GNI) in 1997 to 0.47% in 2007/08.

At the same time, the clock is ticking as concentrations of greenhouse gases mount in the atmosphere. At well over 370 ppm, we are already at 50% above preindustrial levels, unlikely to have been seen on Earth for around 20 million years. Global action is needed now if we are to retain the chance to stabilize emissions at a level to avoid even more dangerous climate change than that to which we are already committed. The work of the Intergovernmental Panel on Climate Change, representing the overwhelming majority of world scientific opinion, including in the United States, has shown that we are now on track to seeing average global temperatures rise by 1.5° to 5.8°C this century as a result of human activities—burning of fossil fuels and deforestation. Failure to act will result in a price, both human and economic, that will be paid across the world for generations to come. Once CO₂ is released into the atmosphere, it will remain there for centuries.

That is why real climate action is needed now at a global level. As Tony Blair has announced, during our G8 Presidency, we wish to deliver real progress on both climate change and African development.

SIR DAVID A. KING
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www.sciencemag.org  SCIENCE  VOL 306  1 OCTOBER 2004
Seeking a global solution

The Copenhagen Consensus neglects the need to tackle climate change.

Jeffrey D. Sachs

To address the global challenges of poverty, climate and disease, it is essential to build effective bridges between the scientific community and policy-makers. These issues are much too complex to leave to the normal give-and-take of interest-group politics. The 2004 Copenhagen Consensus failed to build these bridges in an effective manner, I believe — but others could learn from its flawed approach.

The Copenhagen Consensus was set up by the Danish Environmental Assessment Institute, directed by Bjørn Lomborg, to identify priorities for global action regarding poverty, health, hunger and the environment. With an expert panel consisting of eight prominent economists, including three Nobel laureates, and with the backing of The Economist magazine, the project received considerable attention. The panel reviewed 32 proposals and ranked half of them as good or bad investments. The "very good" rating for HIV/AIDS and malaria policies, and the "bad" rating for three proposals to control climate change, generated the most publicity when the results were announced in May.

Unfortunately, the project's headline conclusions do not withstand close scrutiny, especially the conclusion that climate control is a "bad" global investment. More generally, the conclusions offer little sound guidance to policy-makers, much less a new consensus. On the positive side, the project did help to increase public awareness of important global issues, and has produced several useful background papers.

Wrong question

The panel that drew up the Copenhagen Consensus was asked to allocate an additional US$50 billion in spending by wealthy countries, distributed over five years, to address the world's biggest problems. This was a poor basis for decision-making and for informing the public. By choosing such a low sum — a tiny fraction of global income — the project inherently favoured specific low-cost schemes over bolder, larger projects. It is therefore no surprise that the huge and complex challenge of long-term climate change was ranked last, and that scaling up health services in poor countries was ranked lower than interventions against specific diseases, despite warnings in the background papers that such interventions require broader improvements in health services.

It is worth putting the extra $50 billion — $10 billion per year — into context. Annual income in the world is currently about $40 trillion, of which some $30 trillion is in the high-income (donor) countries. So the project looked at investing a measly 0.03% of annual donor-country income to address the planet's greatest challenges — hunger, disease, environmental degradation and instability — which are life-and-death issues for a billion or more of the world's poorest people. The United States alone spends almost $450 billion per year on the military, a rise of $150 billion in the past three years.

The Copenhagen Consensus would be more convincing if it acknowledged what the rich world has already promised. At the International Conference on Financing for Development in March 2002, both rich and poor countries adopted the Monterrey Consensus, which declared: "We urge developed countries that have not done so to make concrete efforts towards the target of 0.7% of GNP as official development assistance." This figure is currently 0.25% of donor GNP, or about $69 billion per year. The Monterrey goal would mean spending about $210 billion per year, an increase of some $140 billion per year. This is 14 times the sum suggested by the Copenhagen Consensus.

Moreover, the world has already committed to fighting disease, hunger and climate change on a bold and broad scale. The Millennium Development Goals, adopted in September 2000, call for dramatic steps to cut child mortality by two-thirds and the number of people suffering from hunger by half by the year 2015, compared with a 1990 baseline. The United Nations Framework Convention on Climate Change already commits the world to "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system".

With the funds already promised, which can easily be delivered by developed nations, the world would not have had to choose between addressing specific diseases or overall health systems, or between small-scale water projects and long-term climate change. We could do both. The Copenhagen Consensus could then have usefully turned its attention towards how to accomplish those tasks, rather than whether to follow through on commitments already made.

Wrong participants

Mobilizing expert analysis to inform policy-makers is a good idea. A remarkable example is the Intergovernmental Panel on Climate Change (IPCC), which since 1988 has brought together hundreds of leading climate scientists, economists, engineers and other specialists on the issue of anthropogenic climate change. The IPCC has helped the climate-change community to identify areas of consensus and disagreement, and to improve communication across scientific and other disciplines.

Another example is the Commission on Macroeconomics and Health (CMH) of the World Health Organization in 2000–01,
which I had the honour to chair. That effort brought together more than 100 scientists, policy-makers, economists and practitioners for a two-year study on health in low-income countries.

The Copenhagen Consensus fell far short of the IPCC and CMH as a deliberative process. It failed to mobilize an expert group that could credibly identify and communicate a true consensus of expert knowledge on the range of issues under consideration. The panel included distinguished economists but no natural scientists or public-health specialists. Nine of the ten authors of background papers were also economists, as were almost all of the 20 'opponents' (commentators) on the background papers.

With the exception of Robert Fogel, the panel is mostly known for its expertise outside the areas under discussion. A panel of economists brings an important set of tools to the table, but it cannot accurately assess the social costs and benefits of alternative interventions regarding climate, agriculture, disease, water and nutrition without the input of natural scientists, engineers and public-health practitioners.

The evidence made available to the panel was also extraordinarily narrow: the panel received a single background paper and two short opponent papers for each proposal, often with highly idiosyncratic results. The project's timeline itself was far too short for the panel to gain expertise, lasting only a few months in total; the background papers circulated for a few weeks, and in the final discussions, the panel had 5 days to review 32 proposals.

Wrong conclusions
Many of the panel's conclusions were at odds with the evidence under consideration, and no rationale was offered to the public. Climate change is a salient case. The background paper, by William Cline of the Center for Global Development in Washington, examined the benefits and costs of several strategies to mitigate climate change. Cline's central strategy — an aggressive global carbon tax — showed a long-term benefit-to-cost ratio of 2.3, according to the simulation model that he used. The opponents called for a more gradual approach, but both endorsed a framework of early action to regulate and limit carbon emissions, with increasing constraints in future decades.

Despite this agreement between the author and the opponents, the panel concluded that a global carbon tax is a "bad" investment. The brief description of the panel's judgement notes that "the experts expressed an interest in an alternative, proposed in one of the opponent papers", in which an initially low carbon tax rises gradually in later years. The panel also "urged increased funding for research into more affordable carbon-abatement technologies". But these proposals were not ranked as they were not examined in detail. Had there been time to examine these proposals further, the headline conclusion might have been that "the Copenhagen Consensus panel supports a carbon tax".

The proposals regarding health services, disease control and nutrition reveal similar problems. The panel rated interventions aimed at HIV/AIDS and malaria as "very good", but rated as only "fair" a broad scaling-up of basic health services in low-income countries. Similarly, the panel rated as "very good" and "good" two targeted interventions regarding malnutrition — micronutrient supplementation and new agricultural technologies — but ranked as only "fair" two broader and more expensive interventions directed at infant and child nutrition and low-birthweight babies. The bias towards smaller, cheaper, targeted projects is clear, but runs contrary to the experts' advice in the background papers.

The basic-health proposal came from Anne Mills of the London School of Hygiene and Tropical Medicine, who wrote the Copenhagen Consensus background paper on communicable diseases. Her paper stresses the interdependence of the proposals: "both malaria and HIV/AIDS control must include a substantial component of strengthening health services if they are to be successful." Both opponents also stressed the need to strengthen health systems generally if investments on specific diseases are to reach their potential, and discussed ways to organize such spending.

As with climate change, then, the background papers and opponents' comments do not really justify the final ranking. In 2000-2001, Mills co-chaired a task force for the CMH that found a very high benefit-to-cost ratio (roughly 6:1) for a broad-based scaling-up of health services in poor countries. Her study also found that some 8 million deaths each year could be averted within a decade or so. Here, Mills again finds a high benefit-to-cost ratio (now 3.9:1) for a designated package of health interventions for a group of poor countries.

The Copenhagen Consensus panel's low ranking of the broader health interventions seems to reflect the project's two main methodological flaws: the assumption that additional funding is limited to $50 billion over five years; and the lack of experience in health issues among panel members, which perhaps made the obstacles to a broad-based scaling-up of health and nutrition services look more daunting than they are.

Lessons for the future
The core concept of the Copenhagen Consensus is a good one: to engage expert opinion to evaluate policy options on major challenges facing the planet. This approach has been used before and should be adopted again. But the project's methodological failures should not be repeated.

First, future projects should avoid a statement of the policy problem that is likely to bias the results. Second, the expert group should have sufficient time to consider the evidence thoroughly, to consult with external experts, and to consider any proposals that seem to have consensus support. Third, the expert group should cover all relevant disciplines, including several members with long-standing professional experience in each area under examination. Fourth, initial assessments by the expert group should be widely circulated for comments, corrections and feedback before a public report is issued. In this way a true 'consensus' may be reached, and the public won't be left wondering which set of experts to trust.

Jeffrey D. Sachs is director of the Earth Institute at Columbia University, 535 West 116th Street, New York, New York 10027, USA.
Stories About Climate Warming

- In National Geographic (Sep 2004)
- Rapid Warming in the Arctic (Nov 2004)
  - A new report
  - Many news stories
- And many other stories

9 pages here

Ray Jensen
Jan 2005
From the Editor

After a decade as Editor in Chief, I have a pretty good idea which articles will provoke a lot of angry letters. Whenever we publish stories that challenge widely held beliefs, some readers get mad, and they write to let us know.

Well, we’re about to do it again. We’re devoting 74 pages of this issue to a three-part series of stories on global climate change, and I’d be willing to bet that we’ll get letters from readers who don’t believe global climate change is real, and that humans contribute to the problem. Some readers will even terminate their memberships.

Why would I publish articles that make people angry enough to stop subscribing? That’s easy. These three stories cover subjects that are too important to ignore. From Antarctica (above) to Alaska to Bangladesh, a global warming trend is altering habitats, with devastating ecological and economic effects.

So I’m asking you—even those of you who don’t believe the Earth is getting warmer and that human behavior is a contributing factor—to turn to page 2. This isn’t science fiction or a Hollywood movie. We’re not going to show you waves swamping the Statue of Liberty. But we are going to take you all over the world to show you the hard truth as scientists see it. I can live with some canceled memberships. I’d have a harder time looking at myself in the mirror if I didn’t bring you the biggest story in geography today.

Bill Allen
National Geographic melting down?  

Patrick Michaels
GEORGE BUSH HAS A POWERFUL ENERGY PROGRAM

Writer John Carey's description and endorsement of candidate John Kerry's energy plan—and his one-sentence dismissal of President George W. Bush's programs—will sound persuasive to people who don't study the subject ("Kerry's high-wattage energy plan," News: Analysis & Commentary, Aug. 9). But even a modest inquiry reveals that it is the President who has been offering a strong, coherent energy plan.

Among Bush's achievements are: Our hydrogen fuel initiative to power vehicles with domestically produced hydrogen instead of relying on foreign oil; our $1 billion FutureGen program to build an entirely clean-operating coal power plant; our creation of three international partnerships to address global warming with enhanced science and technology; and our regular submissions of energy-efficiency and renewable-energy budgets to Congress.

Meanwhile, [Carey] pushes over such Kerry proposals as his support for ethanol, without mentioning that this is a longstanding Bush position. Senators Kerry and John Edwards, by being absent from the Senate when the energy bill failed by two votes, kept enhanced use of ethanol from becoming law, prevented enlargement of alternative fuel, clean coal, and new energy technologies programs from moving ahead, and killed the extension for wind and other renewable energy tax credits and the energy tax incentives earlier this year. [Kerry] has defended the Kyoto Treaty and a carbon cap that the independent Energy Information Administration said would likely devastate the coal sector, cutting coal use between 18% and 77% and boosting U.S. energy prices between 17% and 83%. It was disappointing to see a piece so one-sided and unobservant of the facts.

—Spencer Abraham
Secretary of Energy
Washington

The Business Week story was publ on Aug 9, 2004
This letter was in:
Business Week
Sep 6, 2004 Page 20

The US Secretary of Energy argues back

Roy
donna

115
Consensus is growing among scientists, governments, and business that they must act fast to combat climate change. This has already sparked efforts to limit CO₂ emissions. Many companies are now preparing for a carbon-constrained world. **By John Carey**

**The Idea That the Human Species Could Alter Something**
as huge and complex as the earth's climate was once the subject of
an esoteric scientific debate. But now even attorneys general
more used to battling corporate malfeasance are taking up the
cause. On July 21, New York Attorney General Eliot Spitzer and
lawyers from seven other states sued the nation’s largest utility
companies, demanding that they reduce emissions of the gases
thought to be warming the earth. Warns Spitzer: “Global warming
threatens our health, our economy, our natural resources,
and our children’s future. It is clear we must act.”

The maneuvers of eight mostly Democratic AGs could be seen
as a political attack. But their suit is only one tiny trumpet note in a
growing bipartisan call to arms. “The facts are there,” says Sena-
tor John McCain (R-Ariz.). “We have to educate our fellow citi-
zens about climate change and the danger it poses to the world.”
In January, the European Union will impose mandatory caps on
carbon dioxide and other gases that act like a greenhouse over
the earth, and will begin a market-based system for buying and
selling the right to emit carbon. By the end of the year, Russia may
ratify the Kyoto Protocol, which makes CO₂ reductions manda-
tory among the 124 countries that have already accepted the ac-
cord. Some countries are leaping even further ahead. Britain has
vowed to slash emissions by 60% by 2050. Climate change is a
greater threat to the world than terrorism, argues Sir David King,
chief science adviser to Prime Minister Tony Blair: “Delaying ac-
tion for a decade, or even just years, is not a serious option.”

There are naysayers. The Bush Administration flatly rejects
Kyoto and mandatory curbs, arguing that such steps willcrip-
ple the economy. Better to develop new low-carbon technolo-
gies to solve problems if and when they appear, says Energy
Secretary Spencer Abraham. And a small group of scientists still
argue there is no danger. “We know how much the planet is
going to warm,” says the Cato Institute’s Patrick J. Michaels. “It
is a small amount, and we can’t do anything about it.”

But the growing consensus among scientists and govern-
ments is that we can—and must—do something. Researchers
under the auspices of the National Academy of Sciences and the
Intergovernmental Panel on Climate Change (IPCC) have pon-
dered the evidence and concluded that the earth is warming,
that humans are probably the cause, and that the threat is real
enough to warrant an immediate response. “There is no dispute
that the temperature will rise. It will,” says Donald Kennedy,
editor-in-chief of *Science*. “The disagreement is how much.” In-
deed, “there is a real potential for sudden and perhaps cata-

Snowmelt
Rapid runoff from
the Greenland Ice
Sheet in summer
Rapid Warming In The Arctic
Changes are already large and likely to become extreme within decades

BETTE HILEMAN

The first thorough assessment of the impact climate change is having on the Arctic concludes that the region is warming rapidly and that environmental effects are already starkly visible.

"Over the past 30 years, the average annual temperature in the Arctic has risen more rapidly than anywhere on Earth," Robert W. Corell, who chaired the study, told a symposium in Washington, D.C., last month. In some regions, "temperatures rose five to 10 times the global average," he explained. Corell is a senior fellow at the American Meteorological Society.

The report, commissioned by eight nations with Arctic territory, including the U.S., was prepared over four years by about 300 scientists and representatives of Arctic indigenous people. The full report will be officially released on Nov. 9 at a conference in Reykjavik, Iceland, where researchers will discuss the findings.

During the 21st century, the study says, warming in the Arctic is expected to be even more severe unless greenhouse gas emissions are cut dramatically. The extent of Arctic summer sea ice, which has already declined 15 to 20%, could dwindle to zero by 2040, according to one model.

The retreat of sea ice, the study notes, is already harming polar bears and seals, which depend on sea ice near land in the breeding season. The changes are also depleting the food supply of the indigenous people who rely on these animals.

The warming trend in the Arctic will have global impacts, the report notes. The most damaging effect will be sea-level rise, as melting of the 2-mile-thick Greenland Ice Sheet accelerates. "Recent research suggests a sea-level rise of up to 1 to 2 meters during this century," unless large cuts are made in CO₂ emissions, Corell said.

Chemical & Engineering News
ISSN 0009-2347
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* There were many news stories about this

* But Greenland has not been warming up.
Ice is melting in the Arctic; lots of news (A change in the wind explains a lot of this)

Scary Arctic Ice Loss? Blame the Wind

The past three Septembers have seen the Arctic ice pack shrink dramatically to a record low amid signs that greenhouse warming could be melting the ice, threatening to clear the Arctic Ocean within decades. Researchers are still worried, but a study presented at the meeting offers some reassurance. A natural, temporary shift in the wind may have been largely to blame for the recent shrinkage.

Winds of the high northern latitudes are the domain of the Arctic Oscillation (AO), an erratic atmospheric pressure seesaw (Science, 9 April 1999, p. 241). Over weeks, years, or even decades, pressure can fall over the pole while rising around a circle near the latitude of Alaska. The resulting steeper pressure drop across high latitudes increases the generally westerly winds blowing there. When the pressure seesaws the other way, the winds drop to weaker than average.

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POLICY FORUM
CLIMATE

The Bush Administration's Approach to Climate Change
Spencer Abraham

As a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), the United States shares with many countries its ultimate objective: stabilization of greenhouse gas concentrations in the atmosphere at a level that prevents dangerous interference with the climate system. Meeting this UNFCCC objective will require a long-term commitment and international collaboration.

President Bush's policy on climate change harnesses the power of markets and technological innovation, maintains economic growth, and encourages global participation. Although climate change is a complex and long-term challenge, the Bush administration recognizes that there are cost-effective steps we can take now.

Near-Term Policies and Measures

In 2002, President Bush set a national goal to reduce the greenhouse gas intensity (1) of the U.S. economy by 18% by 2012. This goal sets America on a path to slow the growth in greenhouse gas emissions and—as the science justifies and the technology allows—to stop and reverse that growth needed to meet the UNFCCC goal (2). Our approach focuses on reducing emissions while sustaining the economic growth needed to finance investment in new, clean energy technologies. The administration estimates that this commitment will achieve about 100 million metric tons of carbon equivalent (MMTce) of reduced emissions in 2012, with more than 500 MMTce in cumulative savings over the decade (3).

To this end, the administration has developed an array of policy measures, including financial incentives and voluntary programs. For example, our Climate VISION (4), Climate Leaders (5), and SmartWay Transport Partnership (6) programs work with industry for voluntary reduction of emissions. The Department of Agriculture is using its conservation programs to provide an incentive for actions that increase carbon sequestration (7). We also are pursuing many energy supply technologies with comparatively low or zero CO2 emissions profiles, such as solar, wind, geothermal, bioenergy, and combined heat and power. The president has proposed more than $4 billion in tax credits as incentives for these and other energy-efficient technologies over the next 5 years (3). Last year, the Bush administration increased fuel economy standards for new light trucks and sport utility vehicles by 1.5 miles per gallon over the next three model years, leading to the estimated avoidance of 9.4 MMTce of emissions (8).

While acting to slow the pace of greenhouse gas emissions in the near term, the United States is laying a strong scientific and technological foundation to reduce uncertainties, to clarify risks and benefits, and to develop realistic mitigation options to meet the UNFCCC objective.

Advancing Climate Change Science

In 2001, President Bush commissioned the National Research Council (NRC) to examine the state of our knowledge and understanding of climate change science. The NRC's report (9) makes clear that there are still important gaps in our ability to measure the impacts of greenhouse gases on the climate system. Major advances in understanding and modeling of the factors that influence atmospheric concentrations of greenhouse gases and aerosols, as well as the feedbacks that govern climate sensitivity, are needed to predict future climate change with greater confidence.

Last summer, the Climate Change Science Program (CCSP) released a new strategic plan that addresses these gaps (10). The plan is organized around five goals: (i) improving our knowledge of climate history and variability; (ii) improving our ability to quantify factors that affect climate; (iii) reducing uncertainty in climate projections; (iv) improving our understanding of the sensitivity and adaptability of ecosystems and human systems to climate change; and (v) exploring options to manage risks. Annually, almost $2 billion is spent on climate change science by the federal government.

A review of the CCSP plan by NRC shows the administration is on the right track. While concern was expressed about future funding to execute the plan, the NRC concluded that it "articulates a guiding vision, is appropriately ambitious, and is broad in scope" (11).

NRC's report also identified the real need for a broad global observation system to support measurements of climate variables. Last June, the United States hosted more than 30 nations at the inaugural Earth Observation Summit, out of which came a commitment to establish an intergovernmental, comprehensive, coordinated, and sustained Earth observation system. The data collected by the system will be used to create better climate models, to improve our knowledge of the behavior of CO2 and aerosols in the atmosphere, and to develop strategies for carbon sequestration.

Accelerating Climate Change Technology Development

The Bush administration also is moving ahead on advanced technology options that have the potential to substantially reduce, avoid, or sequester future greenhouse gas emissions. About 80% of current greenhouse gas emissions are energy related, and, although projections vary consider- ably, a tripling of energy demand by 2100 is not unimaginable (12). Therefore, to provide the energy necessary for continued economic growth while we reduce greenhouse gas emissions, we may have to develop and deploy cost-effective technologies that alter the way we produce and use energy.

By 2100, more than half of the world's energy may have to come from low-or zero-emission technologies to attain the UNFCCC goal (13). The pace and scope of needed change will be driven partially by future trends in greenhouse gas emissions that, like climate sensitivity, are uncertain. The complex relations among population growth; economic development; energy demand, mix, and intensity; resource availability; technology; and other variables make it impossible to accurately predict future greenhouse gas emissions on a 100-year time scale.

The Climate Change Technology Program (CCTP) was created to coordinate and prioritize the federal government's nearly $3 billion annual investment in climate-related technology research, development, demonstration, and deployment (RDD&D). Using various analytical tools, CCTP is assessing different technology options and their potential contributions to...
reducing greenhouse gas emissions. Given the tremendous capital investment in existing energy systems, the desired transformation of our global energy system may take decades or more to implement fully. A robust RDD&D effort can make advanced technologies available sooner rather than later and can accelerate modernization of capital stock at lower cost and with greater flexibility.

CCTP’s strategic vision has six complementary goals: (i) reducing emissions from energy use and infrastructure; (ii) reducing emissions from energy supply; (iii) capturing and sequestering CO₂; (iv) reducing emissions of other greenhouse gases; (v) measuring and monitoring emissions; and (vi) bolstering the contributions of basic science (14).

Ten federal agencies support a portfolio of activities within this framework. Annually, more than $700 million is being spent to advance energy efficiency technologies (plus $500 million for accelerated deployment), and more than $200 million supports renewable energy. Many activities build on existing work, but the Bush administration also has expanded and realigned some activities and launched new initiatives in key technology areas to support the CCTP’s goals.

In his 2003 State of the Union address, President Bush made a commitment to the development of a hydrogen economy, pledging $1.7 billion over 5 years for his Hydrogen Fuel Initiative and FreedomCAR Partnership to develop hydrogen fuel cell–powered vehicles. The transition to hydrogen as a major energy carrier over the next few decades could transform the nation’s energy system and create opportunities to increase energy security by making better use of diverse domestic energy sources for hydrogen production and to reduce emissions of air pollutants and CO₂ (15). Where hydrogen is produced from fossil fuels, we must also address carbon capture and sequestration.

To help coordinate and leverage ongoing work overseas, the United States led the effort to form the International Partnership for the Hydrogen Economy (IPHE). IPHE will address the technological, financial, and institutional barriers to hydrogen and will develop internationally recognized standards to speed market penetration of the new technologies.

The administration also is pursuing next-generation nuclear energy as a zero-emissions energy supply choice. The Generation IV International Forum, with nine other nations as partners, is working on reactor designs that are safe, economical, secure, and able to produce new products, such as hydrogen. Six promising technologies have been selected as candidates for future designs and could be ready as early as 2015. In 2003, President Bush announced that the United States would join the ITER project to develop fusion as an energy source. Although the technical hurdles are substantial, the promise of fusion is simply too great to ignore.

Carbon capture and sequestration is a central element of CCTP’s strategy because for the foreseeable future, fossil fuels will continue to be the world’s most reliable and lowest-cost form of energy. It is unrealistic to expect countries—particularly developing countries—with large fossil reserves to forgo their use. A realistic approach is to find ways to capture and store the CO₂ produced when these fuels are used.

The Department of Energy is currently working on 65 carbon sequestration projects around the country. In the last 2 years, we have increased the budget for these activities 23% to $49 million. The multilateral Carbon Sequestration Leadership Forum, a presidential initiative inaugurated in June 2003 with 16 partners, will set a framework for international collaboration on sequestration technologies.

The forum’s partners are eligible to participate in FutureGen, a 10-year, $1 billion government-industry effort to design, build, and operate the world’s first emissions-free coal-fired power plant. This project, which cuts across many CCTP strategic goals, will employ the latest technologies to generate electricity, produce hydrogen, and sequester CO₂ from coal. Through this research, clean coal can remain part of a diverse, secure energy portfolio well into the future.

These initiatives and other technologies in the CCTP portfolio (16) could revolutionize energy systems and put us on a path to ensuring access to clean, affordable energy supplies while dramatically reducing greenhouse gas emissions. The figure, left, offers a glimpse of the range of emissions reductions new technologies might make possible in energy end use, energy supply, carbon sequestration, and other greenhouse gases on a 100-year scale and across a range of uncertainties.

The Bush administration has developed a comprehensive strategy on climate change that is informed by science, emphasizes innovation and technological solutions, and promotes international collaboration to support the UNFCCC objective. Although the scientific and technology challenges are considerable, the president remains committed to leading the way on climate change at home and around the world.

References and Notes
1. Measured as the ratio of greenhouse gases (carbon equivalent) emitted per real gross domestic product.
5. See www.epa.gov/climateleaders.
10. CCSP, Strategic Plan for the U.S. Climate Change Science Program (CCSP, Washington, DC, July 2003); available at www.climatescience.gov.
Index to Documents with Kyoto Climate News

((This is Doc RJ0306, 16 pages, Oct 2003))

  • Now a total of about 15 documents.

• This has some history and politics about Kyoto.

Documents with News about Kyoto

(from Doc RJ0306, the index to Kyoto)

Roy Jenne
Oct 17, 2003


I have gradually saved some of the news articles about Kyoto as I saw them. Recently I grouped these into more logical sequences. The motive is to present a better feel for the nature of the public debate, and to give input for writers and historians. Cecilia turned the following 8 documents in for scan on Oct 15, 2003:

a. News of Kyoto, the Year 2000, doc RJ0298, 21 p
d. Bush to Europe, Jun 2001, doc RJ0301, 14 p
e. Global Warming; What Kids are Taught; Jul 2001, doc RJ0302, 5 p
g. Kyoto, Aug – Nov 2001, doc RJ0304, 19 p
h. Some Kyoto News, mid-2003, Doc RJ0305, 29 p

\[ \{ \text{8 documents with} \quad \text{197 pages} \] \]

NOTE 1: The above 8 documents have 197 pages.
NOTE 2: There are also a few other documents with Kyoto information like these.

2. There Are At Least 6 More Kyoto Documents

a. They are also listed here.
b. So now there are at least 14 documents that have information about Kyoto climate issues.
c. Plus this index.

3. Information about Energy

The world does not have big energy problems now. But these could easily happen.
a. We have several papers about energy issues.
b. The guide to many documents is RJ0297.
c. How to find the papers: http://www.dss.ucar.edu/docs/papers-scanned/papers.html
Difficulty in reconciling global warming data (Nature, 18 Jan 2001, p 281)

IPCC Assessment up the ante on climate change (Nature, 25 Jan 2001, p 445)

Greenhouse effect confirmed (Mar 2001)

Quieting the Kyoto crowd (Investor's Business Daily, Apr 4, 2001)  

EU officials decry US climate policy (Colorado Daily, Mar 20, 2001)

EU pledges to keep Kyoto Protocol alive

Rage over global warming (Economist, Apr 7, 2001)
- But the Kyoto deal cannot be achieved, even if you try.

Is there a vent in the global greenhouse? (re Lindzen, Mar 10, 2001)

Bush calls in tutors (New York Times, Apr 28, 2001)

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Roy Jenne
Oct 7, 2003
World Use of Natural Gas, 1970 – 2080

Use of Gas in World (from Table 1, Dec 2004)

<table>
<thead>
<tr>
<th>Years</th>
<th>tcm</th>
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<tbody>
<tr>
<td>1970 – 1999</td>
<td>30</td>
</tr>
<tr>
<td>2000 – 2029</td>
<td>30</td>
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<tr>
<td>2030 – 2060</td>
<td>31</td>
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<tr>
<td>2061 – 2070</td>
<td>10</td>
</tr>
<tr>
<td>2071 – 2080</td>
<td>10</td>
</tr>
</tbody>
</table>

\[ 466 \text{ tcm of gas} \]

Estimate of remaining world gas in year 2000

\[ \sim 262 \text{ tcm (a 1992 est.)} \]
\[ \sim 386 \text{ tcm (USGS est., 2000)} \]
\[ \sim 500 \text{ tcm (Intl Gas Center est. in \sim 2000)} \]

Table 1 shows the world observed use of gas for 1970 – 2000 and estimates to 2020, from US DOE document *IEO 2004*. The gas use is given in tcf (trillion cubic feet) and I converted this to bcm (billion cubic meters) in column 2. I added estimates of gas use for 2030 – 2080. The use of 4790 bcm in 2030 is lower than the projection from *WEO 2002*. When gas prices increased, the use went down. High prices for gas mean that less gas is used to make electricity and more coal and nuclear will be used for this purpose.

The production rate of world oil may peak about 2035. This will put more pressure on natural gas. So the rates of increase in gas use are increased in Table 1.

**Table 1.** World Use of Natural Gas, 1970 – 2080

<table>
<thead>
<tr>
<th>Year</th>
<th>IEO 2004 tcf</th>
<th>Gas Use bcm</th>
<th>10-yr diff</th>
<th>WEO 2002 bcm</th>
<th>WEO 2002 Gas MTOE</th>
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<tr>
<td>1970</td>
<td>36</td>
<td>1019</td>
<td></td>
<td></td>
<td>895 (1971)</td>
</tr>
<tr>
<td>1980</td>
<td>53</td>
<td>1500</td>
<td>481</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>73.4</td>
<td>2078</td>
<td>578</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>88.7</td>
<td>2512</td>
<td>434</td>
<td>2527</td>
<td>2085</td>
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<tr>
<td>2010</td>
<td>105.1</td>
<td>2976</td>
<td>464</td>
<td>3377</td>
<td>2794</td>
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<tr>
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<td>3800</td>
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<td>2080</td>
<td>7230</td>
<td>-1100</td>
<td></td>
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</tr>
</tbody>
</table>

*NOTE:* 1 m³ = 35.31 ft³  
MTOE = million tonnes of oil equivalent
The Problem of Energy Talk in 2003
(This really worries me)

1. People assume that the one big problem is global warming.
   □ So there are huge politics to limit use of fossil fuels.

2. But the problem of adequate energy could be a bigger problem in 35 years.
   □ The world needs both adequate energy and a good price.
   □ The energy has to be in the right form. We cannot fly airplanes with electricity.

3. Many preach that it would be easy and affordable to convert to the use of wind and solar and stop fossil fuel use.
   □ These have a role, but there are limits and cost issues.

4. Many tell poor countries that they can “do it all” with solar.
   □ But they will need adequate low cost energy for development.
   □ Good energy analyses are needed, not sales pitches.

5. The talk about global warming is partly factual.
   □ But the hype factor is so large that it is difficult to have good energy policies.

6. Some say that energy problems can be solved with more efficiency.
   □ Efficiency has an important role, but it cannot solve energy problems by itself.

7. We will need several decades to move the world toward a good energy position.
   □ There should be a mix of energy sources.
   □ The reliability and cost of the energy has to be demonstrated.
   □ The energy policy must be grounded in facts, technical possibilities, and good analyses.

Roy Jenne
NCAR
May 10, 2003
What Policy Response to Global Warming is Good?

1. A bunch of climate people and others want the US to take drastic climate action now.
   □ They pushed at the Clinton administration; they are pushing at Bush.

2. But I notice that we have several problems.
   □ There is too much hype in the climate debate.
   □ Too many climate statements sound more like political demands than good scientific assessments.
   □ There are other problems that have to be sensibly handled along with climate issues and other environment issues.
     ▪ We must have an adequate energy supply, now and in the future.
     ▪ The energy must be affordable.
     ▪ We need material supplies, and we need to be gentle on the environment (reasonable strategy, and balance).
     ▪ We need economic growth and adequate jobs.
     ▪ The world has 1.64 billion people with no access to electricity, and 2.39 billion people where energy for cooking and heating comes only from conventional biomass. We need to help them get convenient energy that is affordable.

Many people have no access to electricity or “easy” energy.

3. The next page is a book review from EOS. One part of the review:

Pollack is not immune to such overarguing. Participants in the climate change debate rarely focus on the full extent of both climate and socioeconomic uncertainties. Pollack rightly acknowledges the importance of future economic growth and technological innovation in shaping the climate problem, but he neglects these uncertainties when he describes potential policy responses. Fortunately, creative proposals have begun to emerge for managing the full range of economic, technological, and climatic uncertainties, mixing institution building, market-based emissions controls, technology development programs, and adaptation. The value of these proposals will be recognized best by a public that is attuned to the uncertainties surrounding the climate change problem.

Roy Jenne
Aug 27, 2003
Some Big Issues Have Lots of Politics
(And balanced solutions can be hard to achieve)

1. Realize that there are trade-offs.
   ☑ If energy prices increase, it hurts production, transportation, and consumers.
   ☑ With high energy costs, then less economic growth, and that keeps more people poor.
   ☑ If water cut off for irrigation, it hurts food supply.

2. The solar and wind people; they say:
   ☑ We are ready to do all the energy now.
   ☑ Just turn us loose (and give big subsidies).
   ☑ But the energy is not steady, not cheap, not soon.
   ☑ But some very nice applications are real (I read their popular literature).

3. How to build pressure for Kyoto
   ☑ Exaggerate the possible bad effects of warming.
     • And do not talk about the good effects.
   ☑ Say that bad results can come very fast.
   ☑ Start big lawsuits against energy supply companies.
   ☑ Say to Bush 2: You are a rotten apple because you did not say yes to Kyoto.
     (NOTE: The actual policies of Bush 2 and Clinton have been fairly similar on global warming.)

4. Sometimes I get puzzled about strange events.
   ☑ And people remind me: Watch the money flow.

Roy Jenne
July 28, 2003
Some Things To Do About Energy Now

- World economic growth, more travel, more people
  - Gives big pressure for more energy use.

- The growth in energy use is scary.
  - Prepare to cope with it.

- Policy for adequate energy supplies at affordable costs.
  - This is not easy.

- A slow switch away from gas and oil will start in 35 to 50 years.
  - But we will still need liquid fuels.

- Achieve increasing substitute fuels for oil and gas.
  - Especially after 2040.

- Need strategy to take some pressure off of fossil fuel use now.
  - Then the golden energy age can last longer.

- Keep the option open for nuclear to be a bigger source of energy.

Roy Jenne
July 27, 2003
What US Strategy About Kyoto Works Best?

If we sign up for Kyoto; some ideas and results:
- The present understanding of energy issues and answers is still poor.
- We now take good energy supply for granted (no problem).
- We forget about the need for a few big reliable energy sources.
- The energy cure is thought by many to be mainly wind and solar ("We are ready now.")
- We would spend a ton of money.
- Results:
  - Not much that helps energy supply.
    - Perhaps hurt the energy supply.
  - And there is not much that helps climate.
- And not much work on options that can work better.

Sign up for Kyoto carbon limits; can promises be achieved?
- Europe has best chance (but it won't).
- Canada signed Kyoto in Dec 2002.
  - Almost no way they would meet promise.
- US did not sign Kyoto.
  - Almost no way to meet Kyoto.
- But signing creates politics and possible legal action.

Roy Jenne
July 27, 2003
A global surge ---
In Coal use

- We should not use oil to make electricity.
  - This rule is mostly followed since the 1970s.
  - We need the oil for other uses.

- The world has recently used lots of gas for electricity.
  - But it got lots more costly.
  - The gas reserves in N. America are small.
  - Gas is really too precious for electricity.

- So more coal is being used (Chep-7Nov, 2004).

- And the nuclear option is talked about more.
  - Cheeks for this. We will need it.

- The amount of added water power that can be used is limited.

(see the next 5 pages)

Page 130

Ray Janse
Jan 2005
Global Surge in Use of Coal Alters Energy Equation

Shift Offers a Way to Slow Rise in Demand for Oil; Worries on Global Warming

A world-wide surge in the mining and use of coal is helping offset some of the economic strains of rising oil demand and marks an important shift in energy consumption with long-term consequences for the global energy equation and the environment.

The trend is especially notable in the two countries that are the biggest new sources of global energy demand: China and India. These nations have enormous coal reserves but not nearly enough oil and gas.

By some measures, world-wide coal consumption has been rising faster than the use of any other source of energy, including crude oil, natural gas, hydroelectricity and nuclear power. Last year, world coal consumption rose 6.9%, compared with 2.1% for oil, according to BP PLC, the global energy company.

This year, coal production in the U.S. is expected to climb to a record of over 1.2 billion tons, an increase of more than 3.7% from 2003. About 90% of the coal mined in the U.S. is used to produce electricity, and coal produces about half the U.S.’s electricity needs. In China, coal production is expected to grow about 200 million tons, or 11.8%, this year to 1.9 billion tons.

Coal is primarily used around the world to generate electricity and for steel production. But electricity plants can also run on other fuels, including natural gas or petroleum-based fuels. Indeed, most developed countries have tried to move away from using coal, but those efforts are in many ways offset as developing countries like China continue to choose coal for their newest facilities.

Coal use has surged for several reasons. It’s easily transported on barges or trains. In many cases, power plants are located close to the mines, reducing the plants’ cost of operation. And, the world still has huge untapped coal reserves that can be developed at a low cost, unlike oil.

Although strong demand has caused coal prices to shoot up more than 80% in the past year, to more than $50 a ton, it’s still an economical power generator. It costs $3 to generate a million British thermal units, or BTUs, of power from coal, compared with more than $7 for natural gas and just over $8 for oil, according to the U.S. Energy Information Administration.

In basic power generation, the heat produced by burning coal drives equipment that creates electricity.

With the high demand and heftier price, coal-mining companies are ramping up production, even as many oil giants hold back on new drilling. Peabody Energy Corp., based in St. Louis, the largest U.S. coal producer, plans to double its annual production to 400 million tons by 2010. China’s largest coal miner, Shenhua Group, is planning to double its production to 200 million tons in the period.

Production also is shooting up in Colombia, Australia and Indonesia.

The activity is increasing the odds that coal will play a bigger role in the world’s energy mix in the next decade than many analysts expected.

“We lived in a period of plentiful energy, and now we’re entering a period of tighter supplies.... Coal will fill some of that gap,” says Gerard McCloskey, a coal-industry consultant and editor of a trade newsletter in London.

To be sure, coal never went away. It Please Turn to Page A17, Column 1
Scarcity of Natural Gas Leads to Coal Plant Boom

Sempra, in San Diego, has adopted a two-pronged approach to dealing with high natural gas prices. It has pursued ambitious projects to bring natural gas from Indonesia and other nations to Baja California, Mexico, and Lake Charles, La., placing the company at the forefront of efforts to expand imports of natural gas.

The other Sempra prong is coal, which has attracted less attention. In the last year, Sempra, together with an investment fund connected to the Carlyle Group, spent more than $400 million to acquire a large amount of coal-fired energy generating capacity in South Texas.

Mr. Swartz, the Sempra executive in charge of the project, said county commission officials appear to favor it now that they have been reassured that coal-burning methods today are far cleaner than those at plants built a generation ago. Construction could begin as early as next year if Sempra wins county approval, he said.

But it will not be without a fight. Environmentalists, working with some local residents, have begun marshaling opposition.

"No matter how clean the technology for coal-fired plants, they still contribute to pollution by dumping tons of material in the air basins and beyond," Susan Lynn, executive director of Public Resource Associates, a nonprofit organization that works on land policy issues, wrote in a recent letter to Nevada’s public utilities commission.

Ms. Lynn also said that Sempra’s project would block opportunities for renewable energy companies in the area. Sempra, however, insists that its project would allow wind and

A Comeback for Coal

With the country’s demand for power growing steadily, companies are proposing to build more than 100 coal-fired electricity plants in 30 states.

Electricity figures for 2002 in megawatts. Figures are estimates of all plants’ operating capacity, which is usually a little higher than actual output.

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*One plant in Ohio and two in Pennsylvania do not have estimates on their sizes.

Sources: Moulvaine Company; Energy information Administration

The New York Times
AEP Plans Biggest Power Plant Using Clean-Coal Technology

Utility Sees Construction Of 1,000 Megawatt Project Within Five to Six Years

Aug 31 2004 BY JEFFREY BALL AND REBECCA SMITH

Responding to environmental pressure, American Electric Power Co. said it intends to build the largest power plant so far that uses advanced technology to convert coal into a cleaner-burning gas.

The new approach would cough out fewer air pollutants, such as soot particles, than do conventional coal-fired power plants. It also would produce less mercury, which contaminates water, and less carbon dioxide, believed to be the main global-warming gas. And it would use less water.

Executives say they want to build an approximately 1,000-megawatt synthetic-gas-fired plant in the next five to six years utilizing this "integrated gasification combined cycle," or IGCC, technology. The company estimates the new plant would cost about $1.6 billion, as much as 20% more per kilowatt of capacity than a modern conventional coal-burning plant. Still, AEP says the new plant could save money over the long term.

AEP, the nation's biggest utility by generating capacity, doesn't have a site selected nor has it submitted requests for permits. To attract the needed capital, AEP must convince Wall Street financiers and utility regulators the technology is commercially mature, reliable and cost-effective.

But the announcement indicates where coal-dependent AEP—the biggest carbon-dioxide emitter in the utility industry—will place its bet on the future of clean-coal technology. Its announcement comes in a report the company expects to release today in response to shareholder activists who have been winning increasing support at AEP and other major industrial companies for resolutions demanding that the companies to do more to address environmental issues, particularly global warming.

Although the Bush administration so far has declined to cap carbon dioxide emissions, other nations and even some U.S. states are doing so, and AEP says it expects the federal government will follow suit eventually. That could make AEP a major purchaser in what's now a fledgling market for global-warming-emissions credits. The cost of those credits, essentially permits to release a ton of carbon dioxide, probably would rise if the federal government does cap global-warming emissions. AEP's proposed plant would make it easier to catch car-

Supply of Houses Is Finally Rising In Parts of U.S.

BY JAMES R. HAGERTY

The number of houses on the market is finally rising in some parts of the U.S. where shortages have led to soaring prices.

The new supply should help soften price increases, and some economists say it may eventually bring prices down in some places where they have risen at double-digit rates in the past few years.

"There's going to be a day of reckoning," said Edward P. Leamer, an economist at the University of California, Los Angeles. "The question is how that reckoning is going to occur."

Any reckoning probably will be gradual. Unlike stocks, the general level of home prices couldn't plunge 20% or 30% in a few days. Many homeowners would refuse to sell if they couldn't get something near their target price, so it could take years for the market to adjust to a new supply-demand reality. Because local conditions vary, prices may continue to rise in some cities while falling in others.

Rising supplies are particularly notable in California, where the median home price has shot up 21% in the past year to $463,540. The California Association of Realtors says the inventory of previously occupied single-family homes in Orange County was enough to last 7.5 months at the current sales rate in July, up from 1.4 months in April. For the whole state, the supply stood at 3.3 months in July—the first time since February 2003 that the inventory has topped three months.

Inventories also have risen in some other parts of the country. A survey by Jeffrey G. Otteau, who runs an appraisal firm in East Brunswick, N.J., showed that the inventory of homes in the 18 New Jersey counties he covers was up 14% in July from a year earlier. Inventories are up about 10% from a year earlier in Boston but have fallen more than 50% in Manhattan. In Las Vegas, where the median home price has soared about 50% in the past year, developers are responding with more plans for high-rise housing.
Coal-fired electricity

The future is clean

Coal is costly, but coming back into favour—and cleaner

More of the world's electric power comes from coal than from oil and gas together: a third of Britain's, half of Germany's or America's, three-quarters of India's or China's. And the fuel has one huge advantage: it does not come from the Middle East. But, thanks not least to China's rapid economic growth, the price of coal has doubled since January. No wonder the governments of coal-rich countries are content, the firms that dig it up are rubbing their hands, while the users are looking hard for more efficient ways of burning the stuff.

On the supply side, prospects have been transformed. Analysts foresee America's biggest coal-miner, Peabody Energy, trebling its profits between the first quarter of this year and the last. Europe's biggest miner, Poland's state-backed Kompania Weglowa, with 79,000 employees, was losing nearly $30m a month early last year; it is now making a monthly profit of $30m. Giant shippers such as Australia-based BHP Billiton and Xstrata, exporting from Australia and South Africa, have reported surging profits. China's big state-owned Shenhua group may sell some of its equity. Even in Britain, which once mined 280m tonnes of coal a year and now digs one-tenth of that, the main operator, UK Coal, can imagine a future for what until recently seemed to be a dying industry.

Users agree. American power companies are returning to coal. But everywhere there is one huge problem: the environment. Even the much-denounced Chinese, in fact know that they must clean up power generation, and have begun to do so. The rules in western countries are tight. Getting permission for a coal-fired plant can take years. In 2000, only two such were planned in all of America. Today, there are dreams for nearly 100—but only a half-dozen are actually being built.

Yet coal need not be a filthy fuel. Apart from “scrubbing” emissions, modern combustion techniques can clean them before they start—and use less coal too. A century ago, power plants produced maybe 5% of what their coal could, in theory, deliver; today, about 35%. Pulverising the coal can make this 40-45% (unless it is moist, “subbituminous” coal, and Japanese scientists are working on that). With a high-temperature burn, over 50% may be possible. Less coal burned, fewer nasty emissions; an American version of this, given the go-ahead in 2000 but not yet built, would have cut some of them too. “Fluidised-bed” combustion—coal is burned on a bed of particles suspended in flowing air—also can exceed 40%, and prevent or capture most of the emissions as well. Developed since the 1960s, it is widely used.

Bolder techniques lie ahead. Coal can be burned with oxygen instead of air. It can be gasified (even, perhaps, in situ), the gas going to power a gas turbine, surplus heat to make steam for a conventional one; a big American generator, AEP, this week said it is to build such a plant. Noxious emissions can thereby be greatly reduced; even to zero, claims a California firm working on one version. America's Department of Energy is working on a hybrid of gasification and combustion.

There is a mass of research into such ideas, much of it, as in Canada and Australia, powered by a joint get-together of the big coal-users and government. Will it pay? And how soon? Much depends, now, on legislation. The Netherlands subsidises zero-emission electricity; Norway heavily taxes carbon-dioxide emissions. But Britain's subsidy for “renewable-source” electricity does not (to the distress of those who would profit) go to coal, however virtuously used. American state laws tend to punish emissions—to the point where some plants sit idle for most of the time—but not to reward the virtuous. So the incentives to speed ahead differ. But within 15 years, new coal plants could be as clean as any others, and just as profitable.
China

An unquenchable thirst

SNAIHOU VILLAGE
Growing tensions over scarce water

IN THE drought-stricken village of Snaihou, straw-hatted farmers are busy spreading grains of wheat on the roads to dry in the hot sun. The harvest is a fraction of what it was a few years ago when water flowed in the Juma River, which traverses the village. Now the wide river bed is an expanse of sand and pebbles. But it is not the drought they blame, as much as an unquenchable thirst for water in Beijing, a few miles upstream.

A few days ago, the capital quietly completed a project on the Juma River to divert the water to one of the city's biggest state-owned industries, Yanshan Petrochemical. Only on rare occasions when the river is high will it flow over the diversion dam and on into Hebei Province, to which Snaihou village belongs. According to reports in the state-owned media, a bitter dispute erupted between Hebei and Beijing after news of the project emerged in September last year.

China abhors open feuding between government bodies. But northern China's increasingly acute water shortage is causing tempers to fray. The demands of intensive farming and burgeoning industrial development, as well as waste and pollution, add to the area's historic problem of low rainfall. Last year China consumed four times as much water for each 10,000 yuan ($1,200) of GDR compared with the world average, the Ministry of Water Resources said this month.

But keeping the capital well supplied is a top political priority. Beijing relies heavily on water from Hebei, which has little choice but to provide generous quantities in spite of its own acute needs. The capital is trying to put a stop to wasteful water use by raising charges and investing more in recycling. Work has also begun on a massive project, due for completion in 2010, to divert water from the Yangtze valley. But Beijing's construction frenzy, influx of migrant workers and the Olympic Games in 2008 will all generate growing demand for water.

In February, the Chinese media reported that Beijing had suspended its diversion project on the Juma River and ceased work on the extraction of underground water nearby (also for the petrochemical firm) in order to ease negotiations with Hebei. But if this was so, the stoppage was brief. Your correspondent this week saw a newly fortified stone dam funneling all of the water flow into a concrete culvert. Workers said it was destined for Yanshan Petrochemical. They said wells had been sunk as well to supplement the supply with underground water when needed.

A study published by the Hebei Water Resources Survey Bureau about five years ago—when Beijing was considering a similar diversion scheme—said the project then under review would have a "colossal impact" downstream, negatively affecting the livelihoods of 120,000 people in several Hebei counties.

Hebei is hardly blameless. Farmers in Snaihou village say quarries using large amounts of well water have proliferated on the dry river bed in Hebei for the extraction of sand and pebbles to supply the booming construction industry. Much of the Juma River is diverted before it even reaches the capital.

Jiang Wenchai, a water resources expert at the Chinese Academy of Agricultural Science, says the willingness of Hebei to raise its complaints against Beijing is a sign of progress from the days when no one would dare take on the capital. But a Hebei water resources official clearly recognises to whom he should defer. "Beijing is the capital, so it takes precedence when it comes to politics and overall needs."
Some info about electricity, China, etc

- Fast growth puts China in power crunch (Dec 2004)
- India crippled by power shortages (Aug 2002)
- New "Take away" nuclear power plants (Dec 2004)
- Kerry pledges to axe nuclear waste dump (Aug 2004)
- Kerry and Kyoto
- Europe's energy market may get more freedom (July 2004)
- Population of world and selected countries, 1950-2010

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Roy Ponne
Jan 2005
In the dark: Customers eat by candlelight at an electricity-restricted restaurant in Changsha, Hunan province, southwest of Shanghai, last December. Residents of Changsha spend one day of every four without power.

Voracious growth puts China in a power crunch

Businesses turn to costly diesel generators as government pulls the plug

By David J. Lynch
USA TODAY

WENZHOU, China — It's not even 5 p.m. on a workday and the corridor outside Li Chengwen's office is dark. The air is moist and warm.

Li may be the CEO of an established electronics manufacturer, but in China these days, electricity is far too precious to waste on unnecessary lighting or air conditioning. The booming economy has outstripped the country's ability to generate power, leaving companies like Li's Falo Group to fend for themselves with private generators and conservation schemes.

In the capital, Beijing, officials earlier this month issued their first-ever "yellow" alert warning of possible electricity shortages. Shanghai has reported to switching off the neon lights that brighten the famous riverfront boulevard known as the Bund. And in 24 of China's 31 provinces, electricity shortages have forced periodic power rationing. The nationwide shortfall is estimated at a staggering 30 gigawatts — an amount equal to Turkey's entire electric grid.

Here in China's coastal capitalist heartland of Zhejiang province, the impact has been acute. Most factories can rely on the public electricity network no more than three days a week.

Cover story

Beyond that, they're on their own. "This is definitely a big problem for us," Li says. "Generating our own electricity increases our costs. We are feeling the pressure." So is the Chinese economy, which is downshifting from an unsustainable, double-digit annual growth rate to perhaps 9% this year. Locally, the economic impact of the electricity shortage is estimated at twice that of last year's severe acute respiratory syndrome (SARS) outbreak. That's not all bad, however, as the Chinese

Please see COVER STORY next page.
Chinese turn to diesel generators, which run on foreign fuel

Continued from 1B

The government has been trying to keep the economy from overheating, but as factories in hard-hit areas turn to noisy, diesel-fueled generators to produce power, they're exacerbating another of China's economic vulnerabilities: its dependence on foreign oil. Beijing is expected this year to import about 24 million barrels of oil per day, twice as much as in 2001.

Cover story

China's surging imports are still a fraction of the nearly 10 million barrels a day that the USA imports. But this is a significant jump. Before, China's economic growth already required more energy than the USA. So China's economic growth is already a major factor in higher global oil prices.

About one-fourth of the past year's growth in imports was fuel for industrial generators, according to Scott Roberts of Cambridge Energy Research Associates' Beijing office.

"The number of small and medium-sized enterprises moving to generators is enormous," says Andy Rothman of CERA Asia-Pacific Markets in Shanghai. "One of the reasons oil imports have accelerated is to feed that." At FAP, which makes circuit breakers and high-voltage fuses, the company over the past two years spent about $450,000 on eight diesel-powered generators to cope with a worsening electricity situation. The noisy machines, which further foul the city's already poor air, now provide two-thirds of the company's electricity. But the cost is three times that of the grid.

Zhejiang's provincial government is providing companies with rebates equal to one-third of their extra electricity bills. But, Li, 42, says profits are suffering because he is keeping prices steady to protect market share.

Years of capacity constraints have led some companies to invest in new generating capacity. In Zhejiang alone, the provincial government plans to spend more than $6 billion over the next three years to build power plants. By the end of this year, China will bring online new capacity roughly equal to South Africa's entire electricity supply. Even as an expanding economy pushes demand ever higher, that should shave the current shortfall by two-thirds, Roberts says.

Plus, a total of 130 gigawatts of capacity is under construction — more than the entire Canadian power network. All this new capacity will make its debut as authorities continue to deliberately cool an economy that earlier this year was careening at an unsustainable pace. As the economy cools off, the demand for power will ease. Because China's economy is relatively energy inefficient, 1% decline in the GDP growth rate is expected to trim 2% from growth in power demand.

In 2007, most analysts expect today's shortages to be a distant memory. In fact, even while Chinese factories are struggling to secure enough electricity to keep their assembly lines humming, some experts are warning of China's next problem: An electricity surplus.

Go to 3, next page
Growth of electric power in China

Thriving economic center

Wenzhou has been a center of Chinese economic activity since the 12th century Song Dynasty. When then-Communist Party General Secretary Deng Xiaoping began China's transition to a market economy in 1978, this city sandwiched between a low mountain range and the water was among the first places to enjoy a regeneration of non-state businesses.

Today, the 240,000 private companies that populate this bare-knuckled commercial hub account for about 80% of local electricity demand, according to Ma Jinhong of Wenzhou University's economic institute. To smooth out daily usage, government officials are prodding factories across Wenzhou to shift production to pre-dawn hours. More severe restrictions have been imposed elsewhere. In Yiwu, about a three-hour drive from here, 40,000 businesses were asked to disconnect from the public power grid for 17 days beginning July 24, according to Chinese press reports.

Throughout the past quarter century of economic reform, China's communist leadership has justified its continued monopoly on power by promising -- and delivering -- rising living standards for the average person, or laokouzang. In Zhejiang, a province with a population greater than Spain's, the provincial government's top priority is minimizing the inconvenience for residential users.

So each night, it cuts off electricity to factories from 6 p.m. to 11 p.m. and shifts the supplies to households. Despite the people-first policy, every night's Wenzhou City News carries a list of neighborhoods that will be blacked out if power demand spikes.

Neighborhood blackouts

On a recent afternoon, it was residents of Louqiaozen, who were wondering when the lights would go out. Earlier this year, amid the worst of the recent rationing, this neighborhood on the outskirts of the city faced blackouts up to three times a week. Lately, it's been perhaps three times a month, locals say.

On this day, heavy rain and thick clouds from Typhoon Aere kept air conditioning demand low, and the lights stayed on. But even among the minority with access to alternative power sources, frustration with the periodic shutoffs lingered.

"Of course it's annoying," says Guo Quan, 37, a shopkeeper who was sitting shirtless behind the counter. "The generator creates a lot of noise, and you have to spend a lot of money on it because it uses diesel."

Across the narrow lane, hair stylist Hu Peihua, 37, complains that food in her refrigerator often spoils because of the power outages. She says she's also irked that she had to spend $225 on a generator, plus $4 a day in fuel -- significant sums in a country with an annual per capita income of barely $1,000.

"The government has been talking about realizing the 'four modernizations,'" she says, referring to an old propaganda campaign. "And they can't even give us electricity regularly. I don't know what they are doing."

Demand for electricity soars

Nationwide, the chronic brownouts are the consequence of problems with both demand and supply. A construction boom rippling through energy-intensive raw material industries has sent electricity consumption soaring by 15% this year, roughly twice China's long-run average. More than one-third of the increase in demand, Roberts says, is tied to just four industries: steel, cement, glass and aluminum.

Increasing affluence among urban Chinese also is pushing demand higher. People now routinely have electrical appliances, such as air conditioners, TVs and refrigerators, that earlier generations lacked.

Power supplies have failed to keep pace. About three-quarters of China's electricity is produced by coal-fired power plants. For much of the past two
India crippled by power shortages

Associated Press

NEW DELHI, India — Lying under the open sky each night, Asmit Aggarwal gets to gaze at the stars, take in the gentle breeze and listen to the crickets.

Unfortunately, the 29-year-old software engineer isn’t on some romantic getaway, he’s on his roof.

The au natural sleeping arrangement is Aggarwal’s only way of dealing with the daily power outages across India. Each summer night, as the power — and air conditioning — fades, he climbs two flights of stairs with a mattress, sheets, pillow and mosquito-repellent and tries to sleep on the rooftop.

“It’s an every day thing now,” Aggarwal says. And he has even stopped complaining to the electric company, saying: “You have to get used to sleepless nights.”

Millions of Indians have become accustomed to crippling power outages — sometimes accompanied by water shortages — caused by a combination of widespread corruption in government-run utilities and the common practice of illegally tapping power from overhead lines.

Residents also tamper with electricity meters, and politicians order subsidized or free power for farmers to win votes, pushing utilities to overdraw power and into bankruptcy.

India’s power sector has been at the precipice of disaster for decades, a situation exacerbated in the summer by the scorching heat. Power Minister Suresh Prabhakar Prabhu said losses are currently at $5.4 billion, and that about half of all power made is stolen.

The Indian government is trying to pull the power sector back from the brink. Under an ambitious reform program, states are being provided federal subsidies, technical help from the leading Indian Institute of Technology and software industry giant Infosys and trained manpower from federally run power companies.

They intend to cut the sloth, reduce and train employees and improve transmission and billing. Power Secretary R.V. Shahi has pledged that power in 15 key affected states would turn around in three years.

But on Tuesday night, five states in central and western India — areas that are home to 235 million people — were plunged into darkness when the western grid collapsed under excess load. Trains were delayed by hours, water supply was cut off, industries shut down and health services were crippled.

“We were stuck in complete darkness in the middle of nowhere for almost five hours,” said Mukesh Patel, whose train was stranded overnight in the western state of Gujarat.

In the town of Purnea, in the eastern state of Bihar, there was no power for 34 days after a transformer blew up. When the local utility declined to repair it, residents pooled their money and bought a new transformer.

Prabhu said the state’s current losses are almost 1.5 percent of the country’s gross domestic product.

“If this business-as-usual attitude continues, the losses will reach 1 trillion rupees ($20.8 billion) in seven or eight years,” he told corporate leaders Tuesday at the Confederation of Indian Industry.

The reform program started with a countrywide survey to assess the state of the power sector. It yielded some open secrets.

“We are realizing that there are power stations on paper, which did not exist in reality; transformers which never functioned, and electric meters which never worked,” Prabhu said.

Under the new program, states will be accountable for their performances on the power front, the quality of power will be monitored, and utilities will be offered money as a reward for better performance. In the next three months, a Reliability Index will be ready in each state capital, and in six months for all district hubs across the country, to highlight slack performance of power stations.

“We’ll put it on TV in the same manner that you get the weather report,” said Shahi, the power secretary. “There must be a psychological burden on the mind of officials, that they are lagging.”

Until that happens, however, Aggarwal, the software engineer, will continue to spend summer nights on the roof of his home in Noida, in suburban New Delhi.

“If the power situation does not improve soon, there will be a social disorder,” said Kuldeep Bhatnagar, who lives in the northern city of Lucknow. “People will pick up street fights with officials.”

Aug 1, 2002
Kerry pledges to axe Yucca Mountain nuclear-waste dump

Geoff Brumfiel, Washington

Plans for a multimillion-dollar nuclear-waste dump, already shaken by a string of budgetary and legal setbacks, have taken a further knock. The Democrat presidential candidate John Kerry pledged last week to block the scheme if he is elected.

Debate over the Yucca Mountain repository has injected some science into the presidential race, as both candidates campaign heavily for the swing state of Nevada, home to the site. Advocates of nuclear power hope to make Yucca Mountain the nation's primary nuclear dump, but opposition from the state government and scientific questions about the site have delayed the project (see Nature 412, 850–852; 2001).

On 10 August, Kerry used scientific studies to claim the plan was flawed, including one saying that corrosion could destroy the metal waste-storage canisters. "I can sum up my stance on Yucca Mountain in four words," Kerry told supporters in Nevada. "Not on my watch."

His attack was rebuffed by President George W. Bush, who two days later accused Kerry of "trying to turn Yucca Mountain into a political poker chip". Kerry may also be out of step with the scientific evidence. According to a 28 July letter from the Nuclear Waste Technical Review Board, the government agency that raised the corrosion concern, new data show that corrosion is "unlikely".

The campaign rhetoric comes at a turbulent time for the site. The facility is designed to last 10,000 years, but on 10 July a federal appeal court ruled that it must comply with a 1995 National Academy of Sciences study that raises this to 100,000 years. The decision came as federal officials were rushing to file a licence application for the site with the Nuclear Regulatory Commission, which oversees nuclear-waste disposal.

Yucca's advocates are also faced with a budgeting miscalculation that led the House of Representatives in June to approve just $130 million of the $880 million requested for the site in the next financial year. Many doubt that the bill, when it is completed, will provide full funding. "The project is caught in a perfect storm right now," says Bob Loux, director of the State of Nevada Agency for Nuclear Projects, which opposes the site.

The fate of the site may now depend on the outcome of the presidential election. If Bush wins, he may be able to negotiate a new 2005 budget for the project.
Kerry And Kyoto

Environment: The senator has slammed President Bush for rejecting the global warming treaty. But now even Europe is having trouble sticking with the plan.

Climate change, like Iraq, is one of those issues on which the Bush-haters hang their case against the president and for the supposed superior wisdom of Europeans.

They point to Bush’s 2001 withdrawal from the Kyoto climate change treaty as a high crime of unilateralism.

They’ll admit that the treaty wasn’t perfect. But they think Bush was wrong just to “walk away” from the pact – which is how Bush’s Democratic rival John F. Kerry, likes to put it.

But even Kerry won’t go so far as to say Kyoto is a good idea. His own position is, shall we say, nuanced. Along with 94 other senators, he voted for an anti-Kyoto resolution in 1997, even though he now bashes Bush for rejecting the treaty four years later.

When asked point-blank by the Associated Press last month whether the U.S. should support Kyoto, he said he would make sure that U.S. “re-engages in the development of an international climate change strategy to address global warming, and identifies workable responses that provide opportunities for American technology and know-how.” Whatever he said, it’s not a clear yes or no.

Perhaps that’s fitting, because even the Kyoto fan club called Europe no longer seems so clear on the subject, either.

Europe has certainly tried to keep the Kyoto flame alive. But the closer it gets to implementing the treaty, the more clearly it sees the costs and the more balky it seems to get.

On Wednesday, all 15 EU member states were supposed to submit plans for reducing carbon dioxide emissions so that the continent could move ahead with an emission-trading system starting next year. Six, including Germany and Spain, missed the deadline.

In Germany, the government has softened its proposed CO2 cuts for coal-burning industries. Europewide industry groups are warning that a unilateral EU approach to cutting greenhouse emissions will drive energy-intensive businesses to other countries.

For all its pain, Europe stands to make very little real progress. In December, an EU study showed the EU would get only a 0.5% cut in emissions in 2010 from 1990 levels, not the 8% required by Kyoto.

As time goes on and the cost of Kyoto really sinks in, Europe could well “walk away” from the treaty. Who knows? The U.S. and Europe might one day both recognize that Kyoto is unworkable.

By then, even John Kerry might be ready to give a straight answer on the subject.
Energy

Europe's power struggle

BRUSSELS

Europe's energy markets are struggling towards freedom. But they are not there yet.

“TREK Gulliver!” declared Philippe de Buck at a recent gathering of European regulators, utility bosses and others involved in energy liberalisation. The secretary-general of the Union of Industrial and Employers' Confederaions of Europe urged them to “take their hands off the management of the energy business” and added, “Don’t turn back the process of deregulation.” Only thus, he argued, will Gulliver be liberated from the thousands of “Little John rules and restrictions that bind him”. His timing was curious, to say the least, for July 1st marked a crucial step in the emergence of the EU as the world’s most liberalised large energy market.

The conference that Mr de Buck addressed, in Lyon, France, celebrated the latest advance in the decade-long process of European Union (EU) energy liberalisation. The first big threshold was passed in 1999, when some large firms were allowed to choose their power suppliers. Since July 1st, two-thirds of all customers in Europe have had that right, at least on paper. By 2007, every European will.

As recently as three years ago, such progress was unimaginable. France and (with more subtlety) Germany were doing all they could to put off the moment of market opening, blocking negotiations and actively boosting their domestic champions in the energy business. But Europe's energy dinosaurs lost the latest round in the liberalisation fight, beaten by political pressure from the pro-market British and Dutch, and by the tireless work for change of the European Commission. The Commission is even now demanding that the overblown giant, Electricité de France (EDF), return some €1 billion (US$1.1 billion) in illegal state aid (see page 50) for an account of EDF's ever-expanding problems. The Commission is also opposing the British government's bail-out of British Energy, an ailing nuclear operator.

Philip Lowe, who heads the Commission's competition directorate, argues that the hard work of liberalisation goes mostly unnoticed. His unit has cracked down on colluding Norwegian gas firms. It insisted that Algerian gas imports not have “destination clauses” that forbid resale; it sided with Marathon Oil, an energy company trying to enter the German market, when Germany's ThyssenKrupp refused it access to a network; and it ordered EDF to auction capacity on its link between France and Britain to newcomers. The liberalisation process is, says Mr Lowe, “a constant grinding away at the nitty-gritty of anti-competitive behaviour”.

Even executives of the industry being pushed to liberalise have some kind words for the Eurocrats. Paul Bultheel, secretary-general of Eurelectric, a trade group, says that “despite some flaws, the Commission has done a very good job ensuring that there is a coherent regulatory framework. This is much better than the patchwork that exists in the United States.”

That is no idle boast. July 1st brought more than just a mandatory choice of supplier. Vertically integrated firms must now legally "unbundle" the grid from their supply business. (With luck, supply giants such as Gaz de France and Italy's ENEL will now be forced to sell off their grids so that they have no way to discriminate against new entrants.) All EU countries must now have an energy regulator; before July 1st, Germany doggedly refused to establish one. That, complains Gérard Mesmoud of Suez, a French rival to EDF, meant that foreign firms had to haggle with (or sue) provincial utilities to get them to ship power to clients within Germany, which meant that in practice liberalisation in Germany fell far short of how it looked on paper. A final, related, advance is that every country must now have transparent tariffs for using the transmission system.

Let there be light

So why, given all this progress, did Mr de Buck strike such a cautionary note? Certainly, there is a chance, albeit small, that the reforms will even now be derailed. Perhaps the growing public backlash against blackouts will prompt political action. Last summer's blackouts from England to Italy led some politicians to call for more state intervention to ensure "security of supply". Loyola de Palacio, the EU's Energy Commissioner, rejects that link: "The blackouts in Europe last year cannot be blamed on the market-opening process."

A more serious worry, that might lead to a rethink, is that deregulation would un-
dermine incentives to make essential investment in new generation and transmission. Faith Birol, chief economist at the International Energy Agency, estimates that 40% of western Europe’s coal plants will need to be replaced by 2015. Accusations against America, which endured its worst blackout ever last August, is that a half-baked approach to deregulation reduces incentives to invest. But so does arbitrary state intervention, such as the imposition of price caps on wholesale markets during California’s energy crisis. In contrast, Britain’s more coherent regulatory approach has delivered better results. After privatisation, Britain’s National Grid company invested in upgrading transmission lines at four times the rate it did before it was sold. Security of supply comes not from centralized planning, but from a well-regulated, open market.

Another fear is that liberalisation will be sacrificed to greenery. The EU prides itself on being the world leader in tackling climate change, by promoting renewable energy and other environmentally friendly technologies. Alas, each EU member country has embraced its own, often muddled, set of energy taxes, wind subsidies, carbon-reduction schemes and so on. Eurelectric complains that this has led to "an incoherent and market-distorting patchwork" that deters investment. Far better, it argues, is a market-friendly approach that builds on current plans for pan-EU carbon trading (due next year).

But the biggest challenge will come from the entrenched old monopolists, who have lost some of their strength but are seeking new ways to stitch things up. In France, new power firms seeking small customers will find that many do not have sophisticated electronic meters; they must rely on load and risk profiles provided by the mighty incumbent, EDF. And EDF has used the fruits of its monopoly power in France to buy its way into more deregulated foreign markets. As Paolo Scaroni, ENEL’s boss, puts it, EDF has been "pushing forward on liberalisation abroad—but it’s very reluctant at home."

There are rumours of impending “asset swaps” (via asset sales) or "energy swaps" (via long-term contracts) among national champions such as EDF, ENEL and Endesa. That would allow some foreign penetration while keeping newcomers out and so limiting the amount of competition.

In Spain, a serious obstacle to competition is that the Iberian power grid is poorly connected to the rest of Europe. But “what incentive does a supposedly unbundled Spanish grid operator have to build new interconnections to France?” one Commission regulator asks. Such connections would only let in a flood of cheap nuclear electricity. Italy’s regulator worries about the grip that ENI, a national oil giant, has on the gas infrastructure.

So how can a stitch-up by various national incumbents be avoided? That regulators are already alarmed is a hopeful sign, although it does not satisfy Suez’s Mr Mestrillet. He wants a new pan-EU energy regulator, a “super policeman”, to ensure that Europe builds the inter-connections necessary to forge its balkanised national markets into a "high voltage highway".

That sounds like a Eurocrat’s dream, but Brussels is not interested. Rather, officials say that existing forums for co-ordinating regulatory efforts, as well as various bits of EU legislation, are adequate to the task. Indeed, despite the fears of Mr de Buck, it is clear that the often vilified Eurocrats are feeling unusually optimistic about energy liberalisation. Says one top Commission official neck-deep in reforms: “My aim is to shut down this office on January 1st 2007. I’d like to put myself out of a job because we’ll have a fully competitive energy market and there will be no need for our services.” Here’s hoping.
The incoming leftist government announced a plan on Thursday for the eventual shutdown of Germany’s nuclear reactors, an initiative that was immediately dismissed as unrealistic by the power-generation industry.

“This is the exit from atomic energy,” said the Greens party spokesman, Juergen Trittmann, who is the front-runner to become environment minister under Chancellor-elect Gerhard Schroeder of the center-left Social Democratic Party.

The program would mark a radical shift in energy policy, and it represents the clearest sign to date of influence of the Greens as the junior coalition partner of the new administration, which is scheduled to be sworn in Oct. 27. The Greens have never held national office.

No deadlines were set for the withdrawal from nuclear energy, which supplies a third of the country’s electricity and remains deeply unpopular among Germany’s vast environmental movement. Instead, Mr. Schroeder insisted that the new “red-green” government open talks with the nuclear industry to seek consensus on a timetable to meet a complete reactor ban. If no accord is reached after a year, Mr. Trittmann vowed to enact legislation to set a legal deadline to close the plants.

Noting the plans announced the day before to liberalize the country’s citizenship laws, which conservatives said would change the face of the country, the general secretary of Chancellor Helmut Kohl’s Christian Democrats, Peter Hintze, said Thursday, “The march into the left-wing republic has started.”

Even without deadlines to decommission any plants, Mr. Trittmann said, “A series of atomic power plants will go off line in this legislative period”—the next four years.

German industry, however, which has already balked at other economic initiatives from the new administration, considers the closures of the reactors to be legally unrealistic and economically harmful, according to industry officials and analysts.

“A government headed by Schroeder will only involve premature shutdowns of very few nuclear power stations,” said Gertrud Traud, analyst in Frankfurt at Bank Julius Baer (Deutschland) AG. “Withdrawal from the nuclear power industry is likely to be very slow.”

Wilhelm Simson, chief executive of the VIAG AG, a Munich-based utility group, said such decisions were best left for future generations.

“We cannot operate our economy alone with wind energy and solar electricity,” Mr. Simson said in a magazine interview published Thursday.

Utility executives will use the year-long negotiations as the chance to press their case that a ban on nuclear energy will cost jobs, slow the economy and invariably increase emissions of carbon-based fumes.

To defend their operating licenses, German utilities already have filed lawsuits against any forced shutdowns. The utilities say taxpayers will be forced to pay heavy damages for premature shutdowns.

The issue pits Mr. Schroeder, who is an economic moderate and political pragmatist, against his new partner in the ideologically driven Greens. The new chancellor is expected to block the Greens if they threaten his economic platform.

The Green’s anti-nuclear stance could strain the red-green alliance, political observers say. Failure to make gains in their anti-nuclear crusade, a cornerstone of the Greens platform, could unleash a revolt by the party’s “fundamentalist” wing of environmentalists.

As premier of the state of Lower Saxony for eight years, Mr. Schroeder allowed three nuclear plants to operate “without any problems,” said Roland Farnung, director of the energy division of the RWE AG utility group. Mr. Schroeder shared a coalition with the Greens for four of those eight years.

Mr. Schroeder “is a pragmatic man, competent and experienced,” said Otto Majewski, chairman of the Bayenwerk AG utility group. “We are assuming that the world is not going to be turned upside down in the nuclear energy sector.”

Appealing to economic jitters at a time of near-record unemployment, electronics giant Siemens AG objected that the ban would eliminate some of the 4,500 jobs in its power-plant construction business.

Other industry officials noted that Sweden’s efforts to withdraw from nuclear energy had shown almost no success after two decades.

The initiative was part of another of several disappointments for German business from the new government.

Mr. Schroeder’s plan to overhaul the tax system was “worse than anything we had feared,” according to the German Federation of Industry.

Business leaders, who never warmed to Mr. Schroeder’s pro-business rhetoric during the campaign, threatened to boycott roundtable talks with unions and government on welfare and tax reform if the new chancellor repeals the business-friendly measures put in place by Mr. Kohl.

Suggests for fuel tax increases and the imposition of speed limits on the Autobahn threaten to nix a coalition

Swiss Delay Nuclear Shutdown

ZURICH — The Swiss government postponed on Thursday setting a deadline for shutting the country’s five nuclear power plants, asking instead for a compromise on the issue.

The Federal Council, or cabinet, said the plants would be decommissioned at some point but asked their owners, environmental critics and local communities to agree on when to do it.

Energy and Transportation Minister Moritz Leuenberger, presenting the results of a special cabinet meeting on energy policy, said ministers had also extended the operating license for one of the oldest nuclear stations, Muehleberg, by 10 years to 2012.

(Reuters)
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*Roy Jenne*

*15 July 2002*
Concerns about the Kyoto Approach

1. Would Kyoto cause a big drop in world CO₂ and climate change?
   If Kyoto were completely followed, it would decrease the amount of CO₂ in the atmosphere by only 5% by year 2100, compared with no action. And there are technical reasons why Kyoto will not be achieved.

2. Some technical people understand that Kyoto will not be achieved.
   In the climate community, many recognize that Kyoto would do little good. But it is viewed as a start toward something much larger. This can be a good argument, but if the "big solution" does not have enough technical reality, then it is unlikely that the whole idea is going to work well.

3. Kyoto will cause the transfer of even more manufacturing to other countries.
   That would lead to fewer CO₂ emissions in the US. But it would lead to even more emissions in the world total, because the industry is often less energy efficient in other countries. Also more shipping and travel becomes necessary which also uses a lot of energy.
   * Thus, Kyoto would cause us to lose more jobs and to increase the CO₂ due to this factor.

4. What is causing more energy use?
   The main cause of more energy use is that there are many more people in the world and they are receiving more money. Even a number of developing countries have reached the stage where people can afford a refrigerator, an auto, and a larger house. When people have more money, it is observed that they often will travel more. And this all takes energy.
   * Too many of the facts about energy options are not laid out before the public in a clear way.

5. Good problem solving needs a good analysis of the problem.
   Good problem solving often requires that the basic information and the analyses are fairly accurate. In complex areas of concern like energy and climate, it is well to ask ourselves how well the statements of concerns and technical options match reality. What summary information reaches other scientists and technical people? What information reaches policy makers? What reaches the general public? Does there seem to be a large fog of hype? Are there large movements by special interests, or by politics that may make it difficult to achieve good solutions?
   * There is too much fog of hype.
   * Kyoto has a large economic cost.
   * Kyoto affects energy supply and cost.
   * Kyoto does not reduce CO₂ by a big amount (only 5%)
   * The analysis and discussion of the problems need to improve.

6. Some of the world’s main issues are as follows.
   There is far more at stake than climate change. Without reasonable actions, the energy supply will tend to get worse, especially by about 2040. The supply of fresh water will become a bigger issue. And we need to insure that the supply of food remains good, even with more people and with water taken from agriculture to give to cities. Some main issues:
   * An adequate energy supply is critical.
   * Supply of food, fiber, and building materials must remain adequate.
- Enough fresh water for cities and irrigation.
- Issues of pollution by particles and pollution, and issues of greenhouse warming.
- Issues of health and clean water to drink
- Issues of balance between economic priorities

7. It is not useful to force industry to produce a product that people will not buy.
Ten years ago several states forced auto makers to produce lots of electric cars. The trouble is
that it is very inconvenient to have a vehicle that will only go 100 miles before a long recharge is
needed. This whole idea was mainly a fiasco, yet it was forced by several states and hyped by
many newspapers.
- People did not want this product.
- This rule added to the costs of the auto companies without benefits to anyone. The customers
  of all cars have to pay for these added costs.
- The cost of a product matters a lot. If useless rules increase the costs, then the business will
  suffer, and all customers will suffer.

8. The partnership with industry needs to be constructive
The people working in the industries of the world will actually do the work needed to create the
products and services that all people want. Most businesses have some staff who are trying to
determine if there are sensible ways to increase efficiency and reduce costs. It is likely that
energy efficiency will be a larger part of their thinking as energy costs increase, and the subject is
more on the mind of people.
- Businesses need to have an energy plan that documents several years of actual energy use, and
  their best future estimates of future energy use, energy cost, staff, and output for several future
  years.

9. Some troubles with huge problems like these (energy and climate).
- There will be lots of hype and politics to demand certain energy programs that will be driven
  mainly by the desires of special interest groups, and not supported by technical reality.
- There will be a scramble for big energy subsidies whether or not they really help the energy
  supply at reasonable cost.

10. The growth of energy use in USA and world (and forecast)
It is useful to see charts of US energy use (1950 - 2020) and world use (1971 - 2030). The amount
of growth is very striking. The summaries below permit one to obtain a very quick briefing on
this subject. The reader can also see the energy use for each type of fuel as well as the total.

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<tr>
<td>RJ0321</td>
<td>A Summary of US Energy Use During 1950 – 2020</td>
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<td>RJ0363</td>
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<td>- World energy use, 1971 – 2030, pages 48 to 62</td>
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<tr>
<td>RJ0310</td>
<td>World Motor Vehicle Production &amp; Use, 1900 – 2020</td>
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11. What energy strategy can help?
If the big picture is too cloudy or too political, there are still some useful actions that can be taken.
There are a number of things that will help, regardless of what the grand plan might be. For
example:
• Better energy efficiency for appliances (computers, TVs, air conditioners, etc.) But this is only useful when it can be done at an acceptable cost increment, or even at lower cost.
• A lot of energy is lost through windows. People need to be a lot more aware of the options and costs to reduce this energy loss. Many buildings are constructed with more window area than is necessary or reasonable.

12. An example of a bad energy program
From about 1977 – 83 there was a program to grant homeowners a very large tax credit to install rooftop solar energy systems. I was rather interested in such a system so I finally dug out some of the pertinent technical information. Naturally, the chatter about this was that I would be helping to solve the US energy problems. Also, the government would pay most of the cost.

The cost for a solar system was about $12,500 in 1982 dollars. Some tests had been run to determine the actual amount of energy that could be gathered. We note that most people would not be aware of these tests. The panels did not gather very much energy. The program did not make sense. It finally got to be known as a government program to finance toys for rich people—so it was dropped.
• But we note that the program did get started (why?)
• A number of people had reasons to like the program: People who make, sell, and install the equipment, and buyers that have the government pay most of the cost.
• Whenever big subsidies are involved, the technical reality may be quite different from the sound of the chatter.
Use fossil fuels ---

But keep the CO₂ out of the air

Two years ago this was still a very unpopular idea.

Now it is getting popular.

But we really must know the numbers:
- Energy needed to separate the CO₂ and store it.
- The costs of the process.

4 pages follow.

Roy J planner
Dec 2004
Managing Climate Risk

STABILIZATION OF ATMOSPHERIC GREENHOUSE GAS (GHG) concentrations at a safe level is a paradigm that the scientific and policy communities have widely adopted for addressing the problem of climate change. However, aiming to stabilize concentrations at a single target level might not be a robust strategy, given that the environment is extremely uncertain. The static stabilization paradigm is based primarily on two assumptions: (i), that a safe level of GHG concentrations exists and can be sustained, and (ii) that such a level can be determined ex ante.

The United Nations Framework Convention on Climate Change (UNFCCC) calls for stabilization of GHGs at a safe level, and it also prescribes precautionary measures to anticipate, prevent, or minimize the causes of climate change and mitigate their adverse effects. Such measures should be cost-effective, and scientific uncertainty of threats of serious or irreversible damage should not be used as a reason for postponing them. In this sense, the UNFCCC can be understood as a responsible climate management scheme that calls for precautionary and anticipatory risk management where, in a continuous sense-respond mode, expected climate-related losses are balanced against adaptation and mitigation costs (1).

The availability of technological options for adaptation, preventive mitigation, and backstop risk measures will be critical for limiting the risks associated with climate change. Technologies that can rapidly remove GHGs from the atmosphere will play an important role, particularly if unforeseen catastrophic damages are expected to significantly decrease human welfare and natural capital. Terrestrial sinks are limited by land requirements and saturation, and concerns about permanence limit their attractiveness (2). However, biomass energy can be used both to produce carbon neutral energy carriers, e.g., electricity and hydrogen, and at the same time offer a permanent CO2 sink by capturing carbon from the biomass at the conversion facility and permanently storing it in geological formations (3). To illustrate the long-term potential of energy-related biomass use in combination with carbon capture and sequestration, we performed an ex-post analysis based on a representative subset of the Intergovernmental Panel on Climate Change (IPCC) reference scenarios (4, 5) developed with the MESSAGE-MACRO modeling framework (6, 7). The cumulative carbon emissions reduction in the 21st century may exceed 500 gigatons of carbon, which represents more than 35% of the total emissions of the reference scenarios, and could lead, in cases of low shares of fossil fuel consumption, to net removal of carbon from the atmosphere (negative emissions) before the end of this century. The long-run potential of such a permanent sink technology is large enough to neutralize historical fossil fuel emissions and satisfy a significant part of global energy and raw material demand (7, 8).

In summary, we conclude that a system of climate risk management is practicable and necessary. Increasing deployment of sustainable bioenergy with carbon removal and sequestration, together with structural shift toward low-carbon-intensive fuels, will turn out to be instrumental for such a risk-limiting regime and might offer ancillary benefits for sustainable development (9).

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26 Oct 2001

References and Notes

"Technologies that can rapidly remove GHGs from the atmosphere will play an important role..."
Ocean fix for climate change finds tentative support

Jim Giles

Marine organisms can sense and avoid high concentrations of carbon dioxide, according to a study of a seafloor vent off the coast of Hawaii. The result provides tentative support for plans to tackle climate change by dumping carbon dioxide in the ocean.

Researchers have long been concerned that adding high concentrations of CO₂ to the ocean might cause serious damage to local marine life — some studies have shown that it can kill marine organisms such as nematodes (see Nature 430, 391; 2004). Environmentalists have blocked some plans to conduct further tests, fearing that even small injections of CO₂ might open the door to larger tests or industrial projects.

So the researchers turned instead to studying a natural plume of CO₂ that bubbles up from a subsea volcano called Loihi, near Hawaii. They wanted to assess fears that adding CO₂ to the ocean might create a ‘mortality sink’ — a spot where marine organisms die, attracting scavenging creatures that would in turn be killed.

But this kind of death trap is unlikely to occur, says Jeffrey Summers, a physicist at the Office of Fossil Energy at the US energy department in Washington DC. Summers and colleagues set cages baited with mackerel close to the Loihi plume at various distances from the CO₂. The bait away from the plume was eaten in less than 24 hours, whereas the bait over the vent remained untouched for more than a week.

Eric Vetter, a marine biologist at Hawaii Pacific University who worked with Summers on the project, thinks animals are avoiding the cages because they can sense the high CO₂ levels. “The results are promising,” he says.

The study, scheduled to be presented on 6 September at the 7th International Conference on Greenhouse Gas Control Technologies in Vancouver, Canada, also suggests that sea creatures can recover from short blasts of CO₂. Summers’ team dragged cages of amphipods — shrimp-like creatures — over the vent. The animals seemed to be anaesthetized by the gas within 10 minutes, but became active again around half an hour after being removed from the plume.

Vetter stresses that the work is “very preliminary”, and adds that much more data are needed before conclusions can be drawn about the wisdom of dumping CO₂ in the sea.

Nature 9 Sep 2004

- Two to four years ago the environment people tended to fight the idea of dumping CO₂ into the ocean. Also many scientists rejected it. They wanted people to avoid burning fuels, not just get rid of CO₂. But the energy needs of the world will be very large.

- During about Jan-Sep 2004 I have noticed an increasing trend in the science literature to say:
  - Projects to “bury” CO₂ should be encouraged
  - We need to know if this will work well at a good cost

I agree

Ray Jones
Sept 2004
Carbon Sequestration Efforts Receive International Boost

More than a dozen nations have signed a charter to support international cooperation in the research and development of non-biological sequestration of carbon that otherwise would be emitted into the atmosphere.

The 25 June agreement promises to facilitate technological advances as well as commercial viability for capture and storage of carbon in geological formations such as oil and gas reservoirs, unmineable coal seams, and deep saline reservoirs. Some experts also are examining the possibility of storing carbon in the world’s oceans.

The charter names the U.S. Department of Energy (DOE) as secretariat for the charter’s Carbon Sequestration Leadership Forum, and establishes policy and technical groups that will review progress on collaborative projects and identify key research areas.

The agreement did not focus on biological means of sequestration in terrestrial ecosystem such as forests and wetlands. The charter was signed during a 23–25 June conference hosted by the Energy Department near Washington, D.C. Charter signatories include the U.S., China, and the Russian Federation, Canada and Norway, where two major sequestration pilot projects are located, also signed on.

DOE Secretary Spencer Abraham said that when carbon sequestration projects become widespread, the technique could offer another major option to address global climate change, in addition to energy efficiency efforts and reliance on low-carbon and carbon-free fuels.

Abraham said the U.S. has made carbon sequestration research and development “a top priority” in order to reduce pollution, increase energy security and address long-term potential challenges of climate change. DOE sequestration efforts include the $1-billion FutureGen public-private partnership initiative to build and operate a virtually emissions-free, coal-fired, electricity and hydrogen production plant. The 10–13-year FutureGen program is slated to come online by 2007, and could include international participation from other nations who have signed the sequestration agreement, Abraham said.

According to the agency, separating and capturing CO₂ from energy systems can be accomplished before, during, or after a high-carbon fuel is combusted.

A Long-term Solution

Abraham said that carbon sequestration is important because it acknowledges the fact that fossil fuels-based energy—oil, gas, and coal—will continue for decades to be the lowest-cost energy resource worldwide. According to DOE, fossil fuels currently account for about 85% of the world’s energy sources, and the U.S. has an estimated 250-year supply of coal. The International Energy Agency projects that fossil fuels will remain dominant in 2030.

Many experts at the conference acknowledged that carbon sequestration is a potential long-term and multi-decadal option for managing carbon, rather than a tool that could help meet near-term targets of the Kyoto Protocol.

Abraham said the development of sequestration technologies is key. “At the end of the day whether your challenge is greenhouse gas emissions, or the emissions of NOₓ, or SO₂, or mercury, or any other kind of major environmental challenges, the issue is, ‘can we develop the 21st-century technologies to change the game?’ In our judgment, in this administration, putting a focus on the science and technology investments, which we have, is the way to change the game.”

Some Environmental Challenges

At the forum, Canada’s minister of natural resources, Herbert Dhaliwal, said that once safety and economic issues are resolved, sequestration is a “transformative technology” that can help countries move toward a hydrogen economy. He said, “Of course, we are not going to shut down all our fossil fuel energy plants. It would be unrealistic. So we have to look at how we can deal with the problems that exist with CO₂.”

Rajendra Pachauri, chairman of the Intergovernmental Panel on Climate Change, placed all types of sequestration squarely as one aspect of a three-pronged approach to climate stabilization. “One needs to certainly develop sequestration options,” Pachauri said, noting that the IPCC is preparing a special report on CO₂ capture and storage. “But we really need to do a lot more in terms of moving to renewable forms of energy and reducing our dependence on fossil fuels.”

Pachauri outlined some possible environmental concerns. He said that geological sequestration needs to consider the impacts of high soil CO₂ on above-ground biota, microbial ecology, mineral resources, and aquifers and surface waters. Another concern he noted is the avoidance of leakage over long periods of time. Storage in deep ocean, he said, raises questions about lowering the pH of sea water and the effects on deep sea biota.

David Hawkins, director of the climate center for the non-profit advocacy organization, the Natural Resources Defense Council, said his group supports pilot projects to determine whether geological storage can be demonstrated as a reliable way of permanently keeping carbon out of the atmosphere. He said the group opposes ocean sequestration because of its potential impact on marine ecosystems, and questions about whether ocean disposal of CO₂ would be permanent. Hawkins also said that the Bush administration should support a binding program to start limiting greenhouse gas emissions, which would provide stronger motivation for the private sector to invest further in sequestration efforts.

For more information, visit the Web site: http://usex.org/CSLPproceedings.htm.

—RANDY SHOWSTACK, Staff Writer
The Carbon Conundrum

En route to hydrogen, the world will have to burn huge amounts of fossil fuels—and find ways to deal with their climate-changing byproducts.

Even if the hydrogen economy were technically and economically feasible today, weaning the world off carbon-based fossil fuels would still take decades. During that time, carbon combustion will continue to pour greenhouse gases into the atmosphere—unless scientists find a way to repurpose them. Governments and energy companies around the globe have launched numerous large-scale research and demonstration projects to capture and store, or sequester, unwanted carbon dioxide (see table). Although final results are years off, so far the tests appear heartening. “It seems to look more and more promising all the time,” says Sally Benson, a hydrogeologist at Lawrence Berkeley National Laboratory in California. “For the first time, I think the technical feasibility has been established.”

Last hope?
Fossil fuels account for most of the 6.5 billion tons (gigatons) of carbon—the amount present in 25 gigatons of CO₂—that people around the world vent into the atmosphere every year. And as the amount of the greenhouse gas increases, so does the likelihood of triggering a debilitating change in Earth’s climate.

Industrialization has already raised atmospheric CO₂ levels from 280 to 370 parts per million, which is likely responsible for a large part of the 0.6°C rise in the average global surface temperature over the past century. As populations explode and economies surge, global energy use is expected to rise by 70% by 2020, according to a report last year from the European Commission, much of it to be met by fossil fuels. If projections of future fossil fuel use are correct and nothing is done to change matters, CO₂ emissions will increase by 50% by 2020.

To limit the amount of CO₂ pumped into the air, many scientists have argued for capturing a sizable fraction of that CO₂ from electric plants, chemical factories, and the like and piping it deep underground. In June, Ronald Oxburgh, Shell’s chief in the United Kingdom, called sequestration essentially the last best hope to combat climate change. “If we don’t have sequestration, then I see very little hope for the world,” Oxburgh told the British newspaper The Guardian.

Although no one has adopted the strategy on a large scale, oil companies have been piping CO₂ underground for decades to extract more oil from fields by reducing the viscosity of underground oil. Because they weren’t trying to maximize CO₂ storage, companies rarely tracked whether the CO₂ and gas reservoirs, coal seams that are too deep to mine, and underground pockets of saltwater called saline aquifers.

“Initially, it sounded like a wild idea,” Benson says, in part because the volume of gas that would have to be stored is enormous. For example, storing just 1 gigaton of CO₂—about 4% of what we vent annually worldwide—would require moving 4.8 million cubic meters of gas a day, equivalent to about one-third the volume of all the oil shipped daily around the globe. But early studies suggest that there is enough underground capacity to store hundreds of years’ worth of CO₂ injection, and that potential underground storage sites exist worldwide.

According to Benson, studies in the mid-1990s pegged the underground storage capacity between 1000 and 10,000 gigatons of CO₂. More detailed research is beginning to converge around the middle of that range, Benson says. But even the low end is comfortably higher than the 25 gigatons of CO₂ humans produce each year, she notes.

To test the technical feasibility, researchers have recently begun teaming up with oil and gas companies to study their CO₂ piping projects. One of the first, and the biggest, is the Weyburn project in Saskatchewan, Canada. The site is home to an oil field discovered in 1954. Since then, about one-quarter of the reservoir’s oil has been removed, producing 1.4 billion barrels. In 1999, the Calgary-based oil company EnCana launched a $1.5 billion, 30-year effort to pipe 20 million metric tons of CO₂ into the reservoir after geologists estimated that it would increase the field’s yield by another third. For its CO₂, EnCana teamed up with the Dakota Gasification Co., which operates a plant in Beulah, North Dakota, that converts coal into a hydrogen-rich gas used in industry and that emits CO₂ as a byproduct. EnCana built a 320-km pipeline to carry pressurized CO₂ to Weyburn, where it’s injected underground.

In September 2000, EnCana began injecting an estimated 5000 metric tons of CO₂ to
Carbon storage

From Peter Zweigel, SINTEF Petroleum Research

Having accompanied the Sleipner carbon dioxide storage project for several years in a project monitoring the injection process, I would like to comment on statements in your article on the “mineral sieve” (4 October, p 26).

The method of removing CO₂ from methane gas is not by distilling the CO₂, but by amine scrubbing, the standard technology at present. CO₂ is then pumped not into a “disused oilfield”, but into a much shallower saline aquifer – that is, a porous rock formation filled with salty water.

Your article quotes an environmentalist who is concerned that this technology may “be used as a prescription for business as usual” and may delay development and implementation of other, energy technologies not based on fossil fuel. This concern is not justified, because CO₂ handling, including safe storage, will make fossil energy more expensive and thus make alternative energy resources more competitive. No wonder most of my colleagues developing CO₂ capture and storage technologies view themselves as environmentalists, though with a practical, applied touch.

Trondheim, Norway

1 Nov 2003
New Scientist
p33
What's Been Going On in the Woods

Michael Williams

No one who has visited the Harvard Forest and Museum at Petersham, Massachusetts, can have any doubt that forests are dynamic entities. Although the museum's realistic dioramas of the forest at various times during the last 200 years are striking enough, a walk through the forest itself is only as good. You enter a gloomy yet awe-inspiring grove of tall, mature trees that must, you think, have been there forever. It seems like the forest primeval, until you come across stone walls and the shells of stone dwellings with large trees growing through and out of them. And then it dawns on you that these are the field boundaries and houses of the hard-bitten pioneer farmers of New England, most of which were abandoned in the early 19th century. One can well see how the ruins of the Mayan civilization lay hidden under the Yucatan jungle for hundreds of years. Such scenes are a potent correction to our preconceptions and sensibility about a pristine "nature." They starkly illustrate that the past is essential to understanding present conditions, the role of humans in fashioning the landscape, and the importance of history in deepening our knowledge of ecology.

To understand the forest landscape here, or indeed anywhere, is to embark upon an exciting interplay between the humanities and natural sciences.

Forests in Time could be called a biography of the Harvard Forest and, with variations, of the forest of all New England, where before circa 1850 forest cover declined to about 40 percent of the landscape and has since reverted to between 60 and 90 percent.
SAVING KYOTO
CARBON SINKS

Soaking Up Carbon in Forests and Fields

The climate treaty left open the rules for using managed forests, rangelands, and croplands to help meet Kyoto targets. How should it be done?

Is it fair for global bookkeepers to let countries subtract carbon sequestered by their farmland and forests from the carbon they spew by burning fossil fuels? If so, how do you measure how many tons of carbon an Iowa cornfield has soaked away? Those questions will be high on the agenda as negotiators meet later this month to nail down the details of the Kyoto Protocol (see p. 920). Forests and other land sinks, as they are called, could offset a sizable chunk of the extra CO2 that humans pump into the atmosphere and protect biodiversity as well. But sinks are controversial, both because of uncertainties about how to measure the carbon they absorb and because some countries view sink proposals—particularly the United States—as a distraction to avoid cutting fossil fuel emissions.

The Kyoto Protocol includes land sinks because they’re a big part of the global carbon equation. Carbon dioxide taken up by plants and soils through photosynthesis balances a whopping 2.3 of the 7.9 petagrams of the carbon belched into the atmosphere annually by human activity. (Conversely, cutting and burning forests adds 1.6 petagrams.) That’s why the Kyoto Protocol stipulates that countries will be credited for planting new forests and docked for cutting down existing ones.

Still to be decided, however, is exactly how to define these forests, as well as whether to include other lands managed since 1990 to absorb carbon, for example by sustainably harvesting timber and using no-till methods on farmlands. Carbon sinks are no panacea—forests and fields would absorb less and less carbon as decades pass—but “it could make a heck of a difference” in the short term, says soil scientist Neil Sampson, a consultant in Alexandria, Virginia, who helped write a recent report on sinks from the Intergovernmental Panel on Climate Change (IPCC) (Science, 12 May, p. 942). Letting U.S. farmers make money from sequestering carbon could also win much-needed support for the treaty from Midwestern conservatives in the U.S. Senate.

But crediting countries for such sinks would require massive surveys. For forests, it’s fairly straightforward: Most industrialized countries already track the growth of their forests for timber-harvesting purposes. They typically use a combination of remote sensing, modeling, and on-the-ground measurements, such as carbon analysis of trees, leaf litter, and soil. Even many environmental groups who have some qualms about sinks are fairly comfortable with forest sink accounting, as long as there are provisions to prevent unintended ecological harm, such as moving down old-growth forest to create tree plantations. “There are some questions about how good the inventory systems are, but in my view they can be overcome,” says Daniel Lipshof, a senior scientist with the Natural Resources Defense Council in Washington, D.C.

With farmlands and rangelands, however, monitoring is more uncertain because no system is in place. For example, the National Resource Inventory at the U.S. Department of Agriculture tracks nitrogen content and soil erosion on farmlands but doesn’t routinely measure carbon. Measuring the carbon added by, say, no-till practices could be horrendously difficult, says ecologist Mac Post of Oak Ridge National Laboratory (ORNL) in Tennessee. For one, the amount of carbon absorbed would be tiny—overall, an annual change of 50 grams per 7 kilograms of soil—and it would vary with crop type, weather, and even from furrow to ridge within a field.

Improving these numbers by sampling each farmer’s field just wouldn’t be practical: “You’d probably produce more CO2 than you gained,” says biogeochemist Ben Ellert of Agriculture and Agri-Food Canada (AAFC). However, a pilot project in Saskatchewan has convinced some experts that a statistical approach can bring down the costs of measuring carbon uptake. The 3-year project, supported by energy utilities interested in buying carbon credits from farmers, combined statistical sampling with modeling on 150 farms. It concluded that carbon absorbed by changes in land use could be measured for a relatively low 10 to 15 cents per hectare, according to Brian McConkey of AAFC. And better technologies are on the way, says ecologist Keith Paustian of Colorado State University, Fort Collins: A group at Los Alamos National Laboratory in New Mexico, for example, has invented a sensor for detecting carbon just by sticking the tool in the soil, eliminating the need to cart samples to a lab.

Even if monitoring sinks is doable, a host of policy questions remain. Protecting a forest in one part of a country, for instance, may lead to logging elsewhere. Another concern is the impermanence of projects: A credited forest might eventually be destroyed by a hurricane, for example. One solution laid out by the IPCC sinks report and now endorsed by many groups is to count the carbon going in and out of all of a country’s lands, no matter the type, instead of giving credit for specific activities. “Looking at the whole landscape will bring us closer to what the atmosphere is actually seeing,” says biophysicist Darren Goetzke, a global change consultant in Ottawa.

Still, the uncertainties over measurement are one reason why some want to hold off on giving credit for sinks until the second phase of the treaty, after 2012. Including sinks also faces fierce opposition from the European Union, which rejects the idea because it would allow countries to avoid reducing their fossil-fuel emissions.

Even some sink proponents see the U.S. position as too greedy. It seeks credit for part of the 310 million metric tons of carbon per year that U.S. forests and fields will absorb between 1990 and 2012—even without any new intervention. That adds up to half of the U.S. target emissions cuts. Most other countries, arguing that only deliberately created sinks should count, won’t be willing to accept these credits, says geochimist Gregg Marland of ORNL.

Whether or not countries get credit for their sinks, many scientists look forward to a global effort to monitor the carbon sucked up by the world’s green spaces. As Paustian says, “Irrespective of carbon trading, we need to understand the role of the carbon sink” to improve global models and predict how much the world may warm in the future.

—JOCelyn KAISER
Peat bogs harbour carbon time bomb

FRED PEARCE

THE world's peat bogs are haemorrhaging carbon dioxide into the atmosphere, accelerating global warming. Worse, the process appears to be feeding off itself, as rising atmospheric levels of CO₂ are triggering further releases from the bogs.

That's the claim of a British researcher this week who is warning that billions of tonnes of carbon could pour into the air from peat bogs in the coming decades. "The world's peatland stores of carbon are emptying at an alarming rate," says Chris Freeman of the University of Wales at Bangor. "It's a vicious circle. The problem gets worse and worse, faster and faster."

Peat bogs are a vast natural reservoir of organic carbon. By one estimate, the bogs of Europe, Siberia and North America hold the equivalent of 70 years of global industrial emissions. But concern is growing that such bogs are releasing ever more of their carbon into rivers in the form of dissolved organic carbon (DOC).

"There seems to be an increase of DOC in rivers of about 6 per cent a year at present," says Fred Worrall of the University of Durham in the UK, who collates global data on DOC levels in rivers. Worrall suspects the rise in DOC began about 40 years ago.

Bacteria in the rivers rapidly convert DOC into CO₂ that bubbles into the atmosphere. But speculation has been rife about why the peat bogs are giving up their carbon in the first place. Three years ago, Freeman proposed that global warming was the cause (New Scientist, 25 August 2001, p 8). But that hypothesis failed to stand up in field trials.

A second suggestion, that increased river flows were flushing more carbon out of the bogs, has also bitten the dust.

So Freeman tested a third idea — that summer droughts cause more vegetable matter in bogs to decompose, freeing up more carbon that is released into the rivers. But that too failed when Freeman simulated drought conditions in a bog in central Wales, and found that this reduced the DOC in rivers, rather than increasing it.

"The rate of acceleration suggests we have disturbed something critical that controls the stability of the carbon cycle in our planet," says Freeman.

The trials indicate that there may be another culprit altogether: the direct effects of carbon dioxide in the atmosphere. Freeman grew plants on soil from peat bogs in Iglowlike glass structures, some containing normal air and others with a CO₂-rich atmosphere. He found that plants in the CO₂-rich atmosphere began to assimilate much larger amounts of CO₂, which in turn was released into the soil moisture. There it can feed bacteria in the water that break down the peaty soil itself, releasing stored carbon from the bog into the rivers.

After three years, the proportion of DOC in the CO₂-rich soil was 10 times that within the normal soil. And there was no sign of the increase tailing off.

"This shows that even without global warming, rising CO₂ can damage our environment," says Freeman. "The peat bogs are going into solution."

Researchers from the Centre for Ecology and Hydrology in Lancaster, UK, have been measuring DOC levels in water for some years as part of a programme to monitor river chemistry. But the study is also providing critical evidence of the impact of rising levels of CO₂ in the atmosphere. Recent data shows a 90 per cent increase in DOC levels in Welsh mountain rivers since 1988.

"The rate of acceleration suggests that we have disturbed something critical that controls the stability of the carbon cycle in our planet," Freeman says. "On these trends, by the middle of the century, DOC emissions from peat bogs and rivers could be as big a source of CO₂ to the atmosphere as burning fossil fuels."

Freeman says the dissolved carbon also poses a potential health threat. DOC can react with chlorine disinfectant at water treatment works to produce cancer-causing chemicals called trihalomethanes. "Apart from the global warming implications, this means we will have to pay higher water bills for removing these toxins," Freeman says.