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Climate Change Budget/Finance Economic Analysis [3]

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EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL OF ECONOMIC ADVISERS
WASHINGTON, D.C. 20500

MEMBER

July 31, 1998

Dear Colleague:

I am enclosing a copy of : **The Kyoto Protocol and the President's Policies to Address Climate Change: Administration Economic Analysis**. The government is officially releasing the report today.

The report elaborates on the testimony that CEA Chair Janet Yellen presented in Congressional hearings this past spring. This analysis provides the analytical underpinnings of the Administration's conclusions that the United States can reach its Kyoto target at a relatively modest cost if all the envisioned flexibility provisions are successfully put into place.

We would be happy to answer any questions you may have. (Joe Aldy, on our staff, is best able to answer technical questions--202-395-1455.)

Sincerely,

Jeffrey A. Frankel

Enclosure

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THE KYOTO PROTOCOL
AND THE
PRESIDENT'S POLICIES TO
ADDRESS
CLIMATE CHANGE:

ADMINISTRATION
ECONOMIC ANALYSIS

July 1998

**ADMINISTRATION ECONOMIC ANALYSIS:
MEETING THE CHALLENGE OF CLIMATE CHANGE AT A REASONABLE COST
July 31, 1998**

The Administration's economic analysis of the Kyoto Protocol concludes that we can meet our Kyoto target for reducing greenhouse gases at modest cost; that taking action to address global warming amounts to an insurance policy against a serious threat; that there are real opportunities for low-cost reductions both at home and abroad; and that the benefits of averting climate change could be large.

There is a powerful scientific rationale for taking action on global warming; taking action amounts to an insurance policy against a serious risk. Greenhouse gases are rapidly building up in the atmosphere and at current rates will reach levels not seen in 50 million years by 2100. The nine hottest years on record have occurred since 1987, 1997 was the hottest year ever, and 1998 has been hotter still. Our leading scientists warn of serious consequences, like severe droughts and floods and health problems, if global warming is ignored. The National Academy of Sciences has said: "...even given the considerable uncertainties in our knowledge of the relevant phenomena, greenhouse warming poses a potential threat sufficient to merit prompt responses....Investment in mitigation measures acts as insurance protection against the great uncertainties and the possibility of dramatic surprises."

The costs of meeting our Kyoto target will be modest. Even without counting the impact of domestic policies or the benefits of mitigating climate change, estimates derived using the Second Generation Model (SGM) suggest an emissions price of \$14 to \$23 per ton of greenhouse gases. This would translate into an increase of \$70-\$110/year in 2010 for an average family's energy bill, although such increase would be substantially offset by the decline in electricity prices from restructuring the electricity industry, as the Administration and others have proposed.

Domestic actions that are not factored into the SGM model can lower costs even more and substantially enhance our ability to make reductions at home. These include federal electricity restructuring to increase competition and lower costs; efforts to increase the rate of technology improvement, such as the President's \$6.3 billion budget and tax cut package; innovative practices, like forestry activities, which can sequester carbon; industry consultations; and initiatives to reform federal energy use and procurement.

Doing it smart: The Kyoto Protocol is based upon flexibility measures that reduce costs. At U.S. insistence, the Kyoto Protocol allows emissions to be reduced where and when such reductions are cheapest. Key provisions include international trading of emissions permits as well as measures that allow our companies to share credit for emissions reducing projects abroad.

The benefits of acting to address climate change could be very large. Noted economists have estimated the environmental, health, and economic costs of global warming projected to occur during the next century to be 1% of GDP or more -- over \$80 billion a year in today's terms. In the short term, ancillary benefits of reducing greenhouse gas emissions -- such as reduced air pollution -- could produce savings equal to one quarter of the costs of meeting our Kyoto target.

Economic Analysis

Q: What portion of reductions does your analysis anticipate will be made in the U.S.?

A: The President is committed to significant emissions reductions here at home. This report does not specify what percentage of our reductions would be made at home. However, we think that percentage could be quite substantial. The illustrative model we used -- on the assumption of international trading with industrialized and key developing countries - - assumes 25% domestic action, but that is *not* an accurate representation of what we think will be done domestically because it explicitly excludes domestic policies that we think will have a large impact on the amount of reductions accomplished at home. Those policies include:

- *Electricity restructuring.* We conservatively estimate 25-40 million tons of reductions, or 4-7% domestic;
- *Sink mitigation activities.* Large potential here. We cite two studies that claim very large possibilities. With good interpretive provisions negotiated and reasonable policies, could have sizable reductions -- perhaps in 5-10% range or higher. **[Awaiting EPA backup]**
- *Technology.* Many experts believe that the rate of technology improvement could be enhanced through policies. The President has offered a \$6.3 billion R&D and tax initiative to spur technology, and that will presumably be other policies offered in the 10-year period between now and 2008. We have assumed a rate of technology of improvement of .96/year. Each additional .1 would add about 2% to our domestic reductions.
- *Industry consultations, federal energy.* Other efforts, like voluntary agreements with industry sectors and federal energy reform could further increase amount of domestic reductions.

Let me say finally that we need to view these estimates of reductions at home and abroad with a good deal of humility. We can no more expect precision on these estimates than we could in estimating what the budget deficit will be in 2008; and since we all know that our year to year budget projections are commonly way off, you can get some idea of the range of uncertainty here. Clearly, trading may be less robust than the SGM model assumes, causing the domestic percentage to increase substantially, while low-cost domestic opportunities may be very prevalent.

In short, Further, the whole business of predicting the domestic/international split is highly imprecise at best.

Q: If your model does not account for key factors like domestic initiatives, carbon sinks, or electricity restructuring, why did you use that model?

A:

Q: What about your \$14/ton estimate? Doesn't that assume even more trading from abroad?

A: The answer is the same as for the \$23/estimate, except that at \$14/ton, the model would start off assuming more trading. However, it is our policy to work out acceptable trading rules with the European Union so that they will join us in a trading system -- the assumption underlying the \$23/ton case.

Q: Why didn't you devise some way to factor those elements into your analysis, rather than putting them aside?

The SGM model we used cannot assess the affect of domestic actions -- e.g., whether with respect to technology, sinks, voluntary actions -- directly [**What does this mean?**]. Moreover, we try to be conservative in our approach and while we think the domestic policies can be quite important, their effects are still imprecise enough that we didn't think it appropriate to include them in our model.

Q: Isn't the real problem here that you haven't proposed domestic policies that are likely to have any real effect? Like increased CAFE standards, or a cap and trade on CO2 in the electricity restructuring bill? If you were proposing serious domestic policies instead of a lot of toothless, voluntary initiatives, you could probably estimate the domestic impact better. How can you on the one hand keep saying this is the great environmental challenge of the 21st century, and on the other propose such weak measures to meet it? When are you going to put your money where your mouth is?

A: The President has proposed a good initial set of policies to start us on the path of reducing emissions, while recognizing that we do not yet have a ratified treaty. It would be premature to propose a set of mandatory measures explicitly tailored to meet our Kyoto target before the treaty is ratified. But our \$6.3 billion R&D/tax incentive package is an excellent first step, which the Congress should be endorsing instead of trying to gut. Our proposal on electricity restructuring is a serious one that can make a real difference. We think there is important potential in our industry consultation program and that that potential will grow when the elements of an early credit system are fleshed out more, and we also think we can help push the ball forward through the example and procurement power of the federal government. Finally, we think that there is great potential for

reducing carbon through forestry and soil activities, once some further diplomatic work is accomplished regarding the "sink" provisions of the treaty. So we reject the notion that we aren't doing enough yet. We think the President has struck just about the right balance.

Q: Is this CEA's analysis or the Administration's analysis? If it's the Administration's analysis, why does it not reflect any of the bottom-up perspective that DOE has used in the past?

A: This is an Administration analysis in which CEA had the lead.

Q: Why is there only one scenario? Didn't you think it appropriate at least to represent other views?

The Administration's analysis presents the economic implications of a scenario that best reflects the U.S. government's position on international trading and global participation.

Q: Why are you so optimistic about international trading but conservative about technology?

A: Our conservative approach on technology is intended to avoid rosy scenarios, the same way we try to do that in budgeting. I think our trading assumption is appropriate because it is consistent with both the provisions of the Kyoto Protocol itself and the United States' firm position on how trading rules should be worked out.

Q: Isn't your program based on buying up the so-called "hot air" tons from Russia -- which will do absolutely nothing for the environment? Unless you commit to real, serious domestic action, with credible limits on the amount of permits you buy from abroad, won't this whole effort be a sham?

A: The "hot air" tons from Russia are no less legitimate than similar tons that Germany will be using from the former East Germany. This is a treaty in the real world and targets were negotiated with former East Bloc countries with full knowledge of what their anticipated emissions would be. We think it makes a lot more sense to get on with this process and work with the Russians and others to make sure they have adequate monitoring and verification processes and, hopefully, that funds they earn through the sale of permits will be at least partially plowed into clean and green activities. The alternative is to try to undo the Kyoto Protocol and start renegotiating it -- and we think that is a road to disaster.

Q: How much money would be sent abroad? Isn't this a tax on American business and government transfers to Russia?

A: There will be no taxes on Americans or government transfers to Russia. U.S. firms -- not the U.S. government --- may choose to purchase international emissions permits. That will be up to them and they will undoubtedly do so only if they think it is in their economic interest to do so. We think our companies should have maximum flexibility to meet their emissions obligations in ways that will be cost-effective. U.S. firms interested in international investment and emissions credits will have an incentive to ensure that other countries meet the international standards for adequately monitoring and reporting their emissions of greenhouse gases. Russia will have a significant incentive to use the revenues to invest in modern, climate-friendly plants and equipments so that as its economy recovers, it continues to produce emissions reductions for sale on international markets.

Q: Why don't you present a view that does not include the optimistic assumption that China, India, and other developing countries assume emissions targets?

The scenario we analyze is consistent with our policy. The report illustrates, by the way, how developing countries can maintain sustainable growth while participating in an international system of emissions reductions and trading. By participating in international trading, developing countries could attract investment for cleaner energy and technologies while generating cost-effective abatement opportunities for firms in industrialized countries.

Q: You have essentially assumed an international trading system that operates as seamlessly as the New York Stock Exchange. Have you found a single outside validator to support an assumption that is this extraordinarily optimistic?

A: Because we are still engaged internationally on trading rules, we have the opportunity to develop a system that would promote active private sector participation with minimal transaction costs. Given the interest in climate change by such major actors like the World Bank, the Chicago Board of Trade, and the International Petroleum Exchange in London, and the efforts we have undertaken to learn from traders in other markets, we believe the potential exists to transform the concept of international trading into a practical, workable system. **[WE HAVE TO HAVE SOMEONE TO POINT TO; HOW ABOUT SANDOR]**

Q: Has this analysis been peer-reviewed? Why not?

A: It has not been peer-reviewed. CEA had the lead in preparing the document and CEA, as a matter of policy, does not submit its reports for peer review.

Q: How did you model “meaningful participation by key developing countries”?

A: As the Administration has noted on numerous occasions, meaningful participation varies according to the circumstances of each developing country. (Insert standard response)

In this analysis, the \$14 to \$23/ton scenarios reflect an assumption that some developing countries take on emissions targets and participate in trading. Emissions targets in the first commitment period would surely constitute meaningful participation.

Q: Your analysis includes “key developing countries” with emissions targets. Are China, India, Mexico, and Korea the only key developing countries?

A: These are key countries modeled in the Second Generation Model. While each would certainly qualify as a “key developing country” for the Administration, there are many other countries that would constitute “key developing countries” as well.

Q: Your analysis assumes that “key developing countries” take on targets at their 2010 BAU emissions level -- this implies that they do not have to undertake any emissions reductions to comply with their targets. Is this consistent with Byrd-Hagel? Is this “meaningful participation”?

A: As we have said previously, there is no one-size-fits-all for meaningful participation. We have used targets set at 2010 BAU simply for illustrative purposes. It should not be

construed as a statement on either Byrd-Hagel or meaningful participation, but simply as an illustration.

Q: How much will it cost if you don't get "key developing countries" to take on targets?

A: We have made it clear that we're not submitting this treaty to the Senate without meaningful participation by key developing countries. We think that emission targets that would permit developing countries to engage in trading would be very much in their interest and would certainly satisfy the meaningful participation standard.

Q: How much will it cost if there are restrictions on international trading?

A: It is contrary to U.S. policy to accept restrictions on trading. We do not discuss scenarios that are contrary to our policy. The U.S. position is to secure effective trading rules to promote low-cost emissions reductions. We have stated repeatedly our opposition to trading restrictions as both inefficient and infeasible. Since a ton of CO₂ emitted in New York has the same environmental effect as a ton emitted in Poland, we see no environmental justification for placing restrictions on trading.

Q: Costs in other studies are more than 10 times yours. Why should we believe your estimates?

Those studies reflect neither the flexibility measures we secured in the Kyoto Protocol nor Administration's policies for future action. These studies, some which even claim to be analyses of Kyoto, do not include many of the important flexibility mechanisms in the Kyoto Protocol, such as international emissions trading, the Clean Development Mechanism, or the potential to trade across greenhouse gases. Further, these analyses do not account for the Administration's position on developing country participation. As I have said before, we can do it dumb, or we can do it smart. Doing it dumb means that we would ignore many of the cost-effective opportunities to reduce emissions.

You have provided direct costs. The economic literature indicates that total costs of a policy like this should be 2 - 4 times the direct costs. What are the total costs of your policy?

What are the benefits of Kyoto?

Would a less stringent alternative capture most of the benefits of this approach? Why didn't you assess any such alternatives?

In your analysis, you modeled a tradable permit scheme. Isn't such a scheme modeled the same way as a carbon tax? Doesn't this mean that a tradable permit scheme is just a euphemism for higher energy taxes?

In the model, aren't permits auctioned? Does the Administration intend to auction permits?

The Protocol includes a provision on banking. Did you assess the effect of banking on costs in the first commitment period? Why not?

Why can't you estimate sinks? You agreed to something in Kyoto, and you don't understand its implications 6 months later?

Battelle has recently released a draft paper of its assessment of Kyoto. It indicates that the permit price with full global trading would be \$25/ton. Why is their estimate higher than yours with the same model?

You used only 1 model. With all the same assumptions, what would the likely permit prices be using other models?

Last summer, you said that relying on 3 models would be futile. Yet, now you deliver an economic analysis relying on just 1 of the 3. What has happened since then that allows you to more comfortably rely on SGM?

The report indicates that electricity restructuring will lower carbon emissions by up to 40 MMTCE. How can making electricity cheaper result in lower emissions? Won't people consume more electricity if the price falls?

These additional provisions in the Administration's proposal on electricity restructuring result in some emissions reductions. Do you have an estimate of their costs? If so, do you know what the cost per ton (average and marginal) is for those emissions reductions?

The report indicates a range of ancillary benefits. Why the large range?

Isn't the upper bound of the ancillary benefits estimate derived from EPA's 812 report methodology? Isn't it true that the Administration's economic agencies do not accept that methodology as legitimate? Why then is it in the report?

The testimony presented on March 4 before House Commerce and at several hearings since indicated that, in addition to improved air quality, the ancillary benefits include reduced congestion and traffic fatalities. However, there is no mention of these benefits in the report. Why not? Further, why would congestion and traffic fatalities decrease with a tradable permit system?

Isn't it true that the permit price without trading would be \$193/ton? Wouldn't this be about \$0.50 per gallon in higher gasoline taxes?



William J. Antholis

07/30/98 03:39:37 PM

Record Type: Record

To: Todd Stern/WHO/EOP

cc:

Subject: hot air

So-called "hot air" tons refer to the tradeable emissions that may be sold internationally by formerly-communist bloc countries in Central and Eastern Europe. These nations' emissions fell when they pulled the plug on their centrally planned economies, and our model anticipates that some of their emissions will not reach 1990 levels by the 2008-2012 budget period. However, these countries' targets were negotiated in Kyoto in full knowledge of what their anticipated emissions would be, and to try to undo the Kyoto Protocol would ensure the unravelling of the agreement. Moreover, proposals to ensure that emissions permits represent so-called "real" reductions would at the very least lead to hopelessly complex bureaucracies, and at most would ruin the trading system. This is no less true for Russia and Ukraine than it would be for East Germany.

For instance, it is difficult to imagine how one might determine on a national scale whether reductions have come from intentional emission reduction policies or from poor economic performance. Likewise, proposals to limit the amount of reductions a nation could make from international emissions trading appear completely unworkable. Instead, we think the best approach is to move forward in establishing emissions trading, ensure that this system has adequate monitoring and verification processes, and then urge these countries to invest in keeping their emissions low by using any revenues earned through the sale of permits to replace outmoded energy systems with cleaner and greener ones.

**TALKING POINTS
ECONOMIC IMPACT OF KYOTO PROTOCOL
June 8, 1998**

- * ***President Clinton is committed to addressing the problem of global climate change while maintaining a strong economy.***
- * ***The Kyoto Protocol is a form of insurance against the threat of global climate change.*** It is difficult to put a price tag on the cost of doing nothing to address the problem of climate change. But researchers have nonetheless developed troubling cost estimates of not acting -- ranging in the tens of billions of dollars per year for the United States. And, these estimates do not even fully reflect the value of the insurance against the unknown risk of large-scale and potentially irreversible catastrophic events, such as a weakening of the Gulf Stream.
- * ***Doing it smart: The Kyoto Protocol includes measures that reduce the costs of reducing greenhouse gas emissions.*** Effective international emissions permit trading, joint implementation by Annex I countries, the Clean Development Mechanism, and other aspects of the Kyoto Protocol will reduce the costs of emissions reductions. The Administration also supports federal electricity restructuring legislation that could achieve modest emissions reductions and will provide consumers with substantial savings on their energy bills.

The Kyoto Protocol includes many cost-saving provisions -- and economic analyses that ignore these provisions do not accurately reflect the economic impact of the Kyoto Protocol.

- * ***The Administration believes that the costs of the Kyoto Protocol will be modest.*** With effective mechanisms for international emissions permit trading, joint implementation, and the Clean Development Mechanism, as well as meaningful developing country participation and flexible timetables, the Administration's overall assessment is that the economic cost to the United States will be modest.

Administration assessment is consistent with formal model results. Despite the limitations of any single model in assessing the economic impact of the Kyoto Protocol, economic model results are fully consistent with this conclusion. For example, estimates derived using the Second Generation Model (SGM) suggest that the resource costs of attaining the Kyoto targets for emission reductions might amount to just \$7 to \$12 billion per year in 2008 to 2012 -- or just 0.1 percent of projected GDP.

Administration assessment does not include climate and non-climate benefits, savings from electricity restructuring and several cost-mitigating factors. The Administration estimate of the economic impact excludes a

range of climate and non-climate benefits, the likely savings from electricity restructuring and several cost-mitigating factors, such as carbon sinks and increases in energy efficiency from the President's \$6.3 billion climate change initiative.

II. Briefing Schedule

- Offer Yellen/Stern meetings with Domenici, Dingell - make offers prior to release
- Conduct briefings for Senate and House climate change working groups - hold briefings late afternoon prior to release. Offer this group Yellen/Stern meetings with their Members if they would like them.
- Other Members to offer Yellen/Stern meetings with after the release: Levin, Hagel, (Craig, Enzi), Sensenbrenner, Kucinich, Tierney, Matsui.
- Conduct Senate-wide staff briefing after release.
- Conduct House-wide staff briefing after release.
- Copies of Analysis needed for Hill: 350

Byrd, Kerry, Lieberman
Kerry, Clinton, J. Edwards

Waxman?
Miller?

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United States Senate

COMMITTEE ON THE BUDGET
WASHINGTON, DC 20510-6101

WILLIAM HONOLULU, CHIEF DIRECTOR
DAVID KING, CHIEF DIRECTOR FOR THE BUDGET
THE HOUSE OF REPRESENTATIVES

April 20, 1998

The Honorable Stuart E. Eizenstat
Under Secretary for Economic, Business and Agricultural Affairs
U.S. Department of State
2201 C Street, N.W.
Washington, D.C. 20520

Dear Under Secretary Eizenstat:

The Administration has urged Congress to support the Kyoto Treaty once certain side agreements have been reached. I believe that the Treaty's economic impact must be studied in greater detail before the Administration promotes a proposal of this magnitude. To supplement private analysis, the Administration should provide its own thorough study on this issue.

Recently, you and CEA Chair Janet Yellen commented on the Kyoto Treaty's possible economic impact before the House Commerce Committee. However, it is my understanding that the Administration report cited consisted only of written testimony, which referenced work done on one model. No documentation was provided on the results themselves, nor was any detail given on the underlying assumptions used and adjustments made.

I plan to schedule a major hearing on the economic effects of the Kyoto Treaty. However, before such a hearing can be scheduled, I believe that the Administration should undertake further detailed study of the Treaty's potential economic impact which:

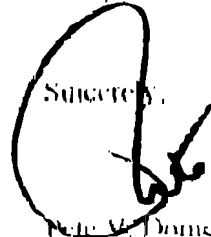
- 1) employs several types of models, so as to reflect both the short-term and long-term impact on GDP, consumption and energy prices;
- 2) provides documentation of its results and explicitly states its assumptions;
- 3) states how permits are to be allocated -- via auctioning or grandfathering. If via auction, it should indicate what is done with the added revenue and how this affects the overall results;
- 4) addresses the impact of an international trading permit system on international trade and capital flows;
- 5) is reviewed by outside academics and experts.

Denise Ramones (LD)

Ann Catherine Chasen
Staff

The Administration's Interagency Analytic Team made a commendable effort last year to attempt to examine the potential economic impact of freezing greenhouse emissions at 1990 levels. However, the terms of the Kyoto Treaty have changed since last summer, bespeaking the need for a new comprehensive economic analysis. A new study would also permit the full incorporation of the remedial suggestions made by the panel of outside experts who reviewed the IAT's report.

While I understand that it will take time to investigate the Kyoto Treaty's full economic effects, I believe that it should be a topic of ongoing analytic efforts within the Administration if it is serious about promoting the Treaty to Congress. As such, I request that the Administration conduct and submit a comprehensive economic analysis of the Kyoto Treaty that addresses the points raised above.


Pete V. Domenici
Chairman

cc: The Honorable Janet Yellen ✓
The Honorable Larry Summers

GAO

GLOBAL WARMING: Preliminary Comments on the Administration's Climate Change Proposal

Briefing Prepared for Staff
of the Senate Committee
on Energy & Natural Resources
May 18, 1998

June 4 HAC

GAO Introduction

- Reductions by 2008-2012
 - Protocol calls for U.S. to decrease emissions 7% from 1990 level
 - Per EIA (04/98), this means a 31% decrease when expected economic/energy growth is factored in *
- Administration has 3-stage proposal to comply with Protocol

*highest of any kyoto signatories

GAO Background: Proposal Has 3 Stages

- Stage 1 (1999-2003)
 - 10 essentially voluntary actions
 - Intended to start "smooth path" to reducing emissions
 - Stage 2 (2004-2007)
 - Review progress, consider next steps
 - No new actions stated
-

GAO Background: Proposal Has 3 Stages (cont.)

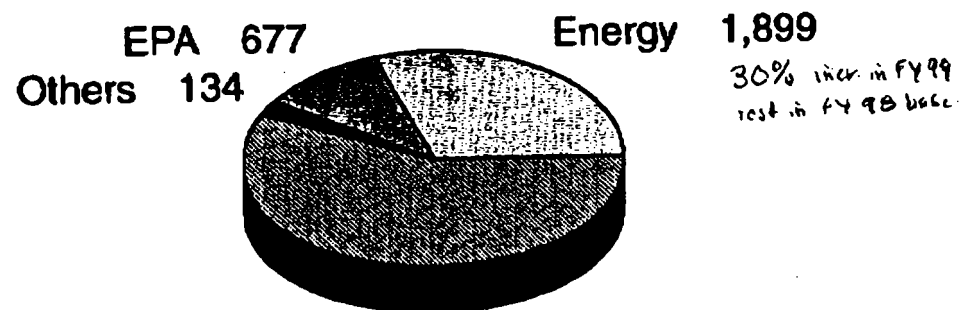
- Stage 3 (2008-2012)
 - Non-voluntary domestic/international emissions trading program
 - Coincides with first 5-year "budget period" under Protocol
 - Protocol targets are "binding"
 - Penalties for non-compliance to be discussed in 11/98
-

GAO Background: Stage 1 Implementation

- Administration request: *incremental* budgetary cost of \$6.3B over 5 years
 - Includes direct outlays and tax expenditures
 - Proposed FY99 increase = \$894M
 - Principal agencies: Energy, EPA, Treasury
 - Others: Agriculture, Commerce, HUD
-

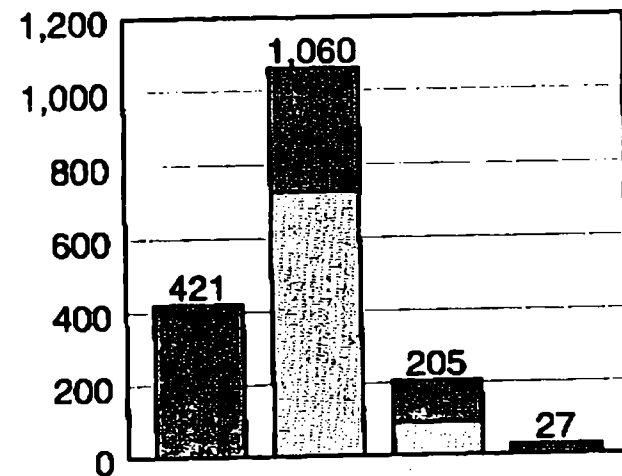
GAO Estimated Costs of President's Climate Change Proposal (in Millions)

Increased Spending by Agency Over 5 Years



Total = \$6,345

Base and Increased Funding, FY99



	Treasury	Energy	EPA	Other
FY98 Base	0	729	90	0
FY99 Increase	421	331	115	27

GAO Scope and Methodology

- Identified minimum elements needed for an effective plan:
 - costs
 - performance goals
 - Selected 4 actions for review based on
 - funds actually or potentially involved
 - our prior work
-

GAO Scope and Methodology (cont.)

- Energy, EPA, and Treasury:
 - reviewed budget documents, strategic and performance plans, and other relevant documents
 - met with cognizant officials
 - OMB: met with officials *last Thurs. - trying since March backgrd. info*
 - White House: awaiting meeting *(Dirk Forrester)*
-

GAO There Is No Overall Plan for Stage 1

- No overall Stage 1 plan exists; no schedule for preparing one
 - Reasons to prepare an overall plan
 - Multi-agency/multi-year approach
 - Significant resource commitment
 - Ingredients of an overall plan
 - Specify all costs, performance goals
 - Assign overall/specific responsibilities, coordination
-

GAO FY99 Information on Stage 1 Actions Is Incomplete

- We reviewed available documents relating to 4 actions:
 - Research & development
 - Tax credits
 - Credit for early action (with lead)
 - Deployment of energy-efficient products (Energy star labelling at EPA).

GAO FY99 Information on Stage 1 Actions Is Incomplete (cont.)

- Information on FY99 costs and performance goals is not complete for all 4 actions
 - Information on FY99 costs exists for 3 actions
 - Information on FY99 performance goals exists for 2 actions
 - Concerns about quality of information
-

GAO FY99 Information on Stage 1 Actions Is Incomplete (cont.)

Action/ principal agency	Information on budgetary costs?	Information on performance goals?
R&D: Energy	yes	yes, but we have concerns
Tax credits: Treasury	yes	no \$3.6B / 5 yrs
Credit for early action: EPA*	??	no
Deployment of energy-efficient products: EPA	yes	yes, but we have concerns

none for FE yet.
continuation of
existing plans,
multi-objectives,
not tied to
Kyoto.
not outcomes or
results oriented

Greenlights- EPA
claims credit for
entire savings-
even though utility
may be responsible
for part of savings

*\$ for setting up program, not for implementation.

No assurance that phase 1 foundations well laid.

GAO Lack of Key Stage 1 Information May Have Implications for Future

- **Stage 1 is the foundation for later stages**
 - **Uncertainty about Stage 1 plan raises questions about**
 - **Feasibility and costs of later stages; providing "smooth path"**
 - **U.S. ability to meet Protocol terms**
 - **Still-undetermined penalties for non-compliance**
-

American Petroleum Institute
1220 L Street, Northwest
Washington, D.C. 20005
(202) 682-8300



William F. O'Keefe
Executive Vice President

March 20, 1996

The Honorable Laura D'Andrea Tyson
Assistant to the President for Economic Policy
The White House
2nd Floor, West Wing
Washington, D.C. 20500

Dear Dr. Tyson:

In response to your request at our meeting on March 6, I have attached an API list of "Additional U.S. Actions to Address Greenhouse Gas Emissions".

I hope these ideas stimulate further White House discussion of this complex issue and that industry can continue to contribute in a positive way to the domestic and international climate change policymaking process.

Please call me if you would like further elaboration or clarification of the attached list. I look forward to opportunities in the future to continue the dialogue on the climate policy issue.

Thank you.

Sincerely,

A handwritten signature in black ink, appearing to read 'W. O'Keefe', written over a circular flourish.

Enclosure

cc E. Holstein
E. Seidman
R. Brown

Additional U.S. Actions to Address Greenhouse Gas Emissions

U.S. industry recognizes the legitimate concerns about the potential long-term effects of increasing greenhouse gas emissions on the Earth's climate system. Increased energy efficiency reduces greenhouse emissions and most companies have sought to improve energy efficiency--and lower costs--since the 1970s. The EOP Group, for example, reported in 1993 that the U.S. achieved a 30 percent reduction in total energy consumption per unit of GDP from 1970 to 1990.

More recently, companies have launched their own initiatives or joined in government/industry voluntary programs aimed at limiting carbon dioxide, methane and other fossil fuel emissions, both in response to the Framework Convention on Climate Change, which entered into force on March 21, 1994, and to the U.S. Climate Change Action Plan that was released in October 1993. To date, while overall results of industry's efforts are positive, the magnitude remains uncertain, both because the greenhouse gas programs are so new and because the federal reporting system does not capture all private sector actions.

Some have responded to this uncertainty and to statements that we face catastrophic consequences if emissions are not reduced promptly by proposing policies and measures that would mandate substantial near-term emission reductions. This strategy is inconsistent with the current state of climate science and with a growing body of economic analyses. Current proposals for near-term emission reductions would be extremely harmful to the U.S. economy, reducing output, costing jobs and placing U.S. industry at a competitive disadvantage. Moreover, the only way to achieve such reductions in a 10-15 year timeframe is by a large energy tax.

A more productive approach would include the following actions:

- o government and industry cooperatively identify and assess cost-effective, flexible voluntary programs;
- o a policy and investment environment that would be conducive to increased private investment in new technologies and processes;
- o impediments to the economic turnover of energy-inefficient capital stock should be identified, reviewed and modified or removed;
- o tax rules should be reviewed to explore the possibility of fostering greater investment in new energy-efficient R&D; and,

- o an investment climate should be developed to encourage the export of U.S. energy-efficient technologies to developing nations.

The following list identifies several opportunities for government/industry cooperation.

o Identify, Expand and Report Cost-Effective Near-Term Actions

- work with government to expand vehicle scrappage programs aimed at reducing emissions from older vehicles
- work with government officials to identify, assess and expand the most cost-effective programs within the U.S. Climate Change Action Plan
- ensure intellectual property rights and patents protection for climate change technologies and discoveries
- remove impediments to the voluntary reporting of company programs and public/private programs aimed at limiting emissions

o Stabilize the Policymaking and Investment Environment

- focus funding of policy-relevant research on reducing major uncertainties about the climate system and on improving the accuracy of climate models, particularly with respect to possible regional impacts, and the role of oceans, clouds and water vapor
- encourage private investment in climate change research
- encourage corporations to include climate change considerations in their long-range business plans

o Accelerate Capital Stock Turnover

- reduce corporate tax rate
- revise depreciation rules to remove any disincentives to the early retirement of energy-intensive equipment and facilities

- change regulations that now discourage capital stock turnover (e.g., Superfund and impediments in the Clean Air Act to new investments)

o Stimulate Investment in Climate Change R&D

- explore the desirability of incentives aimed at increasing private sector R&D in energy-efficient technologies
- request the Treasury Department identify tax barriers that discourage investment in new energy-efficient R&D technologies and processes
- identify ways to encourage corporations to review current R&D plans and budgets and to consider enhancing investments in new energy-efficient technologies and processes
- explore ways to identify promising private technologies and whether accelerated commercialization would help limit greenhouse gas emissions

o Strengthen Climate Change Technology Investment Abroad

- take steps to remove "additionality" as a criteria for "Joint Implementation" activities
- work with international bodies to broaden "sovereign risk insurance" to cover political and other risks to foreign direct investment in technologies aimed at reducing greenhouse gas emissions
- examine export restrictions to see if any unnecessarily constrain the export of U.S. climate technologies
- work with foreign governments to increase direct investment opportunities in a way that provides an opportunity to earn an adequate return on investment
- protect intellectual property rights and patents on technologies transferred

CRITIQUE OF "THE COSTS OF CLIMATE PROTECTION:
A GUIDE FOR THE PERPLEXED," BY THE WORLD RESOURCES INSTITUTE

EXECUTIVE SUMMARY

The World Resources Institute (WRI), a leading environmental organization, has produced a study which purports to examine the costs of policies to deal with climate change. The study's approach is to examine assumptions made by economists who have modeled climate change policy, and the effects on results these assumptions have. WRI divides versions of six of these assumptions into two categories; "optimistic" and "pessimistic." The organization then argues that the results of climate policy depend on which grouping of assumptions is chosen; more "optimistic" assumptions suggest lower costs or even benefits from climate change policy, whereas "pessimistic" assumptions suggest higher costs. WRI's own preference is for a federal carbon tax, with revenues from the tax recycled via reductions in other taxes. WRI's judgment is that such a policy would result in net economic benefits for the United States over the long run.

While it is obvious that analytic results depend on the assumptions made, WRI's study is highly misleading and policy conclusions based on its approach unsustainable. This is so because:

- The economic modelling results reported by WRI were not produced for the purposes WRI puts them to. Rather, WRI has taken a set of results produced to answer one set of questions to address another. Economists use idealized assumptions to answer certain questions; these are neither "optimistic" nor "pessimistic." Were economists instead asked to apply realistic assumptions to climate policy proposals, the results likely would show far higher costs than even the most pessimistic reported by WRI. Yet WRI is arraying idealized modelling results, done for other purposes, to suggest what actual climate policy would mean.

- Some of the results presented are clearly unrealistic. For example, according to a figure in the study which summarizes the results of 16 models included by WRI, carbon abatement of up to one third in the United States is about as likely to increase GDP as to decrease it, and carbon abatement of as much as 97% or 98% (ending the bulk of electricity production and almost all present transport in the U.S.) can be accomplished with only a small percentage reduction in GDP.

- Competitiveness problems that would arise if the U.S. and other developed countries adopted climate change policies while other countries did not are treated as inconsequential by WRI even though there is ample reason to believe such problems could be substantial and could easily lead to protectionist policies by the developed world.

While the presentation of unrealistic results and downplaying of potentially serious problems are sloppy practice, WRI's inappropriate use of economic modelling results is of a more serious nature. Indeed, the confusion caused by WRI's inappropriate presentation of economic modelling results is an outright disservice to furthering the climate debate.

INTRODUCTION

The World Resources Institute, a leading environmental organization, has produced a study that purports to examine economic models which estimate the costs of climate change policy.¹ The purpose of the study, according to its introduction, is to sort out confusion over what such costs may be. The methodology is to examine assumptions made by economists who model climate change policy and the effects on results these assumptions have. A wide variety of models and their assumptions are included, and graphs are offered showing the effects of different assumptions and their consequences for costs. Assumptions then are labeled according to whether they are "optimistic" or "pessimistic" and outcomes of climate policy shown to change according to which grouping of assumptions is chosen. WRI argues that by so doing it is giving the reader the opportunity to decide for himself what is realistic. However, WRI also offers its own judgments about such realism, and proposes that a carbon tax be imposed in the U.S., or else that tradable permits be auctioned off. In defending the climate policies it advocates, WRI argues that a carbon tax would have small negative consequences for the economy, that proper redistribution of the tax proceeds and the use of international joint implementation would further reduce the negative impact, and that when benefits of climate change policy are included such policy would have positive long run economic effects.

Non-economists may be inclined to view the WRI study as a straightforward attempt to parse out the key assumptions that drive climate policy modelling, and even may accept as accurate WRI's labeling of these assumptions as "pessimistic" or "optimistic." If so, such readers will have accepted WRI's methodology as fairly representing how economists have analyzed the issue.

In fact, however, WRI has grossly misrepresented economic analysis of climate change policy, and has done much more to obscure than to elucidate its consequences. What matters for climate policy costs is not what sorts of simplifying assumptions about such policy that economists make, but what policies actually might be adopted. In fact, in approaching a problem of this sort, economists do not make "optimistic" nor "pessimistic" assumptions; rather, they make idealized assumptions in order to facilitate analysis of certain key variables affecting policy. Thus, to take just one example from the

¹ The Costs of Climate Protection: A Guide for the Perplexed, Robert Repetto and Duncan Austin, World Resources Institute, 1997.

WRI study, economists have shown that international joint implementation can much reduce the worldwide costs of climate policy. However, it is not “optimistic” for an economist to include such joint implementation in a modelling exercise nor is it “pessimistic” to exclude it. To understand whether joint implementation in fact will reduce the costs of climate policy, one must assess what might actually happen with joint implementation, whether some countries or none will adopt it, how it will be measured and monitored etc. Economists may have opinions about these things, but that is not what they model. As it happens, widespread international joint implementation is highly unlikely to occur, because most of the nations of the world oppose it. Nevertheless, many economic models might well continue to incorporate such joint implementation for purposes of understanding just how much could be saved and to whom the savings would accrue. This would not be “optimistic,” but rather doing what economists conventionally are asked to do. WRI thus has misappropriated the results of economic analyses of climate policy, taking the results of highly idealized modelling done for other purposes and presenting them as economic analyses of actual policy implementation.

As to WRI’s own policy predilections, the organization has long advocated actions to reduce carbon dioxide in the United States. The new study tries to provide an economic rationale for doing so, but the method behind it is so flawed that the conclusions are little more than the authors’ opinions. There is nothing wrong with offering such opinions, but they should then be labeled as such, and not the result of what economic modelling implies.

MODELS AND ASSUMPTIONS

The notion of examining the results of various economic models to understand why differences arise has precedent in economics. For example, the Stanford University Energy Modelling Forum (EMF) has institutionalized this approach, and has twice examined a range of climate change models.² Indeed, a 1993 economic journal article discussing one of EMF’s studies of climate change identifies many of the same cost-affecting variables that WRI does.³ The authors, however, do not make claims as to what costs of actual climate policy will be.

WRI has chosen to include a wide variety of models in its approach, and stresses that different results spring from different assumptions. The WRI study goes on to identify six key assumptions that most affect results associated with modelling of climate change policy; efficient versus inefficient economic response, availability of a non-carbon backstop fuel, joint implementation, recycling of carbon tax revenues, benefits from reducing climate change, and other environmental benefits. In each case, assumptions made by economic modellers are labeled as “optimistic” or “pessimistic.” Thus, for

² EMF’s work on climate change is primarily contained in EMF-12 and EMP-14, the twelfth and fourteenth of its comparison studies of economic model.

³ “Model Comparisons of the Costs of Reducing CO₂ Emissions,” by Darius W. Gaskins, Jr. and John P. Weyant, American Economic Review, May 1993.

example, it is “optimistic” to assume an efficient economic response to climate policy and “pessimistic” to assume a less efficient one. As we shall see, this categorization grossly misrepresents how economists approach such matters.

WRI PRESENTATION OF MODELLING RESULTS

WRI’s presentation of results is largely captured in three figures within the report, which are here attached. Figure 1 shows a range of GDP impacts from carbon abatement according to some 16 economic models. According to the figure, for reductions of up to about 33% from the base case, the results are as apt to be positive as negative for GDP, though for reductions beyond 33% the results generally turn negative. However, even for reductions from the base case of 97% to 98%, which would mean almost complete abandonment of fossil fuels in the United States, most of the results indicate fairly small percentage reductions in GDP, less than 4%, and one model even predicts that this will result in GDP gains.

Figure 2 presents the modelling results differently, this time demonstrating that, depending on the particular assumptions utilized, GDP can fall, rise, or stay about the same with carbon abatement of up to about 60 percent in 2020. The assumptions cover not only costs associated with implementation of carbon abatement measures, but also recycling of revenues from imposition of a carbon tax and possible economic benefits to the economy from reducing or preventing climate change.

In Figure 3 the results of the models are presented in a slightly different way. Here the case chosen is stabilization at 1990 levels of CO₂ emissions in 2020, while assumptions vary. The figure indicates that under “worst case” assumptions there can be a loss of slightly over two percent of GDP while under “best case” assumptions the GDP could rise by about the same amount. Again, assumptions cover not only various aspects of macroeconomics costs but also possible environmental benefits plus effects of revenue recycling.

POLICY ADVOCACY

WRI’s report does not limit itself to a discussion of economic models and their varying results. Instead, it offers judgments as to what assumptions are reasonable, and advocates a particular course of action. According to WRI, it is unreasonable to think that climate policy will impose large percentage reductions in GDP though there likely will be some cost to such policy even if there is joint implementation. However, after asserting that a carbon tax is superior to tradable permits or other means to reduce carbon use in the U.S., WRI argues that appropriate redistribution of the tax revenues can aid the GDP, and that with proper accounting for economic benefits from climate change policy, GDP likely will be slightly higher if a carbon tax is imposed for the purpose than if it is not. WRI states too that competitiveness concerns are essentially inconsequential and can

be ignored. From all this, WRI concludes that economic impacts of climate policy are no longer the issue; the real questions are how to implement such policy fairly within the U.S., and broadly among leading nations.

CRITIQUE OF WRI

To address the WRI analysis, one needs to understand how economists approach analysis of a policy issue such as climate policy, and then exactly what climate change policy entails. Both have implications for what WRI asserts in its study.

In any modelling exercise, economists have to simplify and to make idealized assumptions in order to make their analyses tractable. Generally, the nature of the problem they wish to analyze dictates just which assumptions they idealize and which not. For example, many economists have examined climate policy by assuming that a carbon tax would be utilized, that such a tax would entail no administrative costs, and that it would be applied uniformly throughout the economy to achieve the desired result. In doing so, they realize that this is an oversimplified and idealized set of assumptions, not a realistic one, but it allows derivation of macroeconomic impacts that later can be compared to those using other assumptions or other policy options.

As another example, some economists use general equilibrium models to assess the consequences of a policy that moves the economy from one set of equilibrium conditions to another. Such a model tends to ignore whatever transition costs there may be in order to try to capture the full interactions that occur among economic agents within the economy as it moves from the one state to the other. No economist using this approach would claim his model has fully captured all of the costs of a policy such as climate policy, but no such economist would accept that they have made "optimistic" assumptions with regard to such costs either. Rather, they would say that their purpose was to understand the full general equilibrium consequences of the policy, and not the costs of the transition.

The distinction between how economists actually approach problems and the way WRI characterizes their approach is crucial. If economists were to be asked to analyze the impacts of actual climate policy initiatives, they likely would make very different assumptions than the ones WRI has labeled as "optimistic" or "pessimistic." As will be seen, more "realistic" assumptions actually would be far more pessimistic than what WRI has represented as such. As a result, economists asked to model climate policy as it likely would be implemented probably would estimate actual costs that would be much higher than what WRI suggests. In any case, they would not accept such an outcome as "pessimistic." Rather, they would simply match their analytical results to the specific question being asked.

Before commenting on each of the key assumptions that WRI identifies, it will be useful to briefly describe what climate policy entails. Such description also will shed light on the various charts that WRI presents in its study.

The basic notion of climate policy is to constrain the U.S. economy to use less fossil fuels than it otherwise would; i.e., to curb options for such use in consumption and in the production of goods and services.

A good illustration can be seen in the often-mentioned notion of returning U.S. CO₂ emissions back to their 1990 level by the year 2010. According to U.S. Department of Energy estimates, that implies reducing carbon emissions some 22.3% below what they otherwise would be in that year. As a first approximation, such a result could be achieved by reducing the use of each of the major fossil fuels by that amount. That would reduce oil and coal use to well below what it is today, in 1997, and natural gas use to about today's level, but with a GDP in 2010 that is considerably higher than today's. Other options of course are possible. The Administration has modelled various such options, with some reducing coal use more in order to leave room for more use of oil and gas. Still, with non-fossil fuel sources such as nuclear and hydroelectric power (the principal renewable fuel used in the U.S.) either expected to decline or not to increase over the period, it is not obvious how the reduced fossil fuel use will be replaced. Some have suggested that energy conservation can do so at low cost, but in its modelling analyses of climate policy the Administration already assumes an annual increase in U.S. energy efficiency of 1.25%. As this already is some three times the actual annual rate of increase of the past ten years, it would seem difficult to increase the rate much beyond this without substantial economic consequence.

The point is that even the stabilization scenario analyzed by the Administration would impose serious constraints in the use of energy on the U.S. economy. In that light, how realistic are the model results as presented by WRI? First, with reference to figure 1, the notion that the GDP will increase with substantial fossil fuel reduction can be ruled out.

Constraining the economy in the way contemplated may impose greater or lesser costs depending on timing, how it is done, etc., but it surely will not be costless. WRI mentions this in the text of its report, though figure 1 as presented indicates that over a wide range of carbon abatement the chances for GDP gain are about as great as for loss.

There is another aspect of figure 1 that raises question. According to the figure, most economic models suggest fossil fuel use can be reduced almost to zero in the United States at very low cost in terms of GDP lost, perhaps two to four percent. This means for example that the U.S. can almost entirely forego the use of coal and natural gas for heating, cooling, electricity generation and production processes, and the use of gasoline and diesel for transport, at fairly low cost. WRI does not report what time period the estimates refer to, but over any policy-relevant timeframe this result would appear

untenable. Again, the impression is left that climate policy can be implemented at surprisingly low cost when the reality likely is very different.

One other comment on the absence of a time frame in Figure 1. Many microanalyses of climate change policy have concluded that even with changing technology, costs of abatement policy are likely to rise with time. That is so because holding CO₂ emissions constant with an expanding economy places ever greater constraints on production processes and on transport involving the use of fossil fuels. It is always possible to assume these dynamic results away through use of optimistic notions about new technologies, but realistically it is more likely that ever-tightening constraints on energy use will lead to ever increasing costs of climate policy. WRI's report does not discuss this.

Figures two and three in the WRI report summarize what it characterizes as the key assumptions that drive macroeconomic analyses of climate policy. The message of WRI's report is that there is no reason to choose worst case-type assumptions; a more optimistic set indicates the costs of climate policy can be cut substantially, or even reversed. What can be said about the assumptions listed by WRI?

EFFICIENT VERSUS INEFFICIENT ECONOMIC RESPONSE

This refers to assumptions made about the flexibility of an economy to respond to changed policies. WRI assesses this by looking at the difference in costs of climate policy as judged by macroeconomic models, which provide for transition costs within an economy that is reallocating resources in the face of new policy initiatives, and general equilibrium models, which move costlessly from one resource allocation equilibrium to another. In reality the two types of models address different types of questions, the former what sorts of costs arise during a policy-induced transition and the other the economic consequences of moving from one equilibrium versus another. Because they have different purposes, comparisons between them are misleading. Nevertheless, in WRI's judgment, a "pessimistic" assumption is that there are transitional costs to resource reallocation while an "optimistic" assumption is that there are none. Though there is debate as to how high such costs might be, no economic modeller, including general equilibrium modellers, argues that these costs actually are zero.

Not captured in this part of WRI's analysis is how flexible the policies themselves are. For simplicity and tractability, almost all economic modellers assume that climate policy implementation will be economically efficient, for example via carbon taxes which are implemented uniformly throughout the economy and with zero administrative cost. But actual policy implementation invariably is not uniform and not low cost. Thus, for instance, much of U.S. environmental policy has been implemented through command and control techniques, i.e., specification of technologies to be used to achieve given environmental goals. Economists long have indicated such methods are highly

inefficient. However, political analysts have argued that costs of such policies are hidden from the public and therefore are more politically efficient. If so, why should climate policy be any different? In other words, if the question were what might actually be done, wouldn't it be realistic to assume that such policy would be implemented at least partly through the same types of techniques? And even if a carbon tax were to be imposed as part of a climate policy mix, why suppose that it would be uniformly and cheaply applied throughout the economy? When the present Administration proposed a BTU tax several years ago, it had different rates for different fuels in order to achieve a variety of political objectives. The BTU tax also was thought to be costly to administer. Why assume it would be different with a carbon tax? The modelling results reviewed by WRI do not reflect such difficulties because that was not their purpose. Were economic modellers to examine a more likely set of climate policies, they almost certainly would show much higher costs than the results reported by WRI. Labeling this "pessimistic" is beside the point; what matters is whether it reflects reality.

AVAILABILITY OF A NON-CARBON BACKSTOP FUEL

The WRI report divides assumptions on this matter between no backstop versus availability of a backstop. In this respect, economic modellers have found that if no non-carbon backstop is specified in climate policy models, the results indicate extremely high levels of taxes necessary to achieve standard policy objectives. Since such high taxes are regarded as politically impossible, the specification of a non-carbon backstop allows the modellers to impose a constraint on how high such taxes may go.

In reality, the issue is not about the political feasibility of high carbon taxes, but what actual non-carbon backstops will cost and whether their costs will increase or decrease with increasing use. Some have argued that backstops will fall dramatically in cost once scale economies are realized, or that their technologies will advance rapidly from where they are today. But much of this is speculative. Some non-carbon backstops such as geothermal energy clearly would increase in cost if much more extensive use were made of them. And some technologies, such as solar power, might experience reduced production costs through improved technology but would demonstrate increasing costs if applied in increasingly less attractive locations. While it is plausible that non-carbon technologies would receive increased attention with policies to reduce carbon use, it is neither optimistic nor pessimistic - simply realistic - to expect that costs of most such backstops are likely to remain relatively high for some time to come.

JOINT IMPLEMENTATION

As stated earlier, many economists have found that joint implementation could greatly decrease the cost of implementing climate policy in the United States. Unfortunately, however, much of the opportunity to reduce costs occurs in non-Annex I

countries, i.e., in countries which are not required to reduce carbon emissions under the Framework Convention. As is well known, such countries have adamantly opposed any constraints on their carbon emissions. And most of them have opposed international joint implementation because it implies that such constraints will exist. So long as no such constraints exist, joint implementation remains difficult because there is no benchmark against which to judge what reductions are taking place. As a result, WRI's use of the presence of joint implementation as a test of "optimism" versus "pessimism" in economic modelling is highly misleading. The reality is that for some time there will be no meaningful joint implementation of the sort economists have modelled under the framework convention as now written. Economists who omit it from their cost analysis are not being pessimistic, merely realistic. And economists who include it are not necessarily optimistic, but rather are interested in the analytic outcome. WRI's classification thus again is meaningless, and its judgments of no practical use.

RECYCLING OF TAX REVENUES FROM A CARBON TAX OR AUCTIONED PERMITS

Yet another variable identified by WRI is whether or not government revenues from a carbon tax or from auctioned tradable permits would be recycled via cuts in other taxes that in themselves would increase the efficiency of the economy. The report distinguishes models which contain such recycling ("optimistic") from those which merely assume lumpsum redistribution of the monies collected ("pessimistic").

Here two points are important. First, the economics literature on environmental taxes reveals that an environmental tax such as a carbon tax, even with recycling of the revenues towards reduction of income taxes, may not improve the efficiency of the U.S. tax system. This is because carbon taxes are themselves taxes upon labor and capital through their impact on the cost of energy, and thus can exacerbate existing inefficiencies of the tax system. Because of this, even with recycling of revenues back towards capital and labor the tax system may be no more efficient than before.

Second, WRI's categorization of assumptions regarding revenue recycling should be seen in context. Economists traditionally have used lumpsum redistributions of tax revenues from carbon taxes as an analytic convenience because they wanted to isolate the effects of climate policy from those of other policies, namely tax reform. Separately, many economists have demonstrated that the efficiency of the U.S. economy could be improved through a reorganization of the U.S. tax system, specifically by greatly reducing taxes on capital income and by also reducing taxes on labor income. In effect, the WRI report is suggesting that models that combine climate policy with tax reform policy are using "optimistic" assumptions, while those that analyze climate policy by itself are using "pessimistic" ones. This is confusion. No climate policy model assumes that fundamental tax reform will take place. At most, such models merely show that if tax reform were included as a component of climate policy, and if it did not exacerbate existing inefficiencies, then costs of such policy could be reduced.

How likely is that? The tax structure of the United States may be economically inefficient as pointed out by economists, but presumably it is politically efficient, i.e., it is the outcome of a competitive political process given the distribution of political power in the United States. Arguing that climate policy revenues could be used to economically efficiently redistribute the tax burden implicitly amounts to arguing that somehow climate policy can be used to redistribute political power in the United States. For if not, the very political conditions that yielded the present tax system will prevail. In other words, relatively high taxes on capital are unlikely to be drastically reduced because of climate policy if they cannot be reduced without such policy. So, the form of the U.S. tax system might be changed with a carbon tax, with some taxes increasing and others reduced, but it is hard to see why the economic inefficiencies (and political efficiencies) that now exist would be dramatically changed. Under these conditions, the notion that it is “pessimistic” to leave tax reform out of climate policy analysis or “optimistic” to include it is misleading. Good economic analysis can deduce the consequences of policy change, but that is very different from analyzing whether it will or will not happen.

BENEFITS FROM AVOIDING CLIMATE CHANGE DAMAGES AND REDUCING CONVENTIONAL AIR POLLUTION

Having argued that costs of climate policy would be small when joint implementation is used and tax reform is counted as part of such policy, WRI goes on to argue that including benefits from reduced climate change damages and from reduced conventional air pollution reverses the outcome - i.e., results in net long run economic benefits.

There are problems with this argument, however. First, the WRI study uses 2020 as its benchmark. Few if any studies predict much climate change impact in that timeframe.

Second, because the time lags involved actually are more like fifty years or more, it is very difficult to estimate the economic impacts of climate change. However, some studies of long range climate change for the U.S. tend to show GDP gains because of an increased growing season and increased recreational opportunities. While others estimate that potential GDP costs will exceed any such gains, there is no consensus among economists as to what impact on U.S. GDP climate change will have. Thus, there is no basis for concluding that policies to reduce climate change will have the benefits WRI asserts.

As to reduced conventional air pollution, the fact is that under the Clean Air Act conventional air pollutants already are controlled through other means. Thus, it is hard to see why climate policy should be credited with the benefits. At most, one might argue that climate policy could reduce the costs of achieving Clean Air Act goals by forcing

pollution reductions that otherwise would have to be accomplished in other ways. But even this is ambiguous; in some ways climate policy might make reduction of conventional air pollution more difficult. For example, reformulated gasoline is one means used to reduce smog, but such gasoline requires more energy (more carbon) to produce than conventional gasoline. Also, policies to encourage reforestation would provide carbon sinks, but also would increase hydrocarbon emissions, an ozone precursor. Thus, in these instances, climate policy would make cleaner air policy more expensive, not less.

U.S. COMPETITIVENESS

WRI concludes its discussion with some remarks on U.S. competitiveness, asserting that little or no damage would be done to such competitiveness through implementation of climate policy initiatives in the U.S. even if many other countries did not implement such policies. For the most part this discussion refers to other Annex I countries or to instances where non-Annex I countries recently have raised energy taxes. However, it is difficult to see the relevance of this discussion. The competitiveness question is what the consequences would be, in the future, if the U.S. imposed a carbon tax or a tradable permit system while countries outside of the OECD did not. Nothing in the WRI study provides information pertinent to that question. Generally speaking, economic modelling has shown that some U.S. production activity will shift abroad, and that the carbon dioxide increases elsewhere that result will somewhat offset the reductions in the U.S. How much activity shifts and at what rate depends upon how great the initial carbon tax might be, at what rate it increases with time, whether the non-OECD countries eventually accept carbon limits, and whether the U.S. and other developed countries impose trade barriers against such countries. Despite WRI's disclaimers, it is clear that such shifting can have serious economic consequences for the U.S., and that if these occur trade protection is a real possibility. Downplaying such consequences is neither "optimistic" nor "pessimistic;" rather, it is "unrealistic."

NATIONAL ASSESSMENT ISSUES

- 1. INABILITY TO PREDICT REGIONAL IMPACTS***
- 2. CLIMATE MODELS CONTRADICT EACH OTHER***
- 3. THE SYSTHESIS DOCUMENT IS OVERTLY BIASED***
- 4. THE SYSTHESIS DOCUMENT IS FULL OF ABSURIDITIES***

1. INABILITY TO PREDICT REGIONAL IMPACTS

“Regional analyses” is used by the National Assessment to identify and characterize potential consequences of climate change on specific geographic regions of the country. According to the National Assessment’s Synthesis report (page1) *“The science of global climate change is developing rapidly and scientists are now starting to be able to project changes at the regional scale as well as to identify the types of consequences that climate change will bring.”*

Here’s what other’s think about whether regional impacts can be forecast reliably:

- ◆ **Working Group II to the IPCC Second Assessment:**

Climate Change 1995 – Impacts, Adaptation and Mitigation of Climate Change: Scientific-Technical Analyses, Cambridge University Press (1996)

Page 24: *“... quantitative projections of the impacts of climate change on any particular system at any particular location are difficult because regional scale climate change projections are uncertain; our current understanding of many critical processes is limited; and systems are subject to multiple climatic and non-climatic stresses, the interactions of which are not always linear or additive.”*

- ◆ **IPCC Working Group II:**

“The Regional Impacts of Climate Change, An Assessment of Vulnerability”, A Special Report of IPCC Working Group II, (1998) (517 Pages)

Preface: *“Because of the uncertainties associated with regional projections of climate change, the report necessarily takes the approach of assessing sensitivities and vulnerabilities of each region rather than attempting to provide quantitative predictions of the impacts of climate change.”*

Page 22: *“Because the available studies have not employed a common set of climate scenarios, and because of uncertainties regarding the sensitivity and adaptability of natural and social systems, the assessment of regional vulnerabilities is necessarily qualitative. Often only very general conclusions can be supported by the currently available evidence.”*

- ◆ **Tom M.L. Wigley:**

“The Science of Climate Change, Global and US Perspectives,” Pew Center on Global Climate Change, National Center for Atmospheric Research (June 1999)

Page 22: *“To assess the importance of these [global-mean] changes to the United States and to plan adaptive strategies to minimize potential damages, we need to have*

information about the spatial details of climate change and their associated uncertainties. This information can be obtained only by using computationally-demanding GCMs [general circulation models] of the climate system; and even here, the spatial resolution of such models is quite coarse – 200 km at best.”

Page 48: “[W]hile we may even now be able to identify the human component of global-mean temperature change above the noise of natural variability, **we cannot yet confidently identify the human component on small (sub-continental) scales.**”

◆ **Dr. J.D. Mahlman:**

Uncertainties in Projections of Human-Caused Climate Warming, by Dr. J.D. Mahlman, Director of the Geophysical Fluid Dynamics Laboratory, National Oceanographic and Atmospheric Administration, Princeton University, *Science Magazine*, (11/21/97)

*“There are a number of statements in informal writings that are not supported by climate science or projections with high-quality climate models.... **There is a large demand for specific climate change predictions at the regional and local scales where life and life support systems are actually affected. Unfortunately, our confidence in predictions on these smaller scales will likely remain relatively low.**”*

◆ **Pew Center:**

Study on Water and Global Climate Change, Executive Summary, released 9/29/99

Page 1: *“Global climatic changes will have major effects on precipitation, evapotranspiration, and runoff. But estimating the nature, timing, and even the direction of the impacts at the regional and local scales of primary interest to water planners involves many uncertainties.”*

Page 4: *“The ongoing National Assessment of the impacts of climate change on the United States is evaluating the implications of two different models – the Hadley and Canadian GCMs (General Circulation Models.... Results based on these GCM outputs as well as more detailed regional studies emphasize two points: **the detailed regional impacts of a greenhouse warming on future water supplies are uncertain** and runoff is sensitive to changes in temperature and precipitation.”*

2. CLIMATE MODELS CONTRADICT EACH OTHER

Canadian Model	Hadley Model
<i>Climate Change</i>	
↓ Decreased storm counts in the Northeast ↑ Increased tendencies for severe drought in the Northeast ↓ Less precipitation than present ↓ Decreased soil moisture in the Southeast ↑ Increased frequency and intensity of droughts in the Midwest ↓ Reduced soil moisture content in the Midwest ↓ Decrease in precipitation in southern Plains states and increases in northern Plains	↑ Increased and stronger storms in the Northeast ↓ Decreased tendencies for drought in the Northeast ↑ More precipitation than present ↑ Increased soil moisture in the Southeast ↓ Decreased frequency and intensity of droughts in the Midwest ↑ Increased soil moisture content in the Midwest ↑ Increase in precipitation over much of the Great Plains region
<i>Agriculture</i>	
↓ Reductions in crop yields in the Southeast	↑ Enhanced crop production in most areas of the Southeast
<i>Water</i>	
↓ Decrease in runoff for the Susquehanna River Basin	↑ Increase in runoff in the Susquehanna River Basin
<i>Forests</i>	
↓ Decline in forests in the Midwest due to higher temperatures increasing forest fire potential and making current forestlands more susceptible to pests and diseases	↑ Increase in tree growth rates in the Midwest due to higher temperatures coupled with beneficial effects of increased CO₂

3. THE SYSTHESIS DOCUMENT IS OVERTLY BIASED

Even good news is dampened with ominous warnings.

For example, the National Assessment concludes that overall U.S. crop productivity is expected to increase as a consequence of climate change. This is good news. It means lower prices for consumers, and more abundant food. But the National Assessment does not highlight this very important positive outcome. Instead the executive summary notes (bullet 2) that *“falling prices and competitive pressure may stress farmers throughout the U.S.”* A fair and unbiased account would have taken note of the good news, too.

Similarly, a key finding in the Executive Summary of the synthesis document (bullet 4) is that *“Forest productivity is likely to increase initially in some areas as trees respond to higher carbon dioxide levels, but over the longer term, changes in larger-scale processes such as fire, insects and disease may negatively impact forests.”* However, there is substantial evidence in the foundation document (Chapter 11) indicating that the future may not be as dire as this sentence would have the reader believe. A balanced approach would say this: *“Forest productivity is likely to increase ~~initially~~ in some areas as trees respond to higher carbon dioxide levels. ~~but~~ Over the longer term, changes in larger-scale processes such as fire, insects and disease **may or may not** negatively impact forests.”*

The synthesis document sensationalizes the most adverse affects of climate change by omitting key facts from the more balanced foundation documents

For example, in the overview of the Midwest region the reader is warned that the Great Lakes levels could decline by as much as 5 feet, and that this would lead to a large reduction in the outflow of the St. Lawrence Seaway, which in turn would adversely effect transportation on the Great Lakes. These results are generated by the hotter Canadian Model. The reader is not told the results of the Hadley model reported in the foundation document, but omitted from the synthesis document. It shows the Great Lakes levels *increasing* by as much as one foot, and that the outflow from the St. Lawrence Seaway would also *increase*, thus facilitating transportation! This kind of omission grossly misleads the reader. It is dishonest.

In another example, the number one key finding on health impacts which was reported in the foundation document (chapter 15, page 13), but omitted from the synthesis document is that *“Climate variability and change **will likely have both positive and negative** consequences for human health in the U.S.”* Instead the reader of the synthesis document is left with the impression that the impact on human health will be pervasively negative.

4. THE SYSTHESIS DOCUMENT IS FULL OF ABSURIDITIES

Here are some examples:

- ◆ **Embarrassingly Patronizing:**

In the section on Native Peoples and Homelands (page 51 synthesis document) it is noted that climate change is affecting the timing of the migration of waterfowl and other species, which in turn affects the oral traditions used by Native Peoples to teach and prepare for planting, hunting, fishing, and gathering. This section's mournful conclusion that "*with climate change, the traditions that have sustained these peoples over many, many generations will no longer match the changing world*" is embarrassingly patronizing and condescending.

- ◆ **Silly:**

The notion that crime in the Northeast will be enhanced by climate change (page 23 synthesis document) is silly.

- ◆ **Incredulous Stretch:**

The idea that climate change **could** enhance extreme weather events, which **could** then have an adverse impact on mental health, which would increase the incidence of post traumatic stress disorder (page 67 of the synthesis document) is quite a stretch.



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Vice President Al Gore: Putting Natural Gas in the Balance

Published: 3/1/99



Vice President Al Gore proclaims natural gas "vital" in meeting the world's increasing energy and environmental needs.

For years, Al Gore has placed a high priority on environmental issues. As the senior senator from Tennessee, he worked to reinvigorate the popularity of Earth Day and wrote a best-selling book, *Earth in the Balance: Ecology and the Human Spirit*, about the importance of protecting our environment. Now, as the 45th vice president of the United States, he's continuing his efforts to educate the public about the virtue of recycling, reducing pollution and using energy efficiently. In an exclusive interview with *American Gas magazine*, Vice President Gore discusses the prominent role natural gas plays in his vision of America in the 21st century.

AMERICAN GAS: *You have long championed the issue of climate change and the need to reduce carbon emissions worldwide. The administration has proposed a domestic strategy involving tax incentives and new research and development funding to spur clean energy technologies. What role do you envision for natural gas, particularly in the area of end-use technologies, in the effort to reduce carbon emissions?*

VICE PRESIDENT GORE: As we enter the 21st century, both the world's energy needs and our recognition of the need to address climate change will continue to grow. Natural gas will play an increasingly vital role in addressing both of these needs. We can expect to see growing use of natural gas in electricity-generating plants, heating and cooling units, and eventually for distributed power, such as fuel cells, microturbines and the like.

AMERICAN GAS: *With respect to the Kyoto climate treaty, how does the administration intend to ensure the participation of developing countries in order to avoid economic imbalance? Will some type of emissions trading system be implemented?*

VICE PRESIDENT GORE: President Clinton and I have made it clear that we will not submit the Kyoto Protocol to the U.S. Senate for approval — a necessary step for U.S.

As we enter the 21st century, both the world's energy needs and the need to address climate change will grow. Natural gas will play an increasingly vital role in addressing

ratification — without meaningful participation by developing **both of these needs.** countries. A significant breakthrough was achieved at the climate negotiations in Buenos Aires in November: Argentina became the first developing nation to announce its intention to take on a binding emissions target within the same time period as the developed world. Kazakhstan made a similar pledge, and we are hopeful that other countries will follow. We will continue our vigorous diplomatic efforts to secure meaningful developing country participation.

Emissions trading — both domestic and international — is integral to a cost-effective climate change strategy. That is why the United States fought so hard to include emissions trading in the Kyoto Protocol. The Buenos Aires conference laid out a two-year plan for developing the rules and procedures for an international trading system that will allow us to reduce emissions at the lowest possible cost. Already utilities and other companies are exploring trading opportunities.

AMERICAN GAS: *The administration has emphasized the need to increase energy efficiency as well as reduce pollutant emissions. Central to this goal is the method for measuring energy efficiency and pollution. Measurements can be made two ways: (1) using a site-based approach at the point of energy consumption (home or business) or (2) using a total energy- or source-based approach, accounting for the entire process of energy production, transmission and end use.*

The Department of Energy (DOE) currently uses the site-based approach. A total energy approach, however, provides a more complete and accurate accounting of energy efficiency and pollution. Is the administration willing to reexamine its methodology for measuring energy efficiency and take into account the full fuel cycle?

VICE PRESIDENT GORE: I don't have to tell you that the "site versus source" debate is a long-standing one, and that the statutes and executive orders that have governed the accounting of efficiency benefits, using both of these methods, have not been consistent. The administration wants the best possible information to reach those making decisions about efficiency in buildings, equipment, appliance and the like. Energy Secretary Bill Richardson, working with AGA and others, is considering how to incorporate information relating to total energy use into all energy efficiency decisions to the extent permitted by statute. In addition, we are working to see that for federal energy management, we provide good information to those making efficiency investments on behalf of the federal government.

AMERICAN GAS: *You are a strong proponent of revitalizing our nation's cities through brownfields programs and other initiatives to protect against the hazards of suburban sprawl. What environmental benefits can be gained through these programs? How can natural gas utilities, longtime residents of urban communities, play a role in this effort?*

VICE PRESIDENT GORE: "Smart growth" strategies benefit the environment, the economy and our quality of life by reclaiming brownfields, preserving open space

economy and our quality of life by reclaiming brownfields, preserving open space and reducing air pollution. In many cases, these benefits are achieved by focusing on development opportunities in existing communities with existing infrastructure.

As you are well aware, the natural gas industry has deep roots in the communities it serves. As a result, it is ideally positioned to work in partnership with local government and the local business community to encourage new investment in clean-burning and efficient natural gas technologies in the residential, commercial and industrial sectors. These technologies can contribute to the revitalization of America's urban neighborhoods.

AMERICAN GAS: *The Low-Income Home Energy Assistance Program (LIHEAP) provides heating and cooling bill payment assistance to low- and fixed-income energy consumers, most of whom have annual incomes of \$8,000 or less. Due to federal budget pressures, LIHEAP has come under heavy scrutiny by Congress. Do you believe LIHEAP is an effective program, and will the administration continue its support for this program?*

VICE PRESIDENT GORE: The administration strongly supports this vital program. Funding for LIHEAP often is under attack and never has been sufficient to meet the full need. We are hopeful that as energy markets become more competitive, consumers will benefit from lower costs, helping the LIHEAP dollar go further. In addition, we hope that homeowner and landlord efforts to install efficiency measures, as well as continued work to weatherize homes, will further reduce home energy bills for low-income consumers.

AMERICAN GAS: *A case can be made that the combination of welfare reform and open competition in the energy market makes it more important than ever to have a sound LIHEAP program in place to protect low-income individuals. What are your views in this respect?*

VICE PRESIDENT GORE: America is enjoying unrivaled economic prosperity — real wages are up while unemployment and welfare caseloads are at their lowest levels in a generation. Even in good times, though, we must maintain a solid safety net for those in need. That is why this administration strongly supports LIHEAP. And that is why our electricity restructuring proposal includes a Public Benefit Fund to support, among other things, assistance for low-income energy consumers.

AMERICAN GAS: *Earlier you mentioned distributed power, which is the generation of electricity through small-scale technologies such as natural gas-fueled turbines and fuel cells. As the administration's point man on ensuring that America remains the world's technology leader, do you agree with those who think distributed power holds great promise for meeting the world's growing energy demands? Do you think electric deregulation will positively affect distributed power and vice versa?*

VICE PRESIDENT GORE: A restructured electricity market will provide many opportunities for distributed power to compete with more traditional central generation stations. The administration's electricity restructuring proposal would

harness the forces of competition to reduce the energy bills of American consumers by an estimated \$20 billion a year while substantially reducing greenhouse gas emissions. These twin benefits will be realized through the development and widespread use of new technologies and distributed power in the restructured market. Over time, the combination of distributed power generators, open grids and reversible meters could revolutionize the electric power industry in even more significant ways.

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Talking points on the NPC Study:

In 1992, the NPC produced a major study of US natural gas potential. The study established that a future characterized by sustained increases in natural gas use was both desirable and feasible. Since that time, the Administration has adopted a goal of increasing gas use as a cornerstone of its energy and environmental policies, predicting an expansion to a 30 TCF market by 2015 if not sooner. But in the seven years since the 1992 study, much has changed, and the 1999 study attempts to update the earlier assessment.

- First, faster than anticipated economic growth and electricity deregulation have caused gas demand to far exceed expectations. Actual 1990-98 growth was 69% higher than forecast in the high case scenario used in the 1992 study. The new study forecasts massive continued growth, with demand expected to expand by about a third in the next decade. Still, the study recognizes that even this forecast may be underestimated, if economic growth should exceed expectations or increasing environmental restrictions call for even greater substitution of gas for coal and oil.
- Second, technology has greatly enhanced our ability to find and produce gas both in traditional supply areas onshore and in the shallow waters of the Gulf of Mexico, as well as in new frontier areas in deep waters of the Gulf. Since the 1992 study, NPC estimates of the domestic resource base have increased 23%. Technology has also greatly reduced the environmental footprint associated with new development.
- Converting this growing potential into actual supply, however, is expected to be challenging. In 1998, for example, US natural gas production actually fell, after having risen steadily for several years. This study sets the stage for a review of ways in which government policy might work to invigorate the supply process, or at least not inhibit it.
- One of the principal barriers to achieving the required expansion of domestic supply is posed by government constraints on access to publicly owned lands. In two of the most promising frontier areas, namely the Federal offshore and the Rocky Mountains, access is already seriously restricted, and statements by some presidential candidates threaten to make it even more so. Gas resources of 76 TCF are located in currently restricted offshore areas of the Eastern Gulf of Mexico, the Atlantic, and the Pacific, near some of the fastest growing regional markets for such gas. In the Rocky mountains, over 40% of the potential gas resources are located on federal land closed to exploration or open only under highly restrictive provisions.

The report contains a number of constructive recommendations to reverse the growing inconsistency between the government's energy goals and its existing access policies. It proposes the establishment of an Interagency Work Group on Natural Gas to establish a long term strategy for responsible development of the nation's natural gas resource base. Such a group would be tasked with producing an inventory of the resource base on federal lands and the existing barriers to utilizing such resource, and developing a set of principles for promoting responsible development of such resources.

Edp
12/13/1999

NATURAL GAS

**A Draft Report
Prepared for the
National Petroleum Council**

**This is a working document
prepared by the NPC Committee on Natural Gas
solely for the review and consideration of the
National Petroleum Council.
Conclusions and recommendations contained herein
are preliminary and subject to substantive change.**

**This draft has not been considered by the
National Petroleum Council
and is not a report of the Council.**

DRAFT REPORT

November 16, 1999

DRAFT

December 15, 1999

Dear Mr. Secretary,

On behalf of the members of the National Petroleum Council, I am pleased to submit to you the results of the 1999 study on natural gas, entitled *Meeting the Challenges of the Nation's Growing Natural Gas Demand*. The objective for the study was to provide the requested advice on the potential contribution of natural gas in meeting the nation's future economic, energy, and environmental goals.

The Council is pleased to report that natural gas will continue to make an important contribution to the nation's energy portfolio well into the twenty-first century. Demand for natural gas will continue to increase as economic growth, environmental concerns, and the restructuring of the electricity markets encourage the use of natural gas. More than 14 million new customers will be connected to natural gas supply by 2015 and many more will find their growing electricity needs met by gas-fired generators.

The estimated natural gas resource base is adequate to meet this increasing demand for many decades, and technological advances continue to make more of those resources technically and economically available. However, realizing the full potential for natural gas use in the United States will require focus and action—by both the industry and the government—on certain critical factors. These factors include:

- Access to resources and rights of way
- Continued technological advancements
- Financial requirements for developing new supply and infrastructure
- Availability of skilled workers
- Expansion of the U.S. drilling fleet
- Lead times for development
- Changing customer needs.

Each of these factors can be positively influenced, but government and industry must act quickly, cooperatively, and purposefully to ensure the availability of competitively priced natural gas.

The National Petroleum Council stands ready to work with government to further discuss the results of this report and to implement the recommendations in order to meet the nation's growing gas demand.

Respectfully submitted,

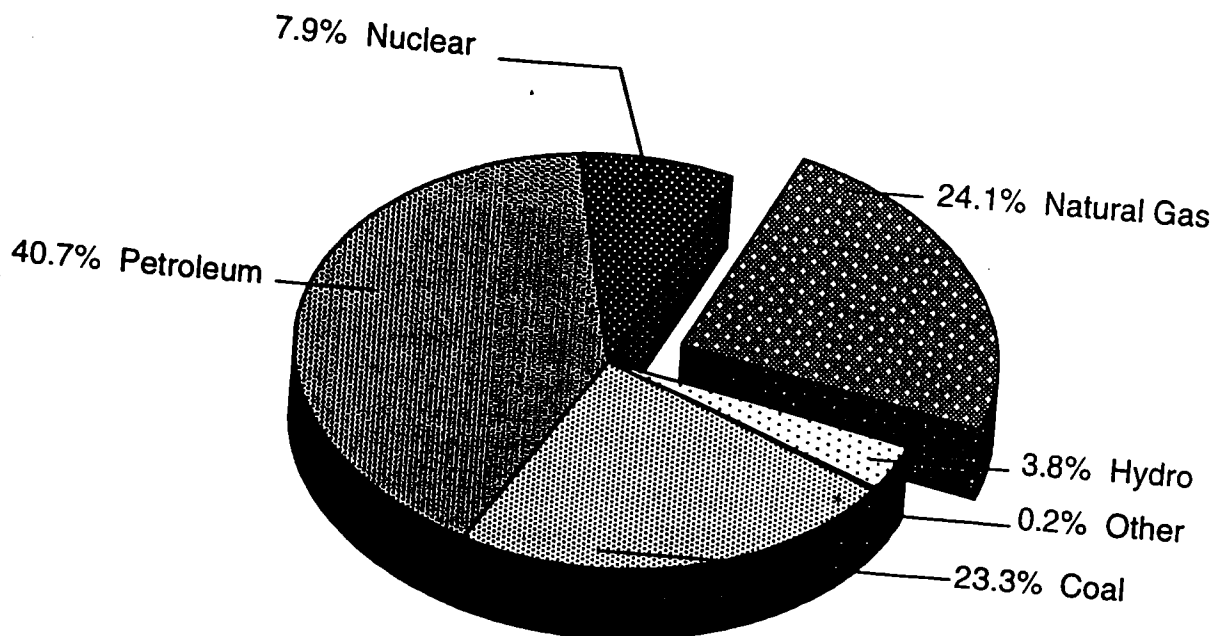
Joe B. Foster
NPC Chair

Conclusions

The emphasis on natural gas is good news for the economy, the environment, and society as a whole. In recent years, the United States has enjoyed a thriving economy, which has been driven in part by the ready availability of energy at competitive prices. Natural gas has played a vital role in meeting those energy requirements and today provides almost a quarter of the nation's energy portfolio (Figure 1). As this study demonstrates, natural gas can be a growing source of energy to power our economy for many years to come.

Actual U.S. gas demand has outpaced the 1992 study High Reference Case projection by more than 1 TCF over the period from 1990 through 1998 (Figure 2). This 1999 study now projects that U.S. gas demand will grow from 22 TCF (including net storage fill) in 1998 to approximately 29 TCF in 2010 and could rise beyond 31 TCF in 2015. Each key consumption sector—residential, commercial, industrial, and electricity generation—will increase (Figure 3a). However, the electricity generation sector alone will account for almost 50% of the increase through 2010 (Figure 3b). Over 110 gigawatts of new gas-fired generation capacity is projected to go into service by 2010, and a total of 140 gigawatts by 2015. Natural gas is now the preferred fuel for new electricity generation facilities, with 96% of the more than 200 recently announced new generation projects planning to burn natural gas. This dramatic shift to natural gas is driven by improved efficiencies, lower capital costs, reduced construction time, more expeditious permitting of natural gas-burning facilities, and environmental compliance advantages. However, the service requirements and price sensitivity of this additional load present many challenges to suppliers and transporters of natural gas.

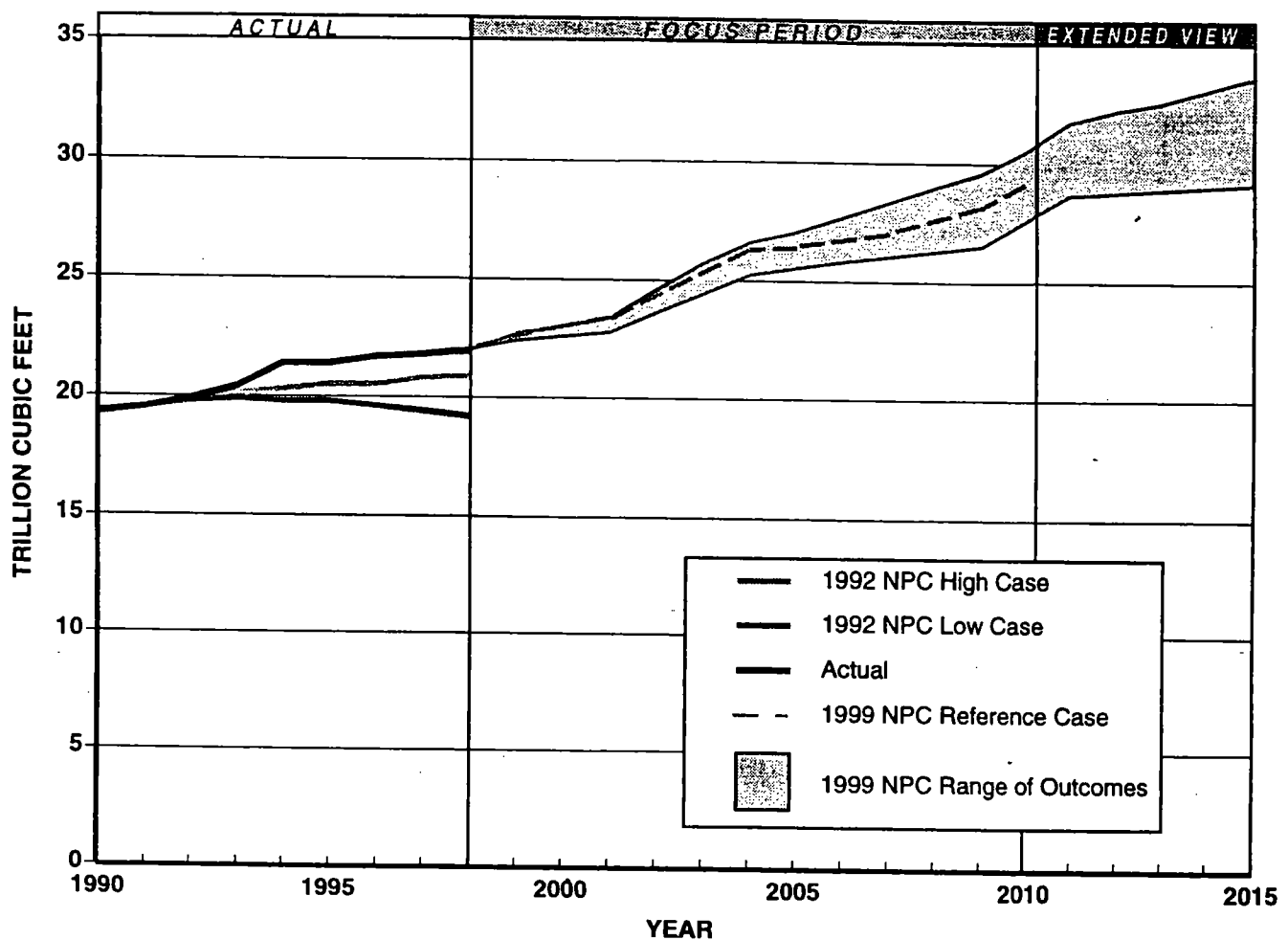
Figure 1. Total U.S. Energy Consumption
By Primary Energy Source, 1998



Source: DOE/EIA, *Monthly Energy Review*, September 1999

- Natural gas supplies almost a quarter of the nation's energy needs.

Figure 2. U.S. Natural Gas Demand
Comparison of 1992 and 1999 NPC Study Results



- Demand has exceeded the 1992 high case projection.
- Demand growth is expected to increase to 29 TCF by 2010, and increase beyond 31 TCF by 2015.
- Additional 7 TCF/year of gas supply will be needed by 2010.

Source of historical data: DOE/EIA, *Natural Gas Monthly*, September 1999

Figure 3a. U.S. Natural Gas Demand
By Sector

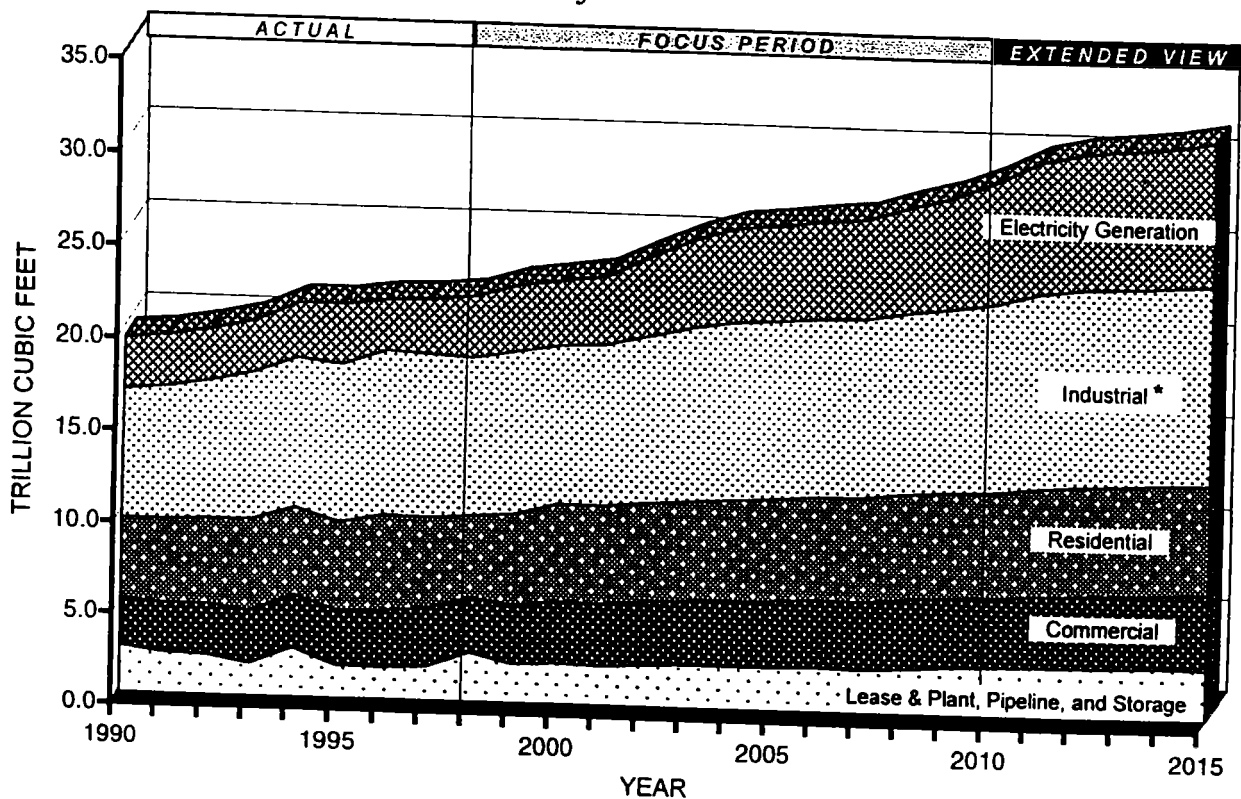
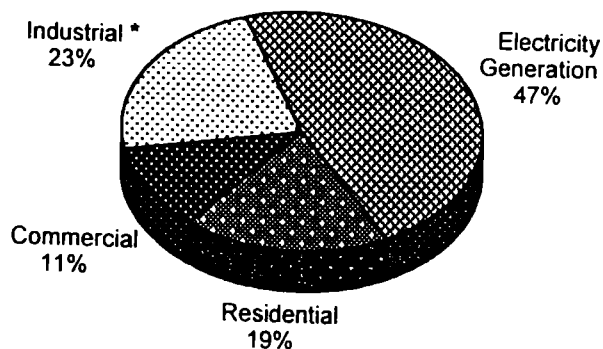


Figure 3b. Growth in
Reference Case Demand,
1998-2010
(Distribution of 7 TCF Increase by Sector)

- Demand will grow in all sectors.
- Almost 50% of demand growth will be due to electricity generation.



* Historical data include all gas use for industrial cogeneration and independent power producers; all gas for new power plants except cogeneration is included in the electricity generation sector.

Source: DOE/EIA, *Natural Gas Monthly*, September 1999

Growth in gas demand will remain subject to changes in such key variables as growth in the economy, price of competing fuels, nuclear retirements, and the capacity utilization of coal-fired electricity generation plants. For example, if 30 gigawatts of nuclear capacity are retired rather than the 15 gigawatts assumed in the Reference Case, demand could increase another 0.7 TCF. If coal capacity utilization remains at current levels instead of increasing from 64% to 75% as assumed in the Reference Case, demand could rise as much as 1.7 TCF. New environmental regulations, beyond those that are currently scheduled for implementation, have not been factored into this analysis and could also further increase natural gas demand. While this study did not attempt to quantify the impacts of additional environmental regulations on demand, incremental increases from Kyoto-related regulation were estimated in independent studies at 2–12% by the Energy Information Administration and 10–22% by the Edison Electric Institute beyond their respective reference cases.

The role that natural gas plays in improving our environment has been widely recognized. A recent Minerals Management Service (MMS) report, *OCS Resource Management and Sustainable Development* (September 1999), pointed out the benefits of natural gas:

Natural gas is the least polluting fossil fuel. It is thought by many, including the present administration, to be the fuel of the early part of the next century that will power our economy into the sustainable fuels of the later decades and beyond. Even in the short run, conversion of more of our fuel burning facilities to natural gas will greatly diminish air pollution and improve the long run sustainability of forests, waters, and farmlands now being negatively affected by acid deposition.

The MMS report also noted the following regarding income from offshore resources:

...royalties and taxes enable government to carry on programs which are beneficial to the oil and gas industry as well as society as

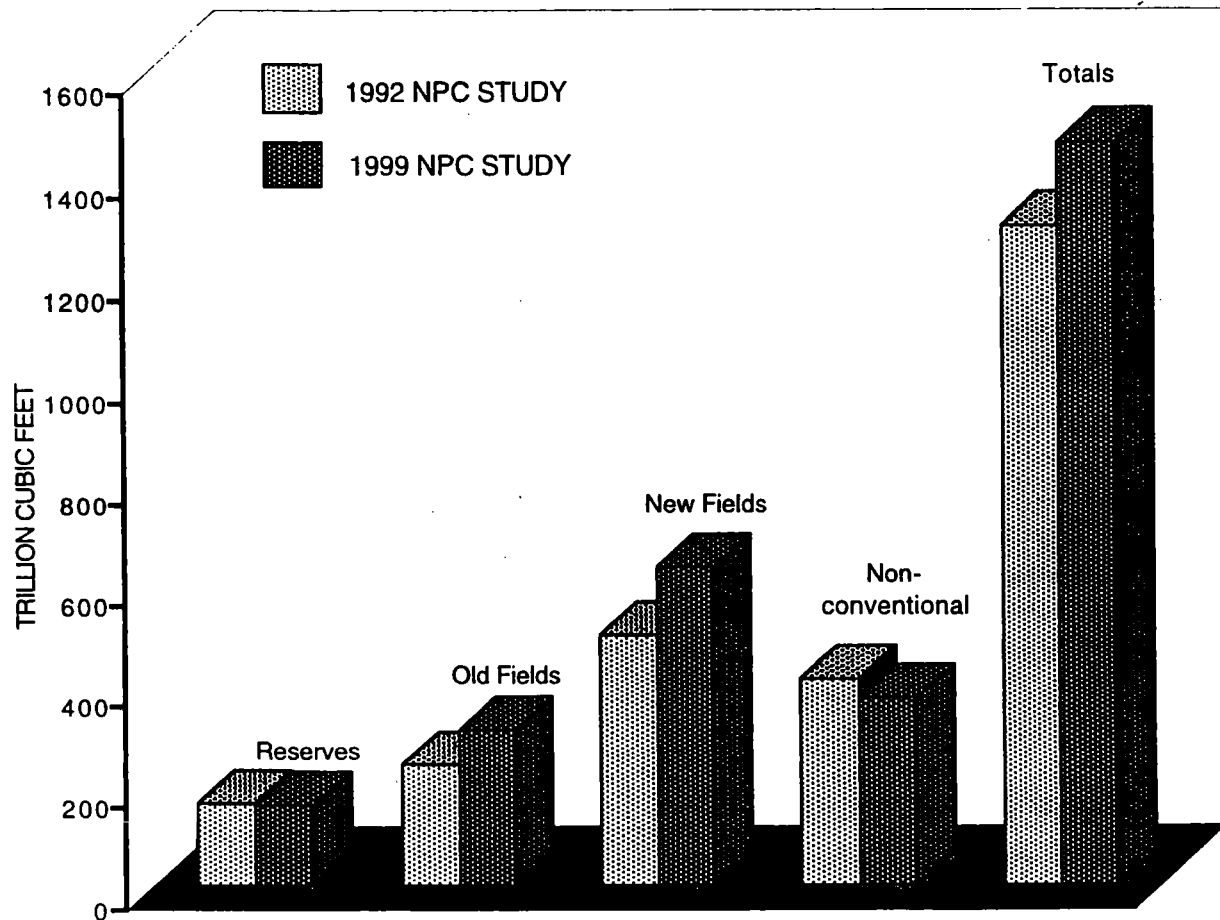
a whole. For example, an average of 60 percent of the collections from Federal offshore sources [\$126 billion since offshore leasing began in 1953] went into the U.S. Treasury General Fund. Among other expenditures the Government uses a portion of these funds to invest in social infrastructure, which helps make the U.S. economy one of the most productive in the world. One of the areas in which some of this money is invested is in renewable energy, including many forms of energy conservation.

In onshore areas, federal, state, and local governments receive royalty income and collect taxes from natural gas production. The revenues that are collected from these sources allow these entities to provide essential services expected by their citizens, such as funding for education.

This study estimates the U.S. natural gas resource base, excluding Alaska, to be 1,466 TCF (Figure 4). This total represents a net increase of 171 TCF over the 1,295 TCF estimated in the 1992 study. Taking into account the 124 TCF that has been produced in the lower-48 states since then, the estimate of the resource base has increased 23% since the last study. The increase is largely due to technology breakthroughs that have opened new frontiers such as the deepwater Gulf of Mexico and have provided improved information and better tools for evaluating—and more fully recovering—resources.

U.S. gas demand will be filled with U.S. production, along with increasing volumes from Canada and a small, but growing, contribution from liquefied natural gas (LNG) imports (Figure 5a). Two regions—deepwater Gulf of Mexico and the Rockies—will contribute most significantly to the new supply (Figure 5b). U.S. production is projected to increase from 19 TCF in 1998 to 25 TCF in 2010, and could approach 27 TCF in 2015. Deeper wells, deeper water, and nonconventional sources will be key to future supply. For example, deepwater production (water depths greater than 200 meters), which in 1998 provided 0.8 TCF annually, will increase to over 4.5 TCF in 2010 (Figure 6). Onshore production from nonconventional formations is projected to increase by 50% from 4.4 TCF in 1998 to almost 7 TCF in 2010, with much of it coming from

Figure 4. U.S. Lower-48 Natural Gas
Resource Base Estimates
Comparison of 1992 and 1999 NPC Study Results



- Estimate of remaining resource base has grown 171 TCF to 1,466 TCF.
- Resource base estimate increased 23%, considering 124 TCF of production.
- Growth is primarily from New Fields, especially in deep water.

Figure 5a. U.S. Natural Gas Supply
By Source

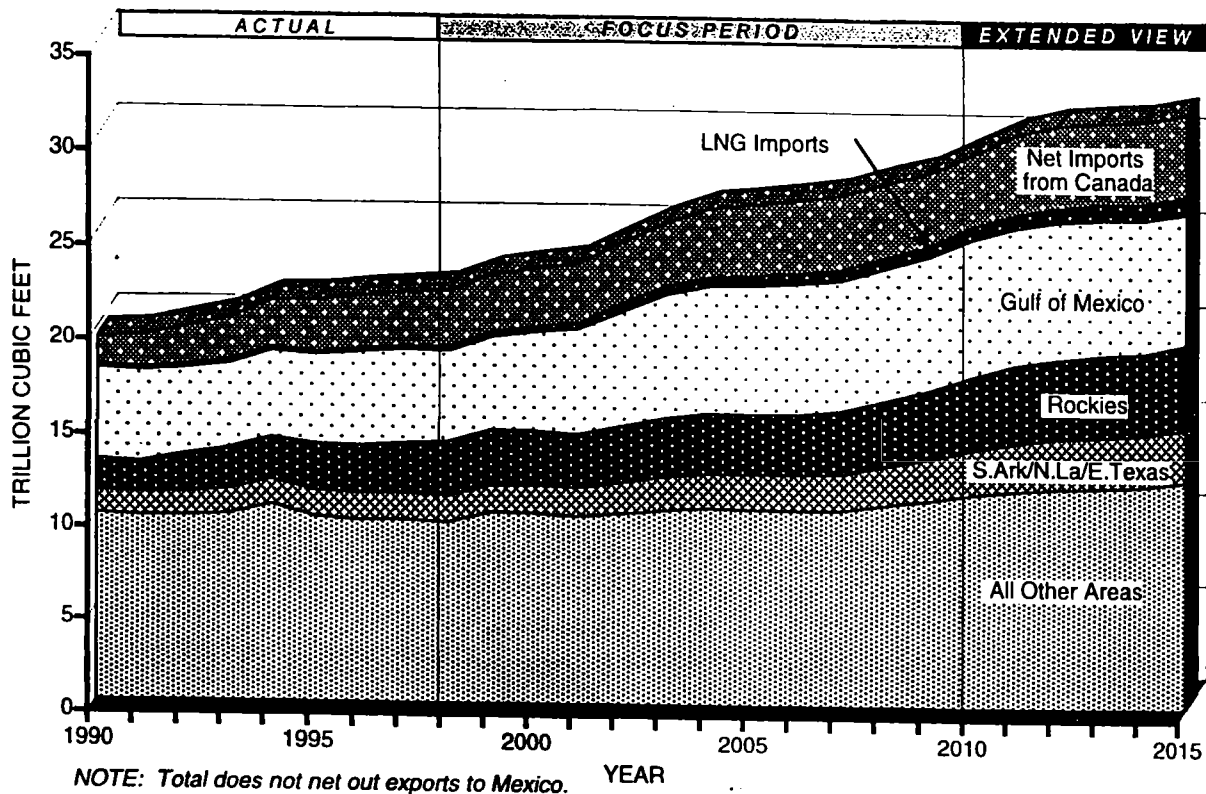
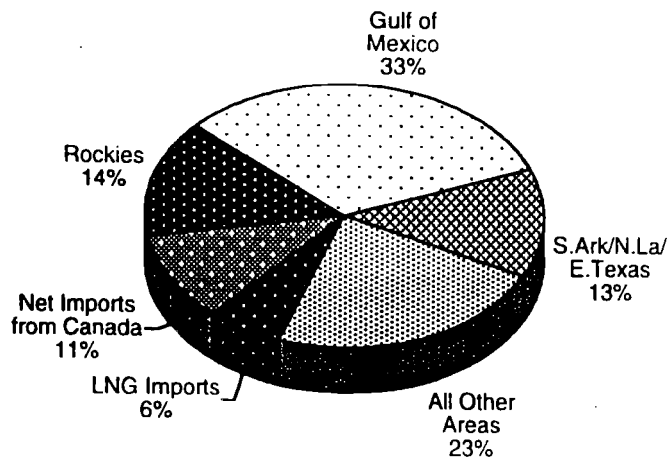


Figure 5b. Growth in
Reference Case Supply,
1998-2010

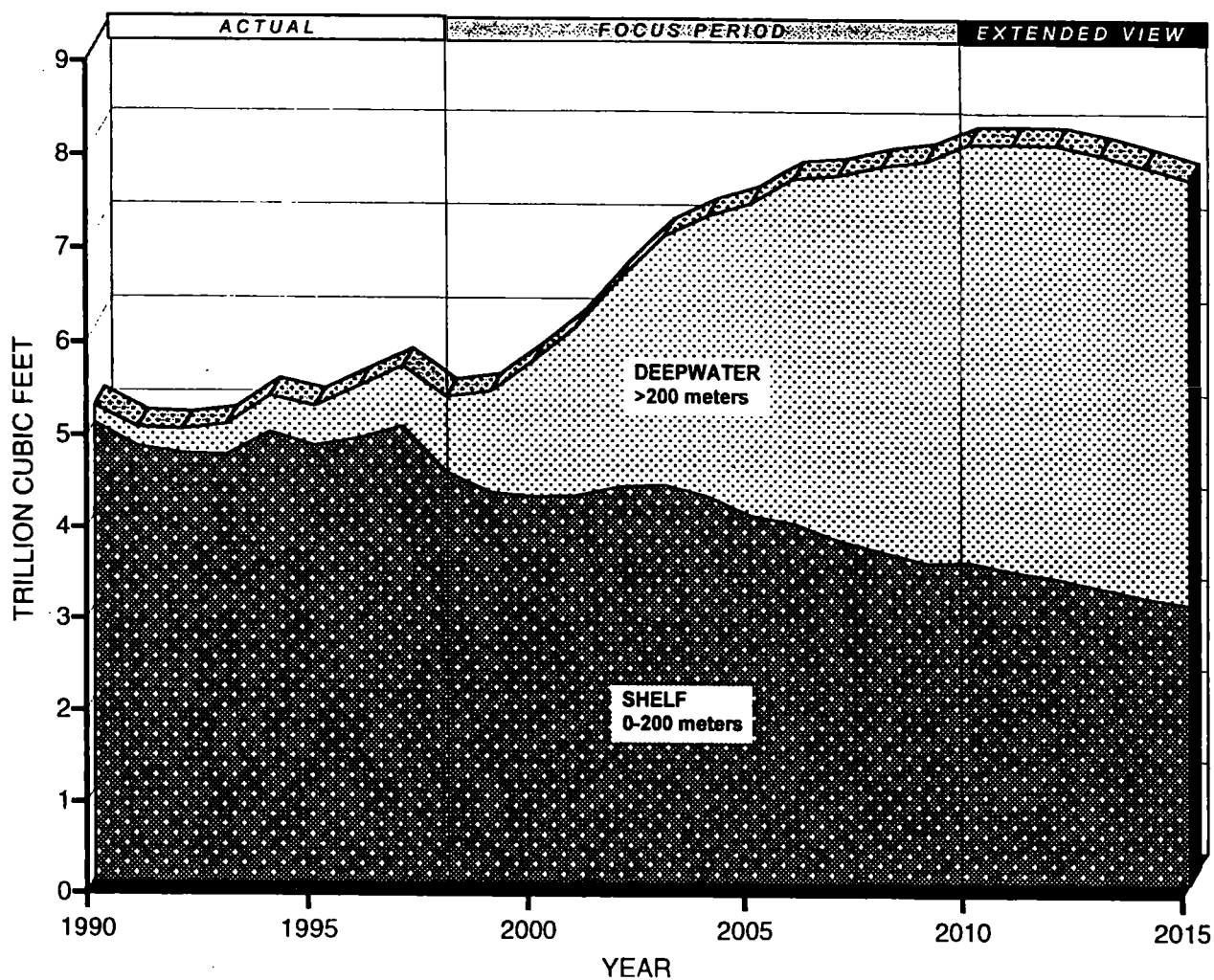
(Distribution of 7 TCF Increase by Source)

- Natural gas demand will be met primarily with domestic resources.
- Highest growth in U.S. production will be from Gulf of Mexico and Rockies.
- Canada will continue to be an important source of supply.



Source of historical data: DOE/EIA, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves Annual Reports*, 1990-1997

Figure 6. U.S. Gulf of Mexico Natural Gas Production



- Gulf of Mexico production will increase 2.7 TCF by 2010.
- Deepwater production will increase from less than 1 to over 4.5 TCF/year.
- Gradual decline is projected for shelf production.

Source of historical data: Dwigths/PI production reports, June 1999

the Rocky Mountain region. By 2015, nonconventional gas production could be approaching 9 TCF. Production is likely to decrease in more traditional areas such as the Gulf of Mexico shelf and onshore Louisiana, each dropping by roughly one-third by 2015. It is important to note that approximately 14% of current natural gas supply is "associated," meaning that it is produced from oil wells. This associated gas will continue to be an important component of the overall supply, particularly in deepwater Gulf of Mexico.

Imports from Canada are projected to increase from 3 TCF in 1998 to almost 4 TCF by 2010, continuing to represent 13–14% of U.S. demand. Canada's remaining resource base is estimated at approximately 670 TCF in this study, down from 740 TCF in 1992. The decrease in the estimated Canadian resource base is due to depletion and reassessment of the nonconventional resources. Challenges similar to those confronting the U.S. industry will be faced by the Canadian producers, compounded by the fact that much of this gas is in frontier areas such as the MacKenzie Delta in far northwest Canada. Reaching this frontier will require significant capital expenditures as well as considerable lead times. Continued cooperation between the United States and Canada will be essential to ensure the timely availability of Canadian gas.

LNG imports are projected to reach a maximum of approximately 0.9 TCF, based on a 75% average capacity utilization rate for existing facilities. The assumption was made that no additional LNG import facilities would be built in the 1999–2015 period. Also, the assumption was made that exports to Mexico would reach a maximum of 0.4 TCF to serve Mexico's gas demand near the U.S. border.

The infrastructure required to deliver gas to market must be optimized and expanded to accommodate the increase in demand as well as the changing logistics of getting new supply to new customers. Future needs include new pipelines to reach supplies in the frontier regions, expansion of existing pipeline systems, new laterals to serve electricity plants, and expansion and construction of storage facilities to meet seasonal and peak-day requirements. By 2015, more

than 14 million new customers will be added to the natural gas delivery system. To serve this growing market through 2015, over 38,000 miles of new transmission line are projected to be needed as well as 263,000 miles of distribution mains and almost 0.8 TCF of new working gas storage capacity.

The current delivery system (transmission, distribution, and storage) was built and optimized over decades to meet the design peak-day requirements of firm service customers that were primarily residential, commercial, and to a lesser extent, industrial customers. The anticipated growth in electricity generation demand for natural gas will require the delivery system to be re-optimized to meet larger off-peak swing loads as well as peak-day requirements that will increase from 111 BCF per day in 1997 to over 152 BCF per day in 2015. Meeting requirements of the electricity generators on a significantly larger scale will entail changes in operational procedures, communications, tariffs, and contracting. Further, these changes must be accomplished without degrading the historically reliable service to the residential, commercial, and industrial markets.

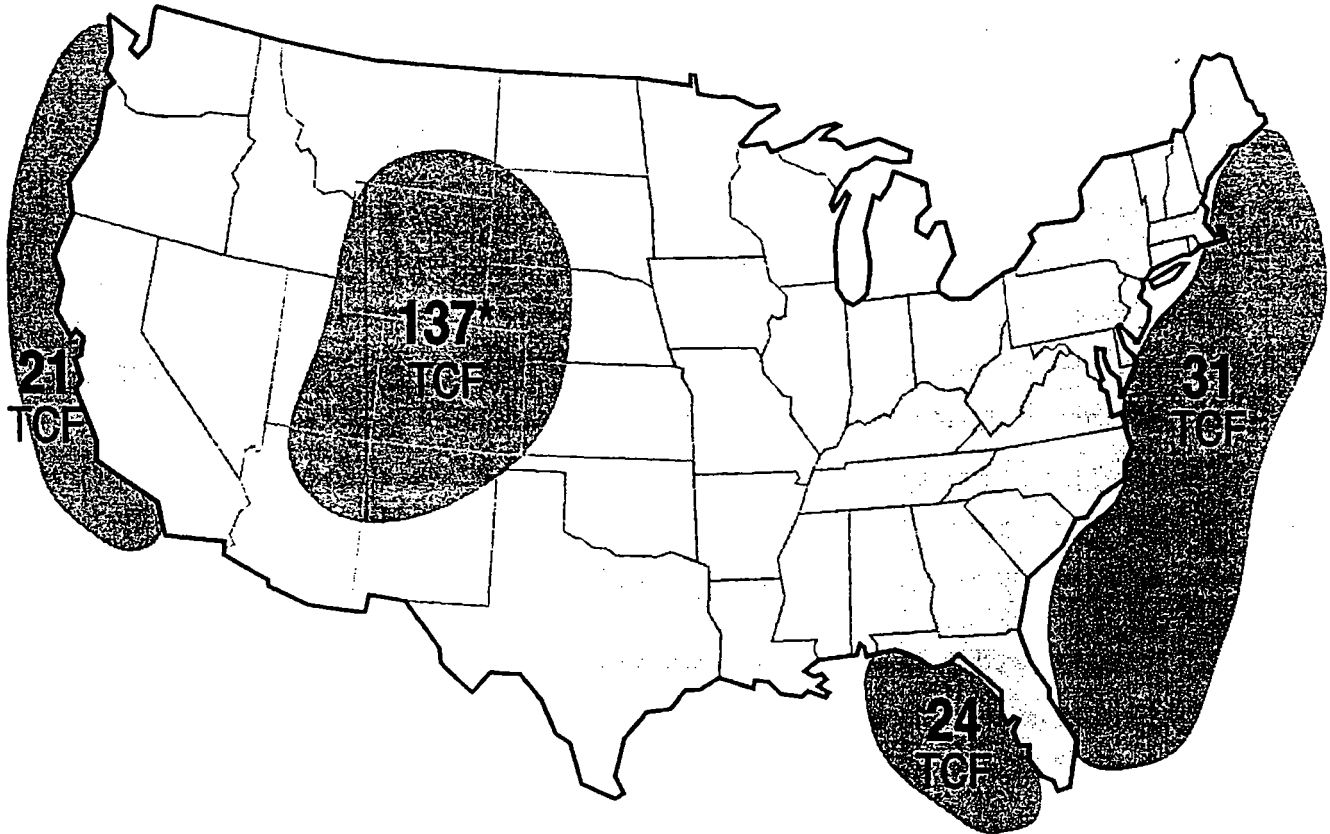
The Council believes that an unprecedented and cooperative effort among industry, government, and other stakeholders will be required to develop production from new and existing fields and build infrastructure at sufficient rates to meet the high level of demand indicated in this study. The ability to meet the anticipated demand hinges on addressing the following critical factors: access, technology, financial requirements, skilled workers, drilling rigs, lead times, and changes in customer requirements.

CRITICAL FACTORS

Access

Much of the nation's resource base resides on federal lands or in federal waters, yet a large portion of this resource base is not open to either assessment or development (Figure 7). Two of the most promising regions for future gas production, the Rocky Mountains and the Gulf of Mexico, currently have

Figure 7. U.S. Lower-48 Natural Gas Resources
Subject to Access Restrictions



* Approximately 29 TCF of the Rockies gas resources are closed to development and 108 TCF are available with restrictions.

- Significant amount of resource is subject to access restrictions.
- These areas are close to large and growing population centers.

significant access restrictions. For example, an estimated 40%—or 137 TCF—of potential gas resource in the Rockies is on federal land that is either closed to exploration or is open under restrictive provisions. Another 76 TCF of resources are estimated for restricted offshore areas in the eastern Gulf of Mexico, the Atlantic, and the Pacific. The eastern Gulf of Mexico is largely closed to exploration and the limited areas that are now open are the subject of political debate. The proposed Lease Sale 181 scheduled for December 2001 in the eastern Gulf of Mexico is the first such sale in this area since the late 1980s, yet only covers a small portion of the entire area. The East Coast of the United States is completely closed to development while Canada is pursuing its East Coast gas resources, as demonstrated by the recent Sable Island development off the coast of Nova Scotia. In addition, drilling on the West Coast of the United States also faces strong restrictions, while offshore British Columbia is opening up to greater exploration and production.

This study assumes that planned lease sales for areas in the Outer Continental Shelf (OCS) will continue on schedule and that further restrictions will not be applied to those lands currently open to development. These assumptions may be optimistic in light of recent statements by some public officials. Further restrictions would increase the challenge of meeting the projected gas demand with cost-competitive supply. Conversely, opening hydrocarbon-rich areas for development would greatly improve the industry's potential to respond to market needs.

Access is also an issue for the transmission and distribution sectors of the industry as they seek rights of way for pipeline facilities. The permitting and construction processes have become more complex over time. Restrictions for wetlands, wildlife refuges, and other sensitive federal and state lands impact the routing and construction of pipelines throughout the United States, not just the frontier areas. Other issues arise from the encroachment of urban development on existing rights of way, heightened community awareness of and resistance to pipeline construction, and increasingly restrictive government policies and regulations. Resolution of these issues—which must be addressed for each

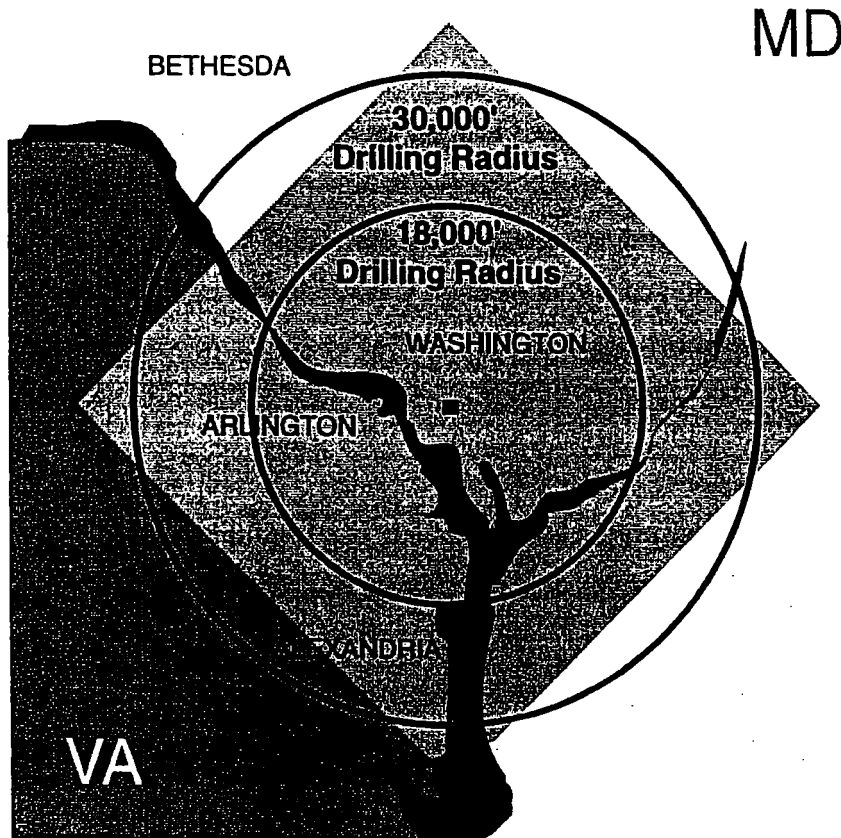
pipeline addition—is costly and time-consuming and often results in project delays or abandonment of projects.

Most of the access restrictions are due to environmental concerns or multiple-use conflicts even though industry has made tremendous improvements in reducing the “footprint” of exploration, production, and transportation activities, and in maintaining clean, safe operations. As stated in a recent Department of Energy report, “Resources underlying arctic regions, coastal and deep offshore waters, sensitive wetlands and wildlife habitats, public lands, and even cities and airports can now be contacted and produced without disrupting surface features above them.”¹ An excellent example of the dramatic improvements in environmental footprints can be found in Alaska where significant efforts have been made to minimize the impact of drilling operations on the tundra. A report to the Secretary of the Interior in 1997 by the Alaska Oil and Gas Association stated that in the 1970s, pads for drilling operations took up about 65 acres whereas the pads for recent operations are now less than 10 acres. The report further explained that cluster drilling and extended reach drilling enable producers to access hydrocarbon deposits 3–4 miles away from the pad, thus greatly reducing the number of drilling locations and associated roads and pipelines. Lateral extensions of 18,000 feet are common on the Alaskan North Slope today. More recent efforts in other parts of the world have extended the drilling reach to 5–6 miles. This has the same effect as setting up drilling operations on the White House lawn and extracting hydrocarbons from beneath most of Washington, D.C., and into its suburbs (Figure 8).

Equally impressive improvements in environmental impacts have been demonstrated offshore, where much of the natural gas production is associated with oil production. As reported to President Clinton by the Cabinet in *Turning to the Sea: America’s Ocean Future* (September 1999), “Advances in technology have made offshore oil and gas production cleaner and safer than ever. Since

¹ U.S. Department of Energy, Office of Fossil Energy, *Environmental Benefits of Advanced Oil and Gas Exploration and Production Technology*, October 1999, pg. 13.

Figure 8. Reducing Environmental Impact
with Extended-Reach Drilling.



- Improvements in extended-reach drilling allow access to resources 5 to 6 miles from the drilling site.
- Similar technologies for minimizing environmental impact continue to be developed.

1980, 6.9 billion barrels of Outer Continental Shelf oil have been produced with a spillage rate of less than 0.001%. Despite these advances, however, environmental concerns have led to congressional and executive moratoria since 1981, and many of our coastal areas are now closed to new leasing through the year 2012.”

This study has determined that access issues, and associated environmental concerns, must be addressed. Access to some portion of the federal gas resource base currently closed or significantly restricted to appraisal or development, as well as acquisition of rights of way, is essential to meeting the projected demand with cost-competitive gas supply.

Technology

Even though the estimated resource base is adequate to last many decades, technological challenges and the degree of difficulty in reaching, evaluating, and producing the resource base continue to escalate. The previously referenced report by the Office of Fossil Energy of the U.S. Department of Energy ² highlights the importance of research and development to the oil and gas industry:

In the past three decades, the petroleum business has transformed itself into a high-technology industry. Dramatic advances in technology for exploration, drilling and completion, production, and site restoration have enabled the industry to keep up with the ever-increasing demand for reliable supplies of oil and natural gas at reasonable prices. The productivity gains and cost reductions attributable to these advances have been widely described and broadly recognized... Looking forward, the domestic oil and gas industry will be challenged to continue extending the frontiers of

² Ibid, p.1.

technology. Ongoing advances in E&P productivity are essential if producers are to keep pace with steadily growing demand for oil and gas, both in the United States and world wide. Continuing innovation will also be needed to sustain the industry's leadership in the intensely competitive international arena, and to retain high-paying oil and gas industry jobs at home. Progressively cleaner, less intrusive, and more efficient technology will be instrumental in enhancing environmental protection in the future.

Technology improvements are particularly important given the more difficult conditions accompanying new resources. Deeper wells encounter extreme temperatures and pressures and increased potential for intensely corrosive environments. These conditions require high-strength materials and advanced drilling methods. Current deepwater endeavors involve exploration wells in over 8,000 feet of water and complex production projects in more than 5,000 feet of water. Subsea pipelines must be built to withstand powerful currents, shifting ocean floors and external pressures that are greater than those inside the pipe. Innovative design, fabrication, and installation techniques must emerge to enable these new resources to reach existing markets at attractive prices.

Technology improvements are also needed for expanding and managing the delivery system and improving efficiency at the burner-tip. The increased challenges of serving a growing market and changing load must not jeopardize the historical reliability and favorable economics of the transmission and distribution system. Pipelines and LDCs will continue to rely on technology for reducing operation and maintenance expenses and minimizing environmental impacts of facilities construction. Information and communications technology will play an ever-increasing role in safe and efficient operations as well as in supply management and customer service enhancements.

Technology advances are essential in all industry segments for improving operational efficiencies, reducing resource development time, increasing production, developing frontier areas, controlling costs, and minimizing environmental

impact. This study assumes that technology improvements will continue at an aggressive pace. However, recent industry trends in research and development spending have raised concerns regarding this assumption. Industry restructuring, consolidations, and spending cuts have resulted in reductions in research budgets. Producers are turning to the service sectors to develop new technology for specific applications. Industry consortia have been formed to address critical technology challenges such as deepwater development. While many of these changes improve the efficiency with which research and development dollars are spent, concerns have been widely expressed that basic and long-term research are not being adequately addressed.

Financial Requirements

Adequate financial performance must be demonstrated in order to compete for and attract the investments required to meet the growing demand. Companies will need to balance short-term performance demands with long-term planning to achieve the needed growth. Almost \$1.5 trillion (\$1998) will be required to fund the industry through 2015. This amount includes over \$700 billion for operating expenses and an estimated \$785 billion for capital investments. Approximately \$658 billion of capital is projected to be spent for oil and gas supply development and about \$127 billion for transmission, storage, and distribution infrastructure expansion (Figure 9). This equates to an average annual increase in capital expenditures from \$34 billion per year between 1990 and 1998 to \$46 billion between 1999 and 2015. Many of these expenditures will involve higher risk projects—such as large deepwater projects or pipelines to new frontiers—each of which can easily exceed \$1 billion.

While much of the required capital will come from reinvested cash flow, capital from outside the industry is essential to continued growth. To achieve this level of capital investment, industry must be able to compete with other investment opportunities. This poses a challenge to all sectors of the industry, particularly for the exploration and production sector, which has historically delivered returns lower than the average reported for Standard and Poors 500 companies.

Recommendations

The Council wishes to emphasize that gas supply, and the associated infrastructure, can be expanded to meet growing demand if the critical factors are adequately addressed. The following recommendations are made by the Council to ensure that the mutual goals of government, industry, and consumers are met. While recommendations are made to the government for specific actions, the Council does not advocate regulations or legislation that artificially alter market signals. Instead, the Council encourages changes that remove impediments which hinder the development of supply and infrastructure to meet market needs.

Recommendation 1: Government and industry must take a leadership position in establishing—at the highest level—a strategy for natural gas in the nation's energy portfolio. An Interagency Work Group on Natural Gas should be established to work with industry and other stakeholders to formulate the strategy and resolve issues.

The government can help to overcome the barriers to meeting future natural gas demand by establishing a national strategy for natural gas. This strategy should include the areas of supply, demand, and transmission/distribution and should address the issues of access to the resource base, technology development, environmental regulation, education of the future workforce, and financial incentives. It should also affirm and describe the role of natural gas in balancing the national objectives of economic growth, environmental protection, and energy security. The strategy must provide a proper balance between conflicting environmental and land-use interests, yet reflect a sense of urgency

about developing natural gas supply and the delivery infrastructure given the long lead times required.

The Council recommends that an Interagency Work Group on Natural Gas be established within the National Economic Council to formulate this comprehensive natural gas strategy and identify and aggressively resolve the issues associated with the development of natural gas supply and supporting delivery systems. This Interagency Work Group should be analogous to, but distinct from, the Interagency Working Group on Energy that has been set up under the National Economic Council to address oil industry issues. This new Work Group should oversee the implementation of government-related recommendations contained in this report. It should also monitor, on a biennial basis, trends for the assumptions used in this study and progress on the identified critical factors in order to anticipate changes in the supply/demand equation. All federal agencies that have a role in natural gas policy, technology, and resource assessments should be members. The Work Group should make every effort to include input from industry and other stakeholder groups, including states with natural gas production or potential for production, in its strategy-setting process. This solicitation of stakeholder views should be as interactive as possible.

The industry must also step up to the leadership challenge and work with government and other stakeholders to identify and understand their issues associated with developing supply and delivery systems and to seek practical solutions. Industry must work with customers to understand future supply and delivery needs and work with government to shape appropriate strategy and policies so that the required services can be provided in the most cost-effective manner while ensuring safety and reliability. Industry councils and trade associations can play an integral role in this effort.

Recommendation 2: Establish a balanced, long-term approach for responsibly developing the nation's natural gas resource base.

As seen in the analysis of critical factors in this report, the estimated size of the resource base is the single most important factor in projecting availability of competitively priced natural gas. While the ultimate size of the resource base cannot be changed and cannot be precisely known, industry can continue to improve its knowledge of the size and characteristics of the resource base, thus improving the likelihood of locating and producing new supply. However, access to a significant portion of this resource base for either assessment or development is subject to restrictions due to environmental and land-use concerns. These concerns are appropriate for consideration in granting access to potential supply areas, but significant improvements in the industry's environmental footprints warrant a new look at these restrictions.

Given the compelling need for developing economic natural gas supply, the following actions are recommended:

- *Government agencies and industry representatives should continue the work begun with this study to inventory existing information on the resource base in the Rocky Mountain region and analyze the impact of access restrictions. A significant portion of work associated with this study included a first-time assessment of resource impacts associated with land access restrictions and related environmental stipulations in six areas in the Rockies. The results were then extrapolated to the entire region. This involved a cooperative effort between members of the Supply Task Group and representatives from the federal government, including the U.S. Department of Energy, the Bureau of Land Management, and the U.S. Forest Service. Representatives from state and local governments, as well as other stakeholders, also participated. This analysis, and the cooperative approach, should be continued and expanded beyond this study to increase understanding of the impact of access restrictions in the Rockies.*

- *Industry should work with the government to prioritize restricted areas on the basis of resource potential as well as environmental sensitivity.* Certain restricted areas should be more fully assessed to determine the potential for gas supply. Those with higher potential and lower sensitivity should be opened for additional geological assessment. Industry should work with the government to identify methods and technologies that could be practically applied to minimize the environmental impact of the assessment.
- *A comprehensive approach should then be established for developing gas supply in selected restricted areas.* Existing moratoria should be reviewed and modified as appropriate. Industry should continue to develop practical techniques that minimize environmental impact, particularly for these sensitive areas. Once a long-term development plan is in place, the affected agencies should work together to coordinate their roles in assisting that development. A template for long-term planning and coordination among multiple agencies can be found in the MMS and their management of the offshore region.
- *Long-term sustainability of natural gas supply should be addressed.* The current study finds that, with focused effort, the gas demand through 2015 and well beyond can be met with sustainable gas supplies from U.S. and Canadian resources. The life of the resource base can be further extended by encouraging efficiency at the burner tip. However, the Council also recognizes that at some point in the future—though probably not within the timeframe contemplated by this report—the United States will need to develop resources in what are now regarded as far frontiers. Such sources might include Alaska, large-scale LNG imports from a variety of foreign sources, and possibly gas transported by pipeline from the Caribbean and Latin America.

Gas hydrates—frozen crystals of methane and water found both below the ocean floor and in Arctic regions—could also be a potential source of natural gas. In *Turning to the Sea: America's Ocean Future*, the Secretaries of

Commerce and Navy recommend the acceleration of scientific research on ocean hydrates. In addition, the Department of Energy's Office of Fossil Energy issued a document, *A Strategy for Methane Hydrates Research & Development* (August 1998), that provides for a comprehensive national research program that includes both marine and Arctic hydrate resources.

Projects to reach the far frontiers will be very expensive and will have extremely long lead times. At some point during the study period, government and industry must begin a cooperative, public planning process to lay the groundwork for far frontier projects.

The recommended Interagency Work Group could play a very important role in addressing access issues and the long-term sustainability of natural gas supply. The Work Group should be assigned the following responsibilities:

- Establish a set of principles that would guide federal land management policy. These principles should balance the national goals of economic growth, environmental protection, and energy security and should recognize the unique role of natural gas in meeting national objectives in the areas of clean air, climate change, electricity industry deregulation, and domestic energy supply. The guiding principles should also emphasize the need for multiple use of public land. Recognizing that it is the primary responsibility of the Secretaries of the Interior and Agriculture to establish land management policies within their jurisdictions, the guiding principles should help put those policies and priorities in a national policy context with respect to natural gas. The principles should be used by the appropriate land management and regulatory agencies to establish policies that promote domestic production of natural gas in order to meet national goals.
- Address the barriers that restrict access to natural gas resources in the Outer Continental Shelf and on onshore federal lands, particularly in the Rocky Mountain region where the majority of the onshore public gas resource is found. The goal of this effort should be to maximize the

amount of economic natural gas resource available for development (consistent with effective environmental protection), reduce delays in natural gas exploration, production, and transportation, and improve consistency among federal and state agencies. The Work Group should oversee the continuing effort to inventory the impact of access restrictions on natural gas resources as discussed above. It should also evaluate the process by which access to the natural gas resource base and pipeline rights of way has been restricted in the past and may be further restricted in the future. The Work Group should look at the following categories of barriers:

- Land withdrawals that put natural gas resources off limits
- Regulatory and policy decisions that make natural gas resources effectively off limits or impractical to recover, such as:
 - “no surface occupancy” designations
 - use of stipulations more restricted than needed to protect environmental resources
 - old access restrictions that don’t account for the effect of technology improvements that might allow development of natural gas in environmentally sensitive areas
 - air quality issues that threaten to delay or limit natural gas exploration and production.
- Decisions and applications of regulations and policies that increase the cost of or impose unnecessary delays in natural gas recovery and transportation, such as:
 - “combined hydrocarbon” leasing that imposes unnecessary costs on producers
 - cumbersome Coastal Zone Management process that impose delays on OCS leasing.

Recommendation 3: Drive research and technology development at a rapid rate.

Technology is another highly critical factor affecting both supply availability and price. Accelerating the development of technology is in the best interests of all stakeholders. The following industry and government actions are recommended:

- *Industry participants must aggressively build on past successes in advancing technologies by investing in research and supporting additional industry consortia.* Transmission and distribution companies should continue to invest in improving the efficiency of the delivery systems. All industry segments should explore additional applications that advanced information and communication technology can provide. Industry must continue to fund basic research, both independently and through grants to universities. Industry must also continue to invest in the development of technologies that reduce the environmental impact of exploration, production, and construction of infrastructure. Industry and consumers should continue to develop more efficient gas consumption equipment, thereby improving energy efficiency and yielding lower costs to consumers.
- *The government should continue investing in research and development through collaborations with industry, state organizations, national laboratories, and universities.* Efforts should be made to define key research and development priorities to support increased reserve growth in existing fields and new field discoveries in areas with the largest potential resource. Examples of specific research that government might sponsor include:
 - Reservoir detection and characterization technology targeted at exploration and field development
 - Technologies to reduce the cost of environmental compliance

- Innovative geologic and engineering concepts based on novel technologies such as 3D and 4D seismic and horizontal drilling.

Particular consideration should be given to long-term technology needs for ultra-deep water, low permeability, and nonconventional reservoirs that will contribute more of the nation's gas supply in the future. Policy issues that affect technological developments should also be addressed.

- *The government should promote high-efficiency gas technologies such as fuel cells, gas cooling, and high-efficiency turbines.* Due to the inherent environmental advantages of natural gas and the high efficiencies offered by new gas equipment, the use of gas in place of other fossil energy forms promotes both energy conservation and environmental improvement (e.g., in areas such as acid rain, ozone formation, particulate emissions, and solid waste disposal). All energy efficiency evaluations and standards should be based on a "total energy efficiency" concept, that is, energy efficiency measurements should include energy used or lost from the point of production through consumption.

The recommended Interagency Work Group on Natural Gas can play a significant role in overseeing technology investments made by the government. Industry and state agencies should be actively involved with the Work Group in directing these efforts.

Recommendation 4: Plan for capital, infrastructure, and human resource needs.

The long-term demand growth projected in this study translates to long-term opportunities for the industry and the government. The increase in demand provides the opportunity for industry participants to expand their markets and to increase their service offerings. Benefits to the government extend beyond meeting environmental goals and include increases in revenues from royalties, rentals, and bonuses from the leasing of federal lands and development of the resources. For example, income generated by the Offshore Mineral Management Program alone generates about \$4 billion annually.

However, taking full advantage of these opportunities will require long-term resource planning on the part of industry and government. The following areas should be specifically addressed:

- *Industry must immediately address concerns regarding the future availability of skilled workers.* Several years are required to train highly skilled workers to perform their jobs knowledgeably, efficiently, and safely. Given the projected increase in activity and the impending increase in retirements, aggressive action must be taken to attract, train, and retain qualified workers at all levels. Industry must also undertake initiatives to attract high school students with strong math and science skills to replenish college enrollments in petroleum, geotechnical, and other energy-related disciplines. Government funding of energy-related studies in universities can also help to populate these disciplines.
- *Producers, drilling companies, and equipment manufacturers should form a joint industry task force, headed by the International Association of Drilling Contractors, to gather additional information on infrastructure needs.* Of particular concern is the projected need to increase the number of wells drilled per year and increase the drilling rigs and equipment required to accomplish that task. The task force can begin its study by collecting data, such as drilling success rates in deeper formations and drilling rates for deep vertical wells, that are needed for assessing future needs. The task force should include rig builders and shipyard operators as well as industry groups such as the Petroleum Equipment Suppliers Association.
- *Government should examine possible new financial incentives, such as limited-duration tax and royalty incentives, that would accelerate the development of high-risk, high-cost natural gas resources onshore and offshore.* Past support from the government, such as tax credits and deepwater royalty relief, has promoted development activity. The MMS, in their January 1999 publication on deepwater development facts, states "The Deepwater Royalty Relief Act, passed in 1995, has contributed significantly to the increase in deepwater activity by providing the opportunity to lease new

prospects in deepwater.” The MMS reports that Gulf of Mexico OCS bids for leases in water greater than 800 meters increased from 49 in 1994 to 1,138 in 1997 and 817 in 1998. Other types of incentives should also be explored with input from industry advisors. These incentives, if properly targeted, can convert non-economic resources into economic supply.

Recommendation 5: Streamline processes that impact gas development.

Once a high level policy is established, all agencies involved in the development of supply and delivery systems should review and align existing policy to eliminate conflicting directives and remove obstructions. Processes that affect development must be streamlined to eliminate duplicative efforts, follow more predictable time-lines, and eliminate unnecessary costs to the industry, government, and, ultimately, consumers. Approval processes involving multiple levels of government, and agencies should be coordinated in order to resolve conflicts in a timely manner.

The Council recommends that the following areas be evaluated:

- Updating of resource management plans for federal lands
- Potential for sharing land management and environmental assessment resources, such as data bases and personnel, among agencies
- Designation of sufficient budgets for required land-management planning and studies
- Adequacy of legislation for land-management policy and procedures
- Opportunities for coordinating permitting/approval processes among agencies.

Recommendation 6: Assess the impact of environmental regulation on natural gas supply and demand.

Additional evaluation is needed to fully assess the impact of existing and proposed environmental regulations on natural gas supply and demand. As

shown in this study, regulations that address issues such as climate change and emissions controls on electricity generation could have a significant impact on natural gas demand and the ability of the industry to meet that demand. Changes in regulations and additional moratoria or extensions of existing moratoria that reduce access to natural gas supply should be examined in the context of the need for increasing gas supply. The recommended Interagency Work Group could play an important role in this analysis by developing and coordinating a process for reviewing any proposed regulations to ensure that the benefits of increasing natural gas use are considered in the regulatory process.

Recommendation 7: Design new services to meet changing customer needs.

In response to the ongoing restructuring of the natural gas and electricity markets, all industry participants must offer new or reconfigured services specifically designed to meet changing customer needs. For example, individual pipelines and LDCs can implement new services to meet customer needs through tariff filings for services such as parking, loaning, balancing, peaking, and hourly firm transportation. While industry-wide changes may take some time to implement, individual pipeline changes can be developed and approved in far less time. Some pipelines and LDCs have already taken the initiative to implement new service offerings, and it is expected that more will follow.

The members of the National Petroleum Council stand ready to further discuss and implement the recommendations made in this report. Members will assist the Interagency Work Group in identifying impediments and solutions to the mutual goals of government, industry, and consumers for increased availability of competitively priced, environmentally desirable natural gas.