ESTIMATED OIL AND GAS RESOURCE BASE ON FEDERAL LAND AND SUBMERGED LAND

OVERSIGHT HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY AND MINERAL RESOURCES

OF THE

COMMITTEE ON RESOURCES
U.S. HOUSE OF REPRESENTATIVES

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ESTIMATED OIL AND GAS RESOURCE BASE ON FEDERAL LAND AND SUBMERGED LAND: HOW MUCH OIL AND GAS CAN THESE LANDS PRODUCE?

Thursday, March 22, 2001
House of Representatives
Subcommittee on Energy and Mineral Resources
Committee on Resources
Washington, DC

The Subcommittee met, pursuant to call, at 2:20 p.m., in Room 1334, Longworth House Office Building, Hon. Barbara Cubin [Chairman of the Subcommittee] presiding.

STATEMENT OF THE HONORABLE BARBARA CUBIN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF WYOMING

Mrs. CUBIN. The oversight hearing by the Subcommittee on Energy and Mineral Resources will please come to order. The Subcommittee is meeting today to hear testimony on the estimated oil and gas resource base on Federal land. How much oil and gas can these lands produce?

Under Committee rule 4(g), the Chairman and Ranking Minority Member can make opening statements. If any other Members have statements, they can be included in the hearing record under unanimous consent.

The Subcommittee meets today in our second oversight hearing on issues concerning public lands, energy and mineral resources. Last week we heard testimony on the extent to which public lands and the outer continental shelf may be accessed to explore for and produce oil and natural gas supplies. Today we hear from the two Federal agencies who are charged with making objective estimates of the U.S. oil and gas resource base both onshore and offshore. These are the U.S. Geological Survey and the Minerals Management Service respectively. An expert representing a professional society of oil and gas geologists, which has examined the methodology of these agency assessments, will testify as well.

As Congress and the Executive Branch deliberate and develop a national energy strategy, it is fundamental that we understand the potential of our Nation's own energy resources to meet forecasted demand. And for the Resources Committee, with jurisdiction over public lands and minerals, we must understand the potential of BLM and Forest Service-administered lands to host oil and gas

deposits. If prospectively valuable lands are made available for seismic work to be followed by exploration drilling, what is the potential to discover reserves and actually supply domestic demands from these public lands?

Last week we spent a lot of time on the dais arguing with each other about the availability of BLM lands for oil and gas leasing. You will recall the infamous 95 percent discussion. I truly believe that that figure is wrong, but that is beside the point. I think that what we did last week was a fool's errand, because no one can deny the simple truth we face today: our constituents' natural gas bills are too expensive because the demand for the commodity is outstripping the long-term supply. That fact is not in dispute.

These available public lands, including the outer continental shelf, are not producing sufficient gas supply to meet demand. But what is the likelihood these public lands could meet our increasing demands if barriers to exploration and development were minimized or eliminated, resulting in cheaper energy for all our constituents? That is what we hope to find out today.

[The prepared statement of Mrs. Cubin follows:]

Statement of The Honorable Barbara Cubin, Chairman, Subcommittee on Energy and Mineral Resources

The Subcommittee meets today, in our second oversight hearing, on issues concerning public lands energy and mineral resources. Last week, we heard testimony on the extent to which public lands and the outer continental shelf may be accessed to explore for and produce oil and natural gas supplies.

Today, we shall hear from the two Federal agencies who are charged with making objective estimates of the U.S. oil and gas resource base both onshore and offshore. These are the U.S. Geological Survey and the Minerals Management Service, respectively. An expert representing a professional society of oil and gas geologists, which has examined the methodology of these agencies' assessments will testify as well.

As Congress and the Executive Branch deliberate and develop a national energy strategy, it is fundamental that we understand the potential of our nation's own energy resources to meet forecasted demand. And for the Resources Committee, with jurisdiction over public lands and minerals, we must understand the potential of BLM and Forest Service-administered lands to host oil and gas deposits. If prospectively valuable lands are made available for seismic work to be followed by exploration drilling, what is the potential to discover reserves and actually supply domestic demand from these public lands?

Last week, we spent a lot of time on the dais arguing with each other about "availability" of BLM lands for oil and gas leasing. You will recall the infamous 95 percent discussion. I truly believe it was a fool's errand to do so because no one can deny the simple truth we face today: our constituents' natural gas bills are too expensive because the demand for the commodity is outstripping the long-term supply. That is a fact not in dispute.

These "available" public lands, including the Outer Continental Shelf, are not producing sufficient gas supply to meet demand. But what is the likelihood these public lands could meet our increasing demand if barriers to exploration and development were minimized or eliminated, resulting in cheaper energy for all our constituents? That is what we hope to find out today.

Mrs. CUBIN. The Chair now recognizes Mr. Kind, the Ranking Member, for any statement he might have.

STATEMENT OF THE HONORABLE RON KIND, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF WISCONSIN

Mr. KIND. Thank you, Madam Chair. And I want to welcome the witnesses for your testimony here today. We are looking forward to it.

This afternoon we do plan on taking testimony on the estimated oil and gas resource base on Federal lands and submerged lands. During the Subcommittee hearing last week, it became clear that there is a great need in our debate on national energy policy for, as one witness put it last week during the testimony, for an intellectual honesty in determining what those reserves are, the potential for oil and gas energy on Federal lands.

In this regard I do welcome your testimony here today, both USGS and the Minerals Management Service, on your estimates of the oil and gas potential. But having said that, I remind my colleagues that oil and gas and our increased reliance on fossil fuels generally will not solve our long-term energy needs in this country. For instance, solar power, wind turbines, geothermal sources can and should contribute to meeting our energy needs. We need to get serious about developing these alternative and renewable energy sources for our long-term energy needs in this county.

Harnessing more of the Earth's own heat could offer one solution to our energy crunch. Geothermal energy is abundant, clean and virtually inexhaustible. According to a recent article in the Christian Science Monitor, geothermal energy development in the U.S. is at a virtual standstill today. However, in other less developed parts of the world where geothermal resources are more competitive with other energy alternatives, its use is on the rise. Developing our geothermal resources could lessen damage to forests and thereby reduce air pollution and the greenhouse gas effect.

And most geothermal scientists believe that the annual heat emitted or otherwise lost from the Earth is enormous, equivalent to 10 times the annual energy consumption of the United States, and more than enough power, more than enough, to power all the nations of the world combined, if it can be harnessed and harnessed cost-effectively.

And so I again welcome the witnesses here today. I would, Madam Chair, take this opportunity to introduce for the record with unanimous consent a report that Minority Leader Dick Gephardt released today offering an alternative long-term energy proposal in the country. That report is titled The Bush Energy Budget: The Edsel Plan for the 21st Century. So without objection, I would like to include that in the record today.

Mrs. CUBIN. Without objection, so ordered.

[The prepared statement of Mr. Kind follows:]

Statement of The Honorable Ron Kind, Ranking Democrat, Subcommittee on Energy and Mineral Resources

This afternoon we meet to take testimony on the estimated oil and gas resource base on Federal Land and submerged lands. During the Subcommittee hearing last week, it became clear that there is a great need in our debate on a national energy policy for, as one witness put it, "intellectual honesty" in determining the potential oil and gas energy resources of the Federal lands.

In this regard, I welcome the testimony of and opportunity to question the US Geological Survey and Minerals Management Service on their estimates of oil and gas potential.

That said, I remind my colleagues that oil and gas and our increased reliance on fossil fuels will not solve our energy crisis. For instance, solar power, wind turbines, and geothermal resources can and should contribute to meeting our energy needs. We need to get serious about developing alternative and renewable energy sources for our long-term needs.

Harnessing more of the earth's own heat could offer one solution to our energy crunch. Geothermal energy is abundant, clean, and virtually inexhaustible. According to a recent article in the Christian Science Monitor, geothermal energy development in the US is at a virtual standstill. However, in other, less developed, parts of the world, where geothermal resources are more competitive with other energy alternatives, its use is on the rise. Developing our geothermal resources could lessen damage to forests and thereby reduce air pollution and the greenhouse-gas effect. Most geothermal scientists believe that the annual heat emitted or otherwise lost from the earth is enormous, equivalent to ten times the annual energy consumption of the United States and more than enough to power all of the nations of the world if it can be harnessed.

So I would hope that the Chair schedule as soon as possible an oversight hearing on alternative energy resources that can be obtained from our Federal lands.

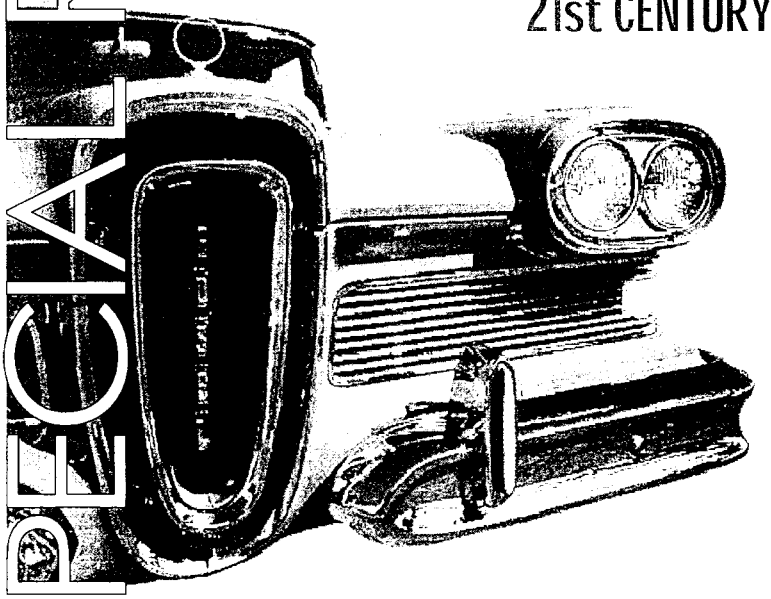
[The "Bush Energy Budget" follows:]

SPECIAL REPORT

A JOINT SPECIAL REPORT BY THE HOUSE DPC AND THE CAUCUS TASK FORCE ON ENERGY

THE BUSH ENERGY BUDGET

AN EDSEL PLAN FOR THE 21st CENTURY



MARCH 22, 2001

THE BUSH ENERGY BUDGET:
AN EDSEL PLAN FOR THE 21ST CENTURY

Both as a candidate and as President, George W. Bush has emphasized that, in order to deal with our energy problems, the country needs long-term energy solutions. For example, at the White House on Monday, March 19, at a meeting of his Energy Task Force, President Bush told the nation:

> ***"We're finding in certain parts of the country that we're short on energy. One thing is for certain, there are no short-term fixes. The solution for our energy shortage requires long-term thinking."***
> President George W. Bush, March 19, 2001

And yet the energy budget that President Bush has put forward fails to meet his own commitment. Indeed, the Bush energy budget fails to provide a long-term, balanced national energy strategy – a strategy dealing with both supply and demand.

Instead, the energy budget President Bush has proposed relies almost solely on drilling in the Arctic National Wildlife Refuge (ANWR) as the answer to all that ails America. The Bush budget ignores conservation, cuts energy efficiency and renewable energy programs, shortchanges research and development, and is very conservative with its compassion for the problems facing American families. A key reason that the Bush energy budget is so inadequate is that the Bush $2 trillion-plus tax cut is so huge that, in order to make room for it, spending cuts are required in important energy programs.

Over the past 30 years, dramatic strides in energy efficiency have saved businesses and consumers billions of dollars – contributing significantly to the nation's economic growth. And yet now, Bush targets the very programs that are essential to lowering future energy demand and costs.

President Bush cuts funding for the Department of Energy (DOE) by $700 million below the department's FY 2001 appropriation. Furthermore, this funding level is $1.4 billion below the level needed, according to CBO, to maintain purchasing power for energy programs at their FY 2001 levels. **That effectively cuts DOE by 7% in the middle of an energy crisis.** Bush's proposed increases in DOE's defense-related programs will cause civilian energy supply and conservation programs to be cut by over 10% – with some critical programs in danger of cuts of over 30%.

The Bush energy budget breaks promises on cleaning the air, promotes highly controversial plans to drill in wildlife refuges, and ignores the reality that over the past 30 years America has saved four times more energy through conservation and improved efficiency than has been found from new sources. As we stand in the first year of the 21st Century, the Bush Administration is proposing an energy plan for an Eisenhower-era America.

Americans oppose a production-only approach to energy policy. On March 16, 2001, Gallup released a poll showing that 64% of Americans oppose the production-only approach to energy policy being pursued by the Bush Administration. *See Gallup survey, conducted 3/5-7 of 1,060 adults, released March 16, 2001.*

THE BROKEN CAMPAIGN PROMISES OF GEORGE W. BUSH

Energy Efficiency & Renewable Energy Programs: In his major September 29th energy policy speech during the Fall campaign, *Candidate* Bush vowed, "To enhance America's long-term energy security, we must continue developing renewable sources of energy." Unfortunately, *President* Bush has failed to live up to this commitment. According to press reports, under the Bush budget for FY 2002, the Energy Department's energy efficiency and renewable energy programs will be cut by as much as 22% from their current $1.18 billion level. *See USA Today, 2/26/01.*

Low-Income Weatherization: During the Fall campaign, *Candidate* Bush called for a doubling of funds for the low-income weatherization program. *President* Bush unfortunately falls $40 million short of that goal in 2002 alone – and $450 million short over ten years. The Bush budget claims he "will nearly double" weatherization funds – that "nearly" means the Bush Administration will fall roughly 150,000 homes short of actually doubling the program over the next ten years. In fact, the Bush plan simply restores the program to the level it was at during the first two years of the Clinton Administration, before it was severely cut when Republicans took control of Congress in 1995. (Indeed, one of the first things the GOP did when they took power in 1995 was to slash the Low-Income Weatherization program by 50%!) Absent these shortsighted GOP cuts, DOE has estimated that an additional 250,000 homes would be weatherized today. These 250,000 families would be saving hundreds of dollars per family per year, and lower energy demand would be benefitting the entire economy and contributing to reducing air pollution.

LIHEAP: Despite his campaign statements in support of the LIHEAP program (Low-Income Home Energy Assistance Program), that helps low-income families pay their heating and cooling bills, the Bush Budget is silent on LIHEAP funding. The only reference to LIHEAP in the budget notes how LIHEAP funds can be diverted to the low-income weatherization program. It raises the question whether the Administration plans to pay for its increase in low-income weatherization at the expense of LIHEAP. Today, despite record-high energy prices and recent winter storms, fewer than one in three eligible families get LIHEAP assistance. Even if fully funded to its current authorization level of $2 billion, nearly half of eligible families might fail to get assistance.

Candidate Bush called for "enhancing" LIHEAP with royalties received from drilling on public lands. Unfortunately, oil prices would have to stay at near record high prices, over $30 per barrel, for a full year before LIHEAP could be fully funded under this plan.

Clean Air: *Candidate* Bush said he was "committed" to mandatory reduction targets for utilities for four air pollutants, including carbon dioxide. President Bush's budget was silent on committing resources to achieve this goal. Now we know why. On March 13, President Bush flip-flopped and came out in opposition to new carbon dioxide standards. "I can't think of a president who has achieved that bad an environmental record in only 60 days,"

said Phil Clapp, president of the National Environmental Trust. *See CNN, March 15, 2001.*

CUTS IN ENERGY EFFICIENCY & RENEWABLE ENERGY PROGRAMS IN THE BUSH BUDGET

The Bush budget's "comprehensive" energy plan does not even mention the words "conservation"or "efficiency." The Bush outline of the DOE budget, however, makes clear that these highly successful programs are going to face bleak futures in the Bush Administration. Indeed, as was mentioned above, the February 26th *USA Today* reports that the Energy Department's energy efficiency and renewable energy programs will be cut by as much as 22% from their current $1.18 billion level. Similarly, the March 7th *Washington Post* reported that up to half of the $700 million cut in DOE below the FY 2001 appropriations level would occur in these programs. "We're looking at cuts of up to 30% [from current funding levels for these programs]," stated David Nemtzow, president of the Alliance to Save Energy. *See Washington Post, March 7, 2001.*

Bush fails to recognize that since 1973, improved energy efficiency and renewable energy have supplied over 80% of the growth in U.S. energy needs beyond 1973 consumption levels. They also have led to a reduction of over 8.25 million tons in carbon emissions. *See Alliance to Save Energy, "It Doesn't Have to Hurt," report from 1997.*

Indeed, DOE estimates that energy efficiency and renewable energy programs will reduce crude oil imports by 1,269 billion barrels per year by 2020. At the same time, DOE also estimates that fossil fuel programs will reduce crude oil imports by 520 million barrels per year by 2020. While fossil fuel programs clearly make an important contribution, these statistics highlight the **key** role energy efficiency and renewable programs can play in reducing our dependence on foreign oil. *See "Evaluating U.S. Vulnerability to Oil Supply Disruption and Options for Mitigating Their Effects," GAO report RCED 97-6, December 6, 1996.*

Not only does the Bush budget cut solar and renewable programs this year. The Bush budget also makes future solar and renewable funding contingent on the unlikely success of the Bush plan to drill in the Arctic National Wildlife Refuge!! Even if this controversial drilling proposal were to become law, solar and renewable programs would have to wait another three years before getting even a dime – even by the Administration's own estimate. In addition, the $1.2 billion "bid bonus" (collected from selling rights to drill in the refuge) Bush is anticipating in 2004 would roughly equal the amount of money President Bush proposes to cut over the next three years. By 2008, the budget then proposes "phasing down" this funding, once again cutting solar and renewable programs.

The vague promise of tax credits referenced in the Bush budget seems to be an attempt to claim credit for the already anticipated extension of current, Democratic-sponsored tax laws supporting the implementation of solar and renewable technologies.

SNOW BLIND IN THE ARCTIC

Despite strong, longstanding, bipartisan opposition, the "uniter, not a divider" President

continues to push the highly controversial, anti-environmental agenda of calling for drilling in the Arctic National Wildlife Refuge (ANWR). In fact, much of the funding proposed in the "comprehensive" Bush energy plan is dependent on collecting bid bonuses from the Arctic wildlife refuge. Not only is this unlikely to happen, making this a hollow promise, but even optimistically it would take up to ten years before the crude would begin to flow to increase supplies of oil on the market.

While the Bush Administration pushes the divisive plan to drill in the Arctic National Wildlife Refuge (ANWR), wide areas of Alaskan land are already open to oil and gas exploration. For example, natural gas is the fuel of choice for most new electricity generation plants coming on line or in the planning stages. Reserves of natural gas are all but depleted, but at the same time there is an abundant supply waiting to be tapped. In the vicinity of Prudhoe Bay on the Alaskan North Slope, there is an estimated 32 to 38 trillion cubic feet of natural gas ready for development. While the infrastructure to bring this fuel south has yet to be put into place, this is an area well worth exploring, considering that the U.S Geological Survey has estimated that with additional exploration, the potential could be to double the current estimate of potential natural gas.

Despite Bush campaign charges, domestic natural gas production on public lands actually grew significantly under President Clinton, exceeding production levels during the Reagan and Bush years – and yet it did not prevent our current energy crisis. Federal lands now account for over 37 percent of domestic natural gas production.

Since 1993, the Bureau of Land Management (BLM) has issued over 28,000 new onshore oil and gas leases and more than 15,000 permits to drill. Notably, BLM conducted a major new lease sale in 1999, offering 3.9 million acres of the National Petroleum Reserve-Alaska (a 23 million acre area west of Prudhoe Bay). In 2000, onshore federal leases produced 2.2 trillion cubic feet of natural gas, accounting for 11 percent of domestic natural gas production.

According to the Department of Interior, approximately 95 percent of lands managed by the BLM in Colorado, Montana, New Mexico, Utah and Wyoming are currently available for oil and gas leasing and development. Specifically, of the 116.4 million acres of BLM-managed lands in those states, more than 110 million acres are open to oil and gas leasing.

Outer Continental Shelf (OCS) oil and gas leasing, restricted by Congress in annual appropriations bills, has been concentrated in the Western Gulf of Mexico and in Arctic Alaska. Subject to those restrictions, new offshore leases covering about 35 million acres have been issued by the Minerals Management Service (MMS) since 1993. Overall, the MMS currently manages more than 44 million acres of OCS lands which have produced more than143 trillion cubic feet (TCF) of natural gas. MMS estimates that the federal OCS will account for approximately 26 percent of the U.S. natural gas production in 2001.

Production of Oil, Gas and Coal from Offshore and Onshore Federal and Indian Lands*

	Oil (barrels x 10^6)	Gas (BCF)**	Coal (short tons x10^6)
1993-2000	4,651	55,587	2,917
1989-1992	1,903	23,619	1,069
1981-1988	4,180	43,606	1,324

*data provided by Department of the Interior
** billion cubic feet

IGNORING THE PROBLEM

On March 6, the U.S. Energy Information Agency (EIA) released its latest "Short-Term Energy Outlook" report. Its findings are alarming. Crude prices were projected to stay "high through 2002," hovering at an average of $26.60 per barrel, with price spikes over $30. Pump prices for gasoline are expected to be only six cents lower than last year's record highs, with the national average only dropping from $1.53 per gallon of regular gasoline to $1.47. EIA then warns: "*The current situation of relatively low inventories for gasoline could once again set the stage for some regional imbalances in supply that could bring about significant price volatility in the U.S. gasoline market.*"

Furthermore, on April 6, EIA will release an updated outlook report. Given OPEC's agreement on March 17 to a 1 million barrel a day cut in production, in its April report, EIA's price projections could be even higher.

Natural gas reserves are projected to hit record lows this Spring. Homes dependent on natural gas for heat are expected to face utility bills that are 70 to 75% higher than last year. By the end of this Winter, well-head prices will be double last year's average.

EIA attributes pipeline failures and constraints as one of the reasons natural gas prices will not decline. Despite campaign promises to promote improved pipeline transportation, the Bush budget is silent on improving the integrity of our pipeline systems, other than to propose to continue to charge pipeline owners tens of millions of dollars per year to cover the cost of an inadequate federal safety inspection system. Pipeline accidents killed 17 people last year. In addition, these mishaps contributed to major energy supply disruptions in multiple regions of the country.

The extreme shortages of electricity in the Western U.S. are expected to worsen. In addition, electricity shortages may spread to other parts of the Country, especially to the Northeast. Despite the warnings that consumers need help now, the Bush budget does not contain any initiatives to provide price relief to any category of consumers this year.

WE CAN DO BETTER

Democrats believe Congress must adopt a comprehensive, balanced energy strategy that deals with both supply and demand. This balanced strategy must promote energy

efficiency, increase domestic energy production, and protect consumers, while at the same time not degrading our environment. It must include such items as addressing infrastructure deficiencies, enacting tax policies that can encourage production, and enacting policies that reduce the demand for fuel and electricity, making our economy more efficient and profitable. This is a particularly glaring omission from the Bush budget when many meaningful energy conservation and efficiency measures could be put in place as quickly as it takes to change a light bulb. We should not be telling the consumers in California – or in other parts of the Country facing tight energy supplies and rolling blackouts – that there is nothing we can do to help when we could be taking the lead in making our economy more energy-efficient today.

Democrats recognize that our current energy situation is the result of a myriad of interconnecting factors that cannot be resolved with a quick fix. However, we believe that there are many short-term and long-term solutions and consumer-relief efforts that can be begun now.

One of the many examples of what can be done is the Emergency Energy Response Act of 2001 (H.R. 683), which has been introduced by House Democrats, to increase funding for LIHEAP and low-income weatherization, and state energy programs. This bill also recognizes that the federal government is the largest consumer of energy in America, and therefore requires federal facility managers to immediately work to increase energy efficiency and use renewable energy.

Finally, other key examples of the components of the type of comprehensive energy strategy being called for by Democrats include the following:

- Fully fund energy efficiency and renewable energy research programs.
- Provide tax incentives to keep marginal wells in production and encourage domestic oil exploration. Marginal wells account for over 20% of the US's on-shore oil production.
- Commit to the federal purchase of domestic crude from marginal wells during times of low prices, and use these purchases to fill the over 110 million barrels in excess capacity in the Strategic Petroleum Reserve. This would provide a price floor for crude from marginal wells and allow the U.S. to strengthen the Reserve.
- Expand existing tax incentives for utilizing renewable energy. Provide tax credits for consumers and businesses for improving the energy efficiency of homes and commercial buildings. Provide tax credits for purchasing high efficiency vehicles.
- Fully fund the federal government's own energy efficiency efforts, saving taxpayers money and reducing energy demand this year. Change government contracting rules to include consideration of energy costs.
- Expand current housing loan programs that encourage the purchase or renovation of more energy efficient homes.
- Fully fund the new Northeast Heating Oil Reserve created by the Clinton Administration last year.

Mrs. CUBIN. Now I would like to recognize the panel of witnesses. Our first witness will be Dr. P. Patrick Leahy, an Associate Director for Geology with the United States Geological Survey; second, Ms. Carolita Kallaur, who is the Associate Director of Offshore Minerals Management with the Minerals Management Service. It is nice to see you again. And our third witness, Dr. Naresh Kumar—I want to say it right, okay—from Growth Oil and Gas, on behalf of the American Association of Petroleum Geologists.

As I explained in our first hearing, it is the intention of the Chairman to place—no, I am not going to do that.

So now I am happy to recognize Dr. Patrick Leahy to testify for 5 minutes. The timing lights are on the table, and they will indicate when your time has concluded. Your entire written statement will be included in the record.

Dr. Leahy.

STATEMENT OF P. PATRICK LEAHY, ASSOCIATE DIRECTOR FOR GEOLOGY, U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

Mr. LEAHY. Thank you, Madam Chairman and distinguished members of the Subcommittee. Thank you very much for this opportunity to present, on behalf of the U.S. Geological Survey, testimony regarding our assessment of oil and gas resources nationally, our assessment of the 1002 area of the Arctic National Wildlife Refuge, and our assessment strategy of Federal lands as called for in the recently enacted Energy Act of 2000. I will summarize my written statement in the interest of time.

Within the Federal Government, the USGS is responsible for assessing undiscovered oil and gas resources of all onshore and State offshore areas of the Nation. In February 1995, the USGS released the National Assessment of the United States Oil and Gas Resources. We are updating that assessment in selected regions thought to have high potential for undiscovered natural gas, including coal-bed methane and gas hydrate. This update will be completed in 2004, with interim products available in early 2002. The updated assessment will include allocations of undiscovered oil and gas resources to Federal lands.

Additionally the USGS is completing a National Coal Resource Assessment during 2001. And, in fact, some of these assessments of selected areas have already been released. The 1995 USGS assessment of the Nation's undiscovered oil and gas was conducted in collaboration with the State geological surveys, the Minerals Management Service, and other Federal agencies and industry geologists under auspices of the American Association of Petroleum Geologists. Assuming existing technology, there are approximately 112 billion barrels of technically recoverable oil onshore and in State waters.

The technically recoverable conventional natural gas equals 716 trillion cubic feet. When one includes the unconventional gas in the estimate, the total increases to 1,074 trillion cubic feet. The total technically recoverable oil and gas resource base onshore and in State waters of the United States is displayed in the table on page 2 of my written statement.

In 1998, the USGS published a report that provided estimates of volumes of undiscovered oil and gas on Federal lands based on the 1995 USGS Assessment. Estimates of oil in undiscovered conventional fields range from 4.4 to 12.8 billion barrels, with a mean value of 7.5 billion barrels.

Estimates of technically recoverable gas in undiscovered conventional fields range from 34 to 97 trillion cubic feet, with a mean value of 58 trillion cubic feet. As before, when unconventional gas resources are included, the volume increases.

These estimated volumes are also listed in my written testimony on page 3.

To my left is a poster that shows the 112 billion barrels of oil and the 1,074 trillion cubic feet of gas. This is a pie chart demonstrating the percentage that is provided from the four sources, the proved resources shown in green, the reserve growth in known fields shown in the darker green, the undiscovered oil on Federal lands shown in red, and the undiscovered oil in non-Federal lands shown in the blue.

The Alaskan National Interest Lands Conservation Act, ANILCA, established the Arctic National Wildlife Refuge in 1980. In section 1002 of this Act, Congress deferred a decision regarding future management of the 1.5-million-acre coastal plain, the so-called 1002 area, in recognition of the area's potential for oil and gas resources and its importance as a wildlife habitat.

USGS released a petroleum resource assessment of the 1002 area in 1998. Based on this assessment the total quantity of technically recoverable oil within the 1002 area is estimated to be between 4.3 and 11.8 billion barrels, with a mean value of 7.7 billion barrels. In the Energy Act of 2000, section 604 requires the Secretary of the Interior to conduct an inventory of energy resources and restriction or impediments to their development on Federal lands.

It is our understanding that the role of the USGS will be to assess the oil and gas resources of basins with Federal land ownership using USGS assessment methodology. Then USGS geologists will allocate the resource estimates to those specific land parcels owned by the Federal Government. The USGS resource estimates will be combined with reserve volumes from the Department of Energy and will be incorporated into a geographic information system.

This in turn will be integrated into a GIS of restrictions and impediments constructed by BLM and the Forest Service. The inventory shall be provided to this Committee within two years of enactment of the legislation, which was last November.

Madam Chairman, thank you for the opportunity to testify. I would be happy to respond to any questions you and the Subcommittee members have.

Mrs. CUBIN. Thank you, Dr. Leahy.

[The prepared statement of Dr. Leahy follows:]

Statement of Dr. P. Patrick Leahy, Associate Director for Geology, U.S Geological Survey, Department of the Interior

Madame Chairman and members of the Subcommittee, thank you for this opportunity to present, on behalf of the U.S. Geological Survey (USGS), testimony regarding our assessment of oil and gas resources nationally, in the 1002 Area of the Arctic National Wildlife Refuge, and of Federal lands as called for in the recently enacted Energy Act of 2000. My testimony will address these subjects in this order.

Within the Federal Government, the USGS is responsible for assessing undiscovered oil and gas resources of all onshore and State offshore areas of the Nation. The Minerals Management Service (MMS) provides estimates for Federal offshore crude oil and natural gas resources. In February 1995, the USGS released the National Assessment of United States Oil and Gas Resources. Currently, we are updating that assessment in selected regions thought to have high potential for undiscovered natural gas, including coal-bed methane and gas hydrate. This update will be completed in 2004, with interim products available in early 2002. The updated assessment will include allocations of undiscovered oil and gas resources to Federal lands. Additionally, the USGS is completing a National Coal Resource Assessment during 2001. To date, coal resource assessments of the Colorado Plateau and of the Northern Rocky Mountains and Great Plains have been released, and coal resource assessments of the Appalachian and Illinois Basins, and Gulf Coast Region will be available later in 2001. USGS coal assessments also identify volumes of coal under federally owned lands, and of federally owned coal under privately owned lands, where present.

1995 National Assessment of United States Oil and Gas Resources

The 1995 USGS assessment of the Nation's undiscovered oil and gas was published in digital format on a CD-ROM (USGS Digital Data Series–30) and in a nontechnical summary, as USGS Circular 1118. The Assessment was conducted in collaboration with State Geological Surveys, with MMS, and with industry geologists under the auspices of the American Association of Petroleum Geologists. Additional cooperation with the Bureau of Land Management, National Park Service, U.S. Forest Service, and Bureau of Indian Affairs was essential for the USGS to generate information regarding oil and gas resources on Federal lands. The current update of the 1995 assessment is being conducted with many of the same partners.

Assuming existing technology, there are approximately 112 billion barrels of technically recoverable oil onshore and in State waters, according to the USGS's most recent assessment.

Technically recoverable resources are those that may be recoverable using current technology without regard to cost. Economically recoverable resources are that part of the technically recoverable resource for which economic factors are included and which can be recovered at a given market price. This includes measured (proved) reserves, future additions to reserves in existing fields (reserve growth), and undiscovered resources. The technically recoverable conventional resources of natural gas in measured reserves, future additions to reserves in existing fields, and undiscovered accumulations equal approximately 716 trillion cubic feet of gas.

In addition to conventional gas resources, the USGS has made an assessment of technically recoverable resources in continuous-type (largely unconventional) accumulations. We estimate about 308 TCFG (trillion cubic feet of gas) of technically recoverable natural gas in continuous-type deposits in sandstones, shales, and chalks, and almost 50 TCFG of technically recoverable gas in coal beds. The total technically recoverable oil and gas resource base onshore and in State waters of the United States is displayed in the table below.

Results of the USGS 1995 National Oil and Gas Assessment

Below is a table of the results of the USGS 1995 assessment:

	---- OIL ---- (billion barrels)	---- GAS ---- (trillion cu. ft.)	-- Natural Gas Liquids -- (billion barrels)
Resource Category	1995	1995	1995
Undiscovered resources			
Conventional Accumulations	30	259	7
Unconventional Accumulations			
Sedimentary reservoirs	2	308	2
Coal-bed methane	NA	50	NA
Anticipated Reserve Growth	60	322	13
TOTAL	92	939	22
Proved Reserves (in 1994)	20	135	7
TOTAL	112	1,074	29

The estimates presented in this testimony reflect USGS understanding as of January 1, 1994, and are shown on a map of the United States in Figure 1. They

are intended to capture the range of uncertainty, to provide indicators of the relative potential of various petroleum provinces, and to provide a useful guide in considering possible effects of future oil- and gas-related activities within the United States.

The geographic information system (GIS) coverages contained in this assessment and related data bases provide the capability to estimate oil and gas resource potential on specific tracts of land, including those owned and/or managed by the Federal Government. This process is called allocation, based on expert opinion, and is accomplished using a methodology that takes into consideration all geologic information available about the basin.

1995 National Oil and Gas Assessment and Onshore Federal Lands (1998)

In January 1998, the USGS published an Open-File Report (OFR 95–0075-N) that reported estimates of volumes of undiscovered oil and gas on Federal lands. Estimates of oil in undiscovered conventional fields range from 4.4 to 12.8 billion barrels (BBO), with a mean value of 7.5 BBO. Estimates of technically recoverable gas in undiscovered conventional fields range from 34.0 to 96.8 trillion cubic feet (TCF), with a mean value of 57.9 TCF. Almost 85 percent of the assessed natural gas in undiscovered conventional accumulations was non-associated gas, that is, gas in gas fields rather than gas in oil fields. Estimates of technically recoverable resources in conventional (continuous type) accumulations for oil are from 0.2 to 0.6 BBO, with a mean value of 0.3 BBO, and for gas, from 72.3 to 202.4 TCF, with a mean value of 127.1 TCF. These ranges of estimates correspond to 95 percent probability (19 in 20 chance) and 5 percent probability (1 in 20 chance) respectively, of a least those amounts occurring.

An economic evaluation was applied to these technically recoverable estimates. Our study concluded that at $30 per barrel for oil and $3.34 per thousand cubic feet of gas, 3.3 BBO oil and 13.6 TCF in undiscovered conventional fields can be found, developed, and produced. In addition, at these estimated prices, 0.2 BBO oil and 11.4 TCF in continuous-type accumulations and 11.8 TCF of coalbed gas can be developed.

Estimated volumes of undiscovered oil, gas, and natural gas liquids in onshore Federal lands, as of January 1994 are displayed in the table below.

	Technically Recoverable			Economically Recoverable*	
				$18/bbl	$30/bbl
	F_{95}	Mean	F_{05}	$2/mcf	$3.34/mcf
Conventional					
Oil (BBO)**	4.4	7.5	12.8	1.6	3.3
Gas (TCF)	34.0	57.9	96.8	9.7	13.6
NGL (BBL)	1.1	1.8	2.7	0.7	0.9
Unconventional					
Oil (BBO)	0.2	0.3	0.6	0.1	0.1
Gas (TCF)	72.4	127.1	202.4	6.1	11.4
NGL (BBL)	0.1	1.5	2.6	0.0	0.1
Coalbed methane (TCF)	13.0	16.1	19.6	7.0	11.8

* Includes cost of finding, developing, and producing the resource. Based on mean values of technically recoverable estimate.

** BBO=billion barrels oil; TCF = trillion cubic feet; BBL = billion barrels liquid, mcf = thousand cubic feet.

Applications of the USGS 1995 National Oil and Gas Resource Assessment

The results of the USGS National Oil and Gas Resource Assessment have been used by the Energy Information Administration for its Annual Energy Outlook, by the California Energy Commission and Canadian Energy Board to model inter-regional natural gas supply and demand and the resulting economic impacts, and by numerous petroleum companies as a basis for evaluating risk associated with exploration and development of domestic oil and gas resources.

Many Federal agencies use the information in the USGS National Oil and Gas Assessment for land-use planning, energy policy formulation, and economic forecasting. Customers include the Department of the Interior, Bureau of Land Manage-

ment, National Park Service, U.S. Forest Service, Bureau of Indian Affairs, Energy Information Administration, and the Department of Energy, among others. In addition, most State Geological Surveys and/or State Divisions of Oil and Gas use the USGS assessment for regional and local resource evaluation and lease planning purposes. Many private sector organizations also use the digital oil and gas assessment results, including environmental protection advocacy groups, petroleum exploration companies, and utility companies (including natural gas and electricity utilities).

USGS Resource Assessment of the 1002 Area of the Arctic National Wildlife Refuge

The Alaska National Interest Lands Conservation Act established the Arctic National Wildlife Refuge (ANWR) as a wildlife refuge in 1980. In section 1002 of that Act, Congress deferred a decision regarding future management of the 1.5-million-acre coastal plain (1002 Area) in recognition of the area's potential for oil and gas resources and its importance as wildlife habitat. A report on the resources (including petroleum) of the 1002 Area was submitted in 1987 to Congress by the Department of the Interior (DOI). Since completion of that report, numerous wells have been drilled and oil fields discovered near ANWR on State lands, new geologic and geophysical data have become available, seismic processing and interpretation capabilities have improved, and the economics of North Slope oil development have evolved.

Anticipating the need for scientific information and considering the decade-old perspective of the petroleum resource estimates included in the 1987 Report to Congress, the USGS reexamined the geology of the ANWR 1002 Area and prepared a new petroleum resource assessment that was released in 1998.

Based on this 1998 USGS assessment, the total quantity of technically recoverable oil within the entire assessment area is estimated to be between 5.7 and 16.0 billion barrels (95-percent and 5- percent probability range), with a mean value of 10.4 billion barrels. The entire assessment area includes Federal, State, and Native areas. Technically recoverable oil within the ANWR 1002 Area (excluding State and Native areas) is estimated to be between 4.3 and 11.8 billion barrels (95- and 5-percent probability range), with a mean value of 7.7 billion barrels. These estimates reflect new data and techniques and thus should not be directly compared to results of the 1995 National Oil and Gas Resource Assessment.

According to the 1998 USGS assessment, volumes of oil are expected to occur in a number of accumulations rather than a single large accumulation, such as the giant Prudhoe Bay field. However, most of that oil is estimated to occur in accumulations that are sufficiently large to be of potential economic interest. At the mean, nearly 80 percent of the oil is thought to occur in the western part of the 1002 Area, which is closest to existing infrastructure developed on State lands. We estimate that the western portion of the 1002 Area contains between 3.4 and 10.2 billion barrels of oil (BBO) (95- and 5-percent probability), with a mean of 6.4 BBO. We estimate that the eastern area contains between 0 and 3.2 BBO (95- and 5-percent probability), with a mean of 1.2 BBO.

As part of our 1998 assessment, the USGS conducted an economic analysis that considers the cost of producing estimated technically recoverable volumes of oil from the 1002 Area. Our study estimates the market price that would have to be paid to find, develop, produce, and transport a specific volume of oil to the West Coast of the United States. Figure 2 summarizes estimated volumes of economically recoverable oil as a function of the market price of that oil. This graph assumes constant 1996 dollars and the expectation that production will repay all operating costs, including taxes and transport to market, all investment expenditures, and provide an after-tax rate of return of at least 12 percent on the investment.

Comparison with Previous Assessments

Among previous assessments of ANWR 1002 Area petroleum resources, only the 1987 USGS assessment of in-place resources is directly comparable to our 1998 assessment. The technically and economically recoverable petroleum resource estimates cannot be compared directly because different methods were used in preparing those parts of the 1987 Report to Congress. The current assessment shows an overall increase in estimated in-place oil resource when compared to the 1987 assessment. Ranges are 11.6 to 31.5 BBO versus 4.8 to 29.4 BBO, (95- and 5-percent probabilities) and mean values are 20.7 BBO versus 13.8 BBO (current assessment compared to 1987 assessment). The increase is a consequence of improved resolution of reprocessed seismic data, which allowed the identification of many more potential petroleum accumulations in parts of the area, as well as information available regarding recent nearby oil discoveries.

Another significant change is in the geographic distribution of resources. In the 1987 assessment, about 75 percent of the mean estimated in-place oil was thought

to occur in the southeastern section of the 1002 Area and only 25 percent was thought to occur in the northwestern area. In the current assessment, nearly 85 percent of the in-place oil is thought to occur in the northwestern area and only about 15 percent is within the deformed area. The reason for this change in interpretation is largely related to improved resolution of the seismic data, especially in the northwestern area where, in various plays, it allowed the identification of many more potential petroleum accumulations than were previously thought to exist. The southeastern area with only a single well offshore and complex geology onshore carries great uncertainty. Further, part of that area considered oil prospective in 1987 is now considered prospective only for gas because of new understanding of the thermal history of the rocks.

Sec. 604 Energy Act of 2000

The Secretary of the Interior is charged with conducting an inventory of energy resources and the restrictions and impediments to their development on Federal Lands in Section 604 of the Energy Act of 2000, signed into law on November 9, 2000. The exact text is given below:

SEC. 604. SCIENTIFIC INVENTORY OF OIL AND GAS RESERVES.

(a) IN GENERAL. The Secretary of the Interior, in consultation with the Secretaries of Agriculture and Energy, shall conduct an inventory of all onshore Federal lands. The inventory shall identify:

(1) the United States Geological Survey reserve estimates of the oil and gas resources underlying these lands; and

(2) the extent and nature of any restrictions or impediments to the development of such resources.

(b) REGULAR UPDATE. Once completed the USGS reserve estimates and the surface availability data as provided in subsection (a)(2) shall be regularly updated and made publicly available.

(c) INVENTORY. The inventory shall be provided to the Committee on Resources of the House of Representatives and to the Committee on Energy and Natural Resources of the Senate within two years after the date of the enactment of this section.

(d) AUTHORIZATION OF APPROPRIATIONS. There are authorized to be appropriated such sums as may be necessary to implement this section.

It is our understanding that the role of the USGS will be to assess the oil and gas resources of oil and gas-bearing basins with Federal land ownership, consistent with the USGS assessment and allocation methodology. Then, USGS geologists will allocate resource estimates to those specific land parcels owned by the Federal Government. The USGS resource estimates will be combined with reserve volumes from the DOE/EIA, and will be incorporated into a geographic information system (GIS) that shows the spatial distribution of those potential resources and known reserves. The resource and reserve GIS will be integrated with a GIS of restrictions and impediments constructed by BLM and USFS. The USGS has met several times with representatives of the Bureau of Land Management (BLM), the US Forest Service, the US Department of Energy and their Energy Information Administration and the staff of this committee to discuss plans to produce this inventory.

The USGS intends to use some of the resource estimates from the 1995 National Oil and Gas Assessment, for which there are not significant new data, and will update resource estimates for the gas-prone areas of the country for which we have new data and are developing improved assessment methods.

Madame Chairman, this concludes my remarks. I would be happy to respond to any questions.

[Maps and charts accompanying Dr. Leahy's testimony follow:]

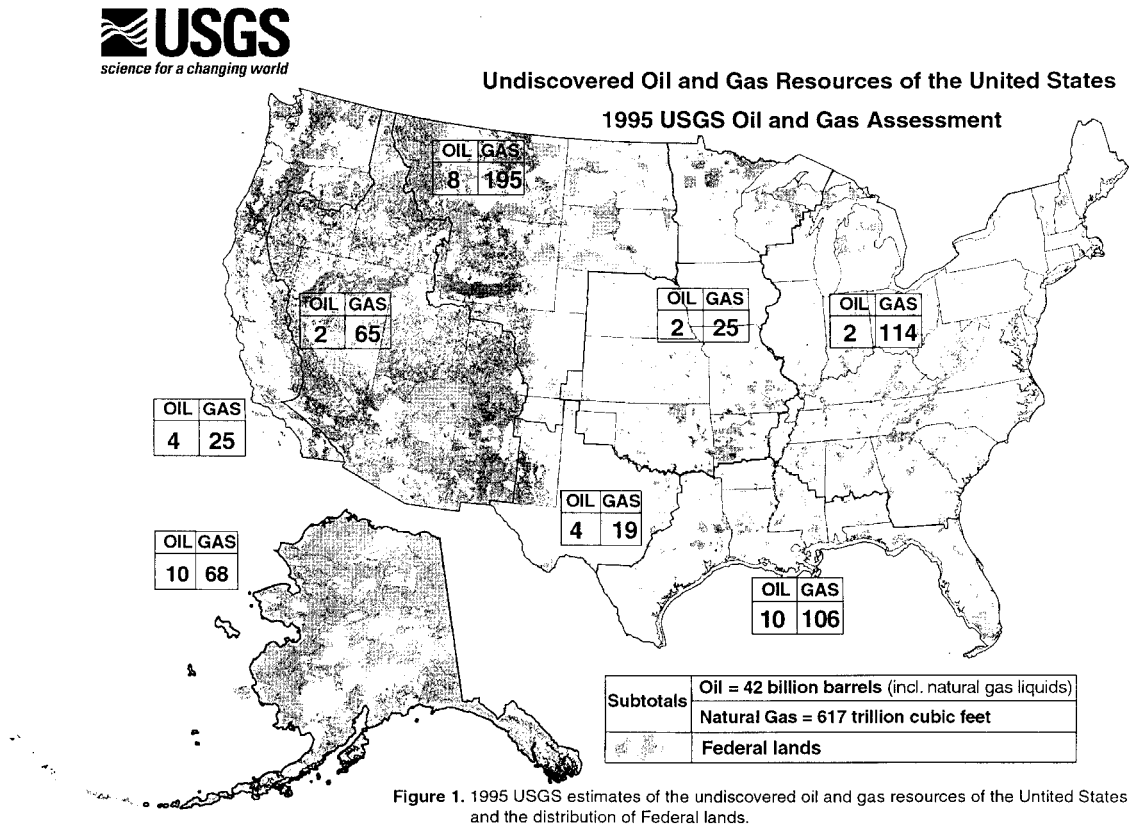
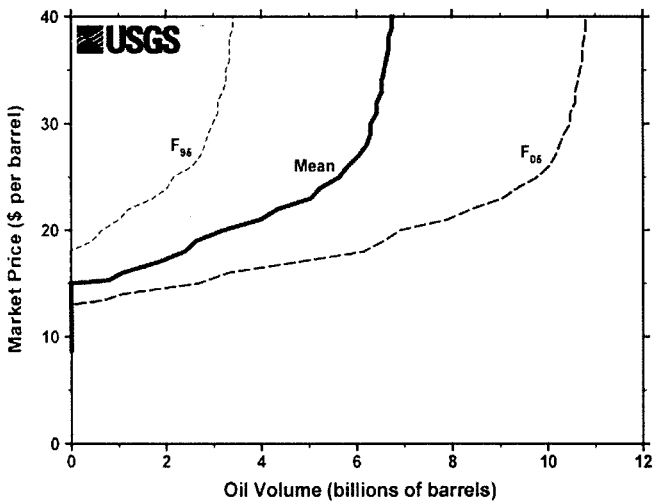


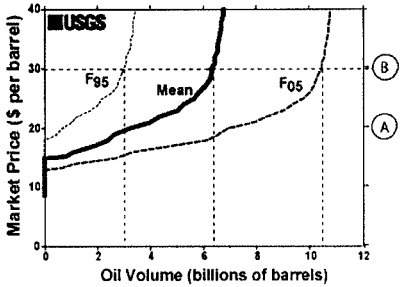
Figure 1. 1995 USGS estimates of the undiscovered oil and gas resources of the Untited States and the distribution of Federal lands.

Economically Recoverable Oil in Federal Part of 1002 Area - Arctic National Wildlife Refuge



Summary of the USGS estimates of economically recoverable oil that may occur beneath the Federal 1002 Area of the Arctic National Wildlife Refuge. The three curves are based on estimates of technically recoverable oil volumes at the mean (expected) value, and at the 95 percent (F95) and 5 percent (F05) probabilities. Each curve relates market price/cost to the volume of oil estimated to be profitably recoverable. Included are the costs of finding, developing, producing, and transporting oil to market based on a 12 percent after-tax return on investment all calculated in constant 1996 dollars.

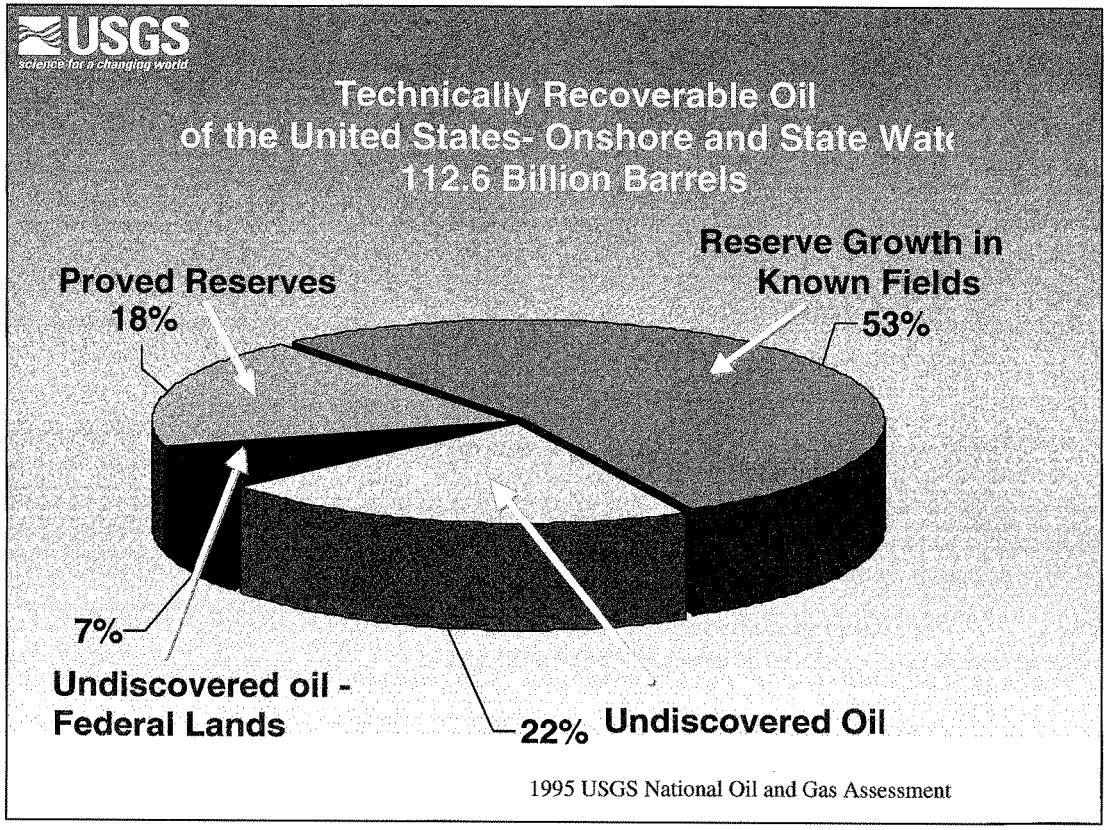
How to Read the Graph

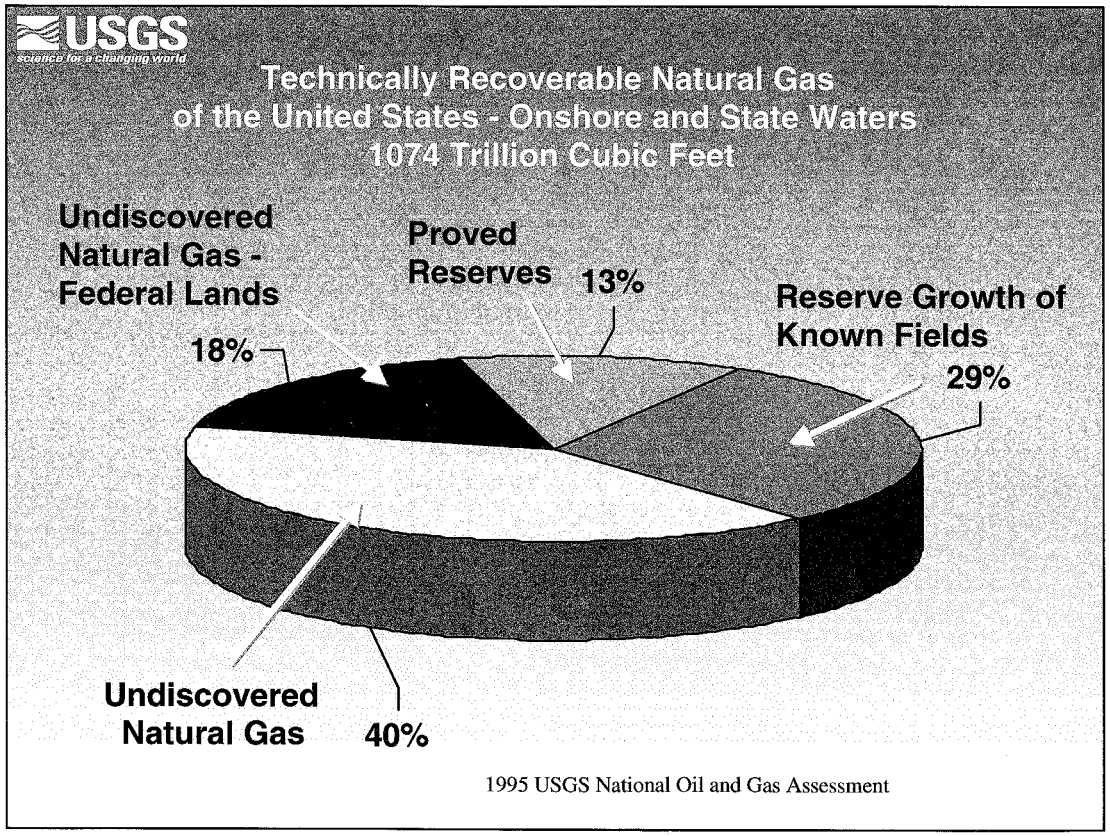


(A) At a market price of $20 per barrel, there is a 95% chance (F95) that at least 650 mmbo are economically recoverable and a 5% chance (F05) that at least 6.9 bbo are economically recoverable, with a mean (expected value) of 3.2 bbo economically recoverable.

(B) At a market price of $30 per barrel, there is a 95% chance (F95) that at least 3.0 bbo are economically recoverable and a 5% chance (F05) that at least 10.5 bbo are economically recoverable, with a mean (expected value) of 6.3 bbo economically recoverable.

Figure 2. Economically recoverable oil in Federal part of 1002 Area- Arctic National Wildlife Refuge.


USGS
science for a changing world
Technically Recoverable Oil
of the United States- Onshore and State Wat
112.6 Billion Barrels
Proved Reserves
18%
Reserve Growth in
Known Fields
53%
7%
Undiscovered oil -
Federal Lands
22%
Undiscovered Oil
1995 USGS National Oil and Gas Assessment


USGS
science for a changing world
Technically Recoverable Natural Gas
of the United States - Onshore and State Waters
1074 Trillion Cubic Feet
Undiscovered Natural Gas - Federal Lands
18%
Proved Reserves
13%
Reserve Growth of Known Fields
29%
Undiscovered Natural Gas
40%
1995 USGS National Oil and Gas Assessment

Mrs. CUBIN. The Chair now recognizes Carolita Kallaur to testify.

STATEMENT OF CAROLITA KALLAUR, ASSOCIATE DIRECTOR, OFFSHORE MINERALS MANAGEMENT, MINERALS MANAGEMENT SERVICE, U.S. DEPARTMENT OF THE INTERIOR

Ms. KALLAUR. Thank you, Madam Chair and distinguished members of the Subcommittee. Thank you for allowing me to present information on our nation's OCS oil and gas resource potential.

I will start again. Madam Chairman and distinguished members of the Subcommittee, thank you for allowing me to present information on the oil and gas resource potential of the outer continental shelf. With your permission, I will submit my formal testimony, the MMS 2000 resource assessment, and maps which display our current estimates for the record.

I will use the time this afternoon to touch upon the major points in my testimony. While the focus of today's hearing is the future, I think it is informative to first review where we are today in terms of providing energy for our Nation. The outer continental shelf is an important contributor to domestic energy production. It currently accounts for 25 percent of oil production and 26 percent of natural gas production. It is the major source of oil and gas from Federal lands. The majority of the production comes from the central and western Gulf of Mexico. The success of the Gulf's deepwater regime has allowed the OCS to maintain this level of contribution over the past few years.

We are, however, beginning to be concerned about the ability of the OCS to maintain its current level of gas production. Historically the OCS has been much more of a gas province than an oil province, and clearly today natural gas is viewed as the fossil fuel of choice.

What we are beginning to witness is a steady decline in shallow water natural gas production. While deepwater activity has been very successful to date, it is primarily an oil province with significant amounts of associated gas, a different mix than what has been the case historically in the Gulf.

I raise this issue because the National Petroleum Council study on natural gas looks to the OCS to increase gas production to between 7 and 8 TCF a year by 2012 from its current level of 5 TCF. We are not confident at this point that we can achieve that goal. At the same time I recognize on an historical basis government estimates tend to be more conservative than those of the private sector.

Now, let me talk about our recent estimates of undiscovered conventionally recoverable resources. I have provided each of you with a map of the United States with our current estimates for each OCS planning area. Of the remaining U.S. conventional resources on a barrel-of-oil-equivalent basis, the offshore contains 63 percent. So, the OCS clearly will continue to play an important role in our energy future.

The 2000 resource update resulted in an increase of 29.4 billion barrels of oil and 94.2 trillion cubic feet of gas from our 1995 assessment. The increase occurs almost entirely in the Gulf of Mexico

based on deepwater exploration results and additional areas being assessed.

The mean numbers for these estimates for the OCS are 75 billion barrels of oil and 362.2 trillion cubic feet of gas. We also provide information on what percentage of the resources are under moratoria and which ones are available for leasing. The estimated oil under moratoria are 16 million barrels of oil, or about 21 percent, and 56 trillion cubic feet of gas, or about 17 percent.

In reviewing these moratoria estimates, one needs to recognize there is a higher degree of uncertainty because of the limited level of activity in these areas. These numbers might go up or down if drilling were to occur.

The experience of our neighbors to the north in Canada is interesting in this regard. For many years drilling occurred in the Scotian Basin offshore Eastern Canada. Companies had found a small oil field that they were about to abandon. A rig became available, and they decided to use it and drill deeper, resulting in a major natural gas discovery called the "Deep Panuke." The "Panuke" discovery will have a significant impact on Canada's ability to produce natural gas for their own use as well as export gas to the United States.

It is interesting to note that the same geologic trends continue along the U.S. Atlantic shelf. But whether ours is as prospective as the Canadians can only be confirmed through drilling.

In conclusion, while there may be uncertainty about some of our resource estimates, clearly the bottom line is that the outer continental shelf of the United States will continue to play an important role in providing energy for our Nation. For those areas that are available for development, our primary focus is to ensure that any activities conducted offshore are done without harm to the environment and to offshore personnel. We believe that through this approach there will be a greater chance that the contribution of the OCS can increase in the years ahead.

Thank you, and I would be pleased to answer any questions.

Mrs. CUBIN. Thank you, Ms. Kallaur.

[The prepared statement of Ms. Kallaur follows:]

Statement of Carolita Kallaur, Associate Director, Offshore Minerals Management, Minerals Management Service, U.S. Department of the Interior

Madam Chairman and Members of the Subcommittee, I appreciate the opportunity to appear before you today to present testimony on the Minerals Management Service (MMS) estimates for the United States Outer Continental Shelf (OCS) crude oil and natural gas resource base and the underlying methodology used by the MMS in creating these estimates.

Background

As you are aware, MMS's mission consists of two major programs: Offshore Minerals Management and Minerals Revenue management. The leasing and oversight of mineral operations on the OCS and all mineral revenue management functions for Federal (onshore and offshore) and American Indian lands are centralized within the bureau. In 2000, OCS oil and natural gas production accounted for roughly 25 and 26 percent, respectively, of our nation's domestic energy production oil production was over 500 million barrels and natural gas production was over 5 trillion cubit feet. The amount of oil and natural gas production in 2000 was the most ever produced on the OCS. In addition, in fiscal year 2000, MMS collected and distributed about $7.8 billion in mineral leasing revenues from Federal and American Indian lands.

In its role as manager of the Nation's OCS energy and nonenergy mineral resources, the bureau's long-term strategy is to assess those resources; determine, in consultation with affected parties, if they can be developed in an environmentally sound manner; and, if leased, to regulate activities to ensure safety and environmental protection. This long-term strategy affects the way MMS manages OCS resources and the way MMS faces the challenge of maintaining a balance between providing energy and protecting the Nation's unique and sensitive environments and other natural resources.

An integral element in this long-term strategy is the ability to identify the most promising areas of the OCS for the occurrence of crude oil and natural gas accumulations and to quantify the amounts of oil and natural gas that may exist in these areas. However, since much of the OCS has not been thoroughly explored, we must deal with the uncertainty that these resources may or may not exist in these most promising areas.

We must also develop indicators of the economic viability of these resources under a variety of economic and price scenarios and costs associated with exploration, development, and production activities for the specific areas where the resources may occur. Within MMS, these functions are performed through the Resource Evaluation (RE) Program component of the Offshore Minerals Management Program.

MMS Resource Evaluation (RE) Program

The RE Program is focused upon the acquisition and analysis of geologic, geophysical, petroleum engineering, and economic data and information related to the mineral potential (predominately crude oil and natural gas) of OCS lands. The primary source of these data and information is the oil and natural gas industry, which conducts exploration, development, and production activities on OCS lands. The MMS acquires these data under terms of lease agreements or permits. Hence, the data and information are considered proprietary by MMS regulations and generally not available for public release.

The RE Program functions encompass all cycles of OCS program activities and provide technical data and information supporting a wide array of program and regulatory decisions affecting Offshore Minerals Management including OCS leasing decisions, bid adequacy determinations, environmental analyses, royalty-relief considerations and a myriad of related issues and decisions that must incorporate specific knowledge about the amounts of oil and natural gas resources and reserves.

In performing these functions, MMS personnel must constantly update the information data bases to reflect new data produced by current drilling and seismic activities performed by industry as well as update production data from known fields as crude oil and natural gas are produced from these fields. There are several byproducts that result from our ongoing geologic, economic, and engineering analyses. For example, MMS publishes annual reports that update the estimates of proved reserves for Gulf of Mexico and Pacific OCS fields, and the Gulf of Mexico are all valuable information sources to the industry, the States, and the public. These annual reports are located on the MMS Internet website under the Gulf of Mexico and Pacific Region webpages. In April 2000, the MMS held a Natural Gas Symposium in Houston, Texas, where the participants discussed and identified the role of the Federal OCS in supplying the future natural gas demand of the U.S. The information presented at the Symposium is available on our MMS homepage.

OCS Resource Assessments

As background to discussing any resource estimates of crude oil and natural gas accumulations on the OCS, it is important to understand the differences between the terms undiscovered resources and known reserves proved and unproved.

Undiscovered resources are quantities of crude oil and natural gas that geologic data and information suggest may exist in areas outside of known oil and natural gas fields. However, verification of the existence of crude oil and/or natural gas can only be determined from exploratory drilling activities and verification of the ultimate number and sizes of fields is only truly known after an area has been thoroughly explored, developed, and all discoveries produced a timeframe generally covering decades.

Known reserves are those crude oil and natural gas accumulations that have been discovered and determined to be economically viable to develop and produce. Estimates of known reserves are reported in two categories by MMS: Proved reserves are those accumulations that have existing production and transportation facilities or regulatory commitments for installation of such facilities. Unproved reserves are those accumulations that have been discovered, but lack sufficient geologic and economic studies by MMS and OCS lessees to determine whether such discoveries can be commercially developed.

Of note, MMS reserve and resource estimates address conventionally recoverable crude oil and natural gas quantities that is, estimates do not include accumulations of heavy oil, oil shales, gas hydrates, coalbed methane, or similar continuous-type hydrocarbon occurrences.

OCS Known Reserve Estimates

Based on the most recently published report as of December 31, 1998, MMS estimates of proved reserves for the OCS are 3.8 billion barrels of oil (Bbbl) and 31.3 trillion cubic feet (TCF) of natural gas. Additionally, MMS estimates of unproved reserves for the OCS are 2.3 Bbbl of oil and 6.0 TCF of natural gas.

OCS Undiscovered Resources

Previous OCS Resource Assessments

Since its creation in 1982, MMS has completed four systematic assessments of Federal OCS undiscovered oil and natural gas resources, including the 2000 update. The results of the first resource assessment and the methodologies used to develop these estimates were published in a 1985 MMS report entitled Estimates of Undiscovered, Economically Recoverable Oil and Natural Gas Resources for the Outer Continental Shelf as of July 1984. Following release of the MMS report in 1985, MMS agreed to join the U.S. Geological Survey (USGS) in conducting a joint, concurrent resource assessment of the United States (both onshore and offshore) to provide the Department of the Interior, Congress, and other public and private organizations with estimates reflecting consistent timeframes. A National Academy of Sciences (NAS) panel reviewed the 1985 resource assessment and its resource estimate methodologies and recommended certain changes for future assessments.

The second MMS assessment was conducted using improved methodology. The results of this National Assessment were published in 1989 in a joint MMS/USGS publication entitled Estimates of Undiscovered, Conventional Oil and Gas Resources in the United States A Part of the Nation's Endowment. Subsequently, MMS reported a more detailed set of results from this joint assessment in 1990 in an MMS report entitled Estimates of Undiscovered Oil and Gas Resources for the Outer Continental Shelf as of January 1987.

Similarly, an NAS panel also reviewed MMS procedures employed in its second resource assessment and additional recommendations were published.

In view of the importance of such estimates to outside private and public interest groups, additional reviews of the MMS (and USGS) methodologies and report procedures were conducted by the Association of American State Geologists (AASG), the Energy Information Administration (EIA, U.S. Department of Energy), and the American Petroleum Institute (API). The AASG and EIA reviews resulted in published reports with technical recommendations for enhancing the methodologies employed by both MMS and USGS, while the API review resulted in private recommendations to the Department.

In preparation for conducting its third systematic OCS resource assessment (1995), MMS not only took into account the technical recommendations of NAS and others but also looked internally at other ways to improve on its past efforts. Because the results of the resource assessment would be used by different customers, each with different information needs and levels of technical sophistication, the bureau devoted considerable time and attention to improving on the way the estimates are made and how they are reported. Customers (user groups) surveyed include:

- MMS/DOI decisionmakers;
- Federal and State Agencies and Congress;
- Oil/Gas and related industries;
- Geologic and scientific communities and academia; and
- The general public.

Methodology

Armed with the technical recommendations and the realistic conclusion that the needs of our customers (including ourselves) could be better met, MMS embarked on an effort in 1991 to revise our resource estimation and reporting procedures. Our specific goals were to establish a method for estimation that:

- Maintained the strong points of earlier methodologies;
- Utilized the extensive amount of proprietary geological and geophysical data within MMS data bases to the fullest extent; and
- Provided MMS geologists flexibility to use their judgment to capture a broad range of possible geologic interpretations to address specific areas.

In addition, we wanted to:

- Produce functional/understandable results;

- Reflect the high quality science inherent in the MMS activities addressing resource assessment and estimation;
- Ensure that estimates reflect geologic potential (known and unknown) as well as reflect risks and uncertainties;
- Separate determinations of economic viability from the process of estimating geologic potential; and
- Report estimates and related information to a broader audience.

The Petroleum Exploration and Resource Evaluation System (PETRIMES), a probabilistic play analysis model which was used by the Geological Survey of Canada, was chosen as the basic platform for the present assessment of geologic resources. Most of the resource assessment models currently in use, by either industry or other government agencies, provide estimated resources in aggregated numbers representing total resources as a distribution. However, PETRIMES can also provide an estimate of the number and size of oil and natural gas pools that remain to be discovered. That information is very useful for planning and decisionmaking processes related to exploration and development of OCS resources.

One drawback to PETRIMES, however, is that it was designed to assess a single commodity play, such as an oil play or a gas play. In reality, OCS plays are (in most cases) mixed plays containing both oil and gas pools. To utilize PETRIMES for the assessment of OCS resources, MMS implemented a number of changes to the original PETRIMES program. The most important change made to the program was to provide the ability to separate estimation of both liquid (condensates and oil) and gas (associated gas and nonassociated gas) phases required for an accurate economic evaluation of the OCS. The modified version of PETRIMES developed by MMS is called the Geologic Resource Assessment Program (GRASP).

The Probabilistic Resource Estimation Offshore (PRESTO) model, developed by MMS and used in its 1987 assessment, was modified to accept the assessed output of GRASP at the pool level to determine the economically recoverable resources at the geologic basin level and higher. Unlike the 1987 resource assessment, where economic resources were estimated for only two sets of distinct oil and gas prices inflated over time, the present assessment depicts the uncertainty of assessed results by providing a continuous series of resource values over a range of prices (price supply curves) for each geologic basin, province, and area.

In addition to adopting revised geologic modeling approaches and computer models in its 1995 resource assessment, the MMS also opened up the process of developing estimates for the OCS by holding public workshops for industry, academia, and other interested parties to discuss MMS geologic interpretations and assumptions to be used in the estimation process. We also retained the services of two outside experts in the petroleum assessment community both of which had served on NAS panels reviewing previous MMS assessments to provide technical advice to MMS scientists.

Finally, the results of the 1995 OCS resource assessment were published in a format that allow for more openness in OCS resource management decisions reporting maps of the most promising plays, estimates of the number and sizes of accumulations that may exist within these areas, price-supply curves for examining the impacts of uncertain future oil and natural gas prices on the economic viability of the resources, and a substantial amount of supporting assumptions and underlying geologic information. Industry can use this information for prioritizing plays to be explored; plays that will benefit from further development and plays that need cost improvements.

The 1995 OCS resource assessment also contained both a geologic assessment section and an economic viability section. In view of the extensive amount of data and information available, MMS issued an Executive Summary of its OCS resource estimates as well as technical, in- depth results through three regional reports (Gulf of Mexico/Atlantic Region, Pacific Region, and Alaska Region).

2000 OCS Resource Assessment

This assessment represents an estimation of the undiscovered hydrocarbon potential of the OCS was done to support staff work and analysis needed in formulating the next 5-Year Oil and Gas Leasing Program covering the timeframe 2002–2007. It should be noted that the methodology for the 2000 assessment has not changed significantly from that used in the previous 1995 assessment.

The assessment also is used by MMS in the decisionmaking process on many programmatic issues. Further, it provides important information when conducting environmental studies and the analysis of options on numerous offshore issues. Industry uses the assessment as another piece of scientific information in formulating its business strategies, and the States and interest groups do the same.

While previous assessments were performed concurrently with an effort by the USGS, the current assessment was not a joint effort. This is due to the fact that the USGS does continuous assessments and updates specific areas all the time. In contrast, the MMS 2000 OCS assessment covers a specific time period, often targeted to meet specified regulatory requirements, such as preparation of a 5-Year Leasing Program. Therefore, it was not practical to conduct a joint assessment.

The 2000 assessment presents the updated assessment results since the 1995 assessment for the Alaska, Atlantic, and Gulf of Mexico OCS Regions. In the Alaska Region only the Beaufort and Chukchi Seas, Hope Basin and Cook Inlet areas were updated, as other planning areas lacked new data and changes since the last assessment. The Pacific OCS Region was not updated for the same reasons. The Atlantic OCS Region was re-evaluated to reflect recent exploration results offshore Nova Scotia, current exploration and production technologies, and to make the water depth divisions compatible with the ones now being used in the Gulf of Mexico.

The MMS has recently made public the 2000 assessment, and I have included a copy of the assessment with my written testimony for the hearing record. The total mean undiscovered, conventionally recoverable resources for the United States OCS are 75.0 billion barrels of oil and 362.2 trillion cubic feet of natural gas. Within that total, MMS determined that the undiscovered conventionally recoverable resources foregone by the 1998 moratoria (i.e., the President's June 1998 OCS decision) would be approximately 16 billion barrels of oil and 62 trillion cubic feet of gas.

The total mean undiscovered economically recoverable resources for the United States OCS are 26.6 billion barrels of oil and 116.8 trillion cubic feet of gas at prices of $18 per barrel and $2.11 per thousand cubic feet, respectively, and 46.7 billion barrels of oil and 168.1 trillion cubic feet of gas at prices of $30 per barrel and $3.52 per thousand cubic feet, respectively.

A Comparison of the 1995 and 2000 Assessments

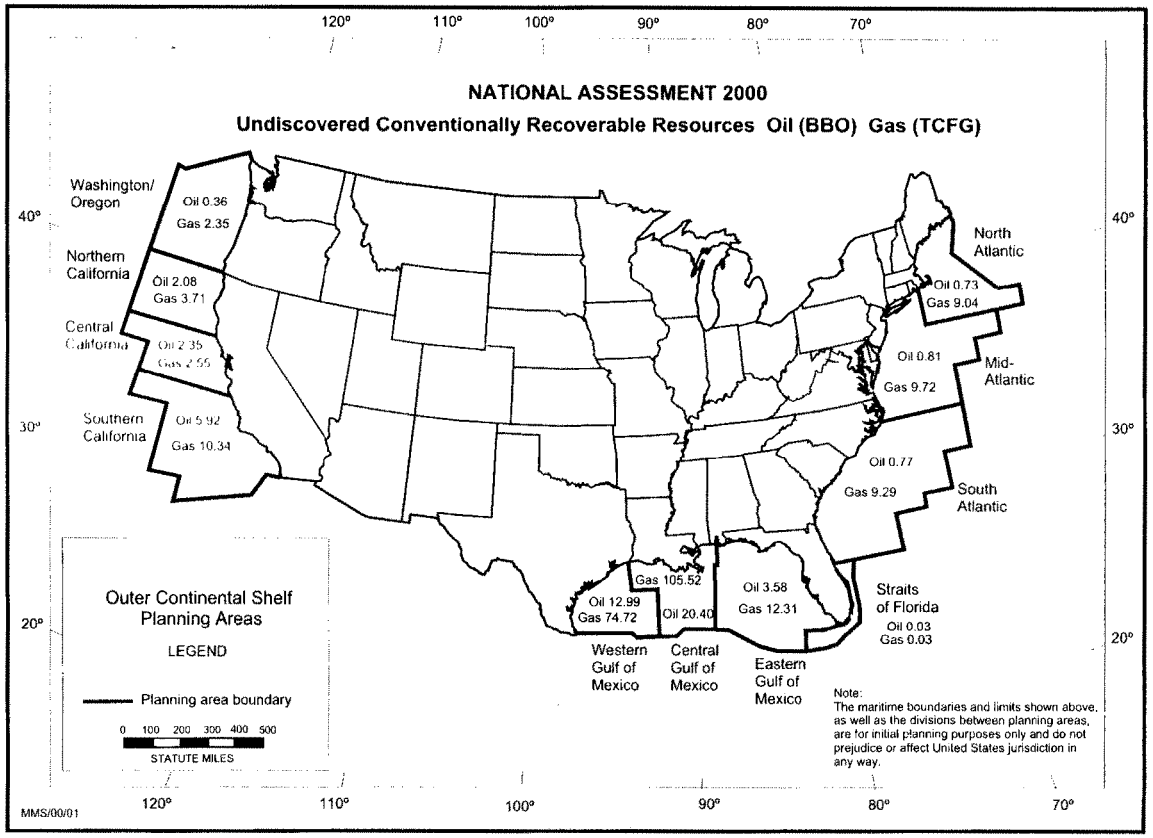
The current assessment resulted in an increase from the 1995 estimates of 29.4 billion barrels of oil and 94.2 TCF of gas in OCS undiscovered conventionally recoverable resources. The increase occurs almost entirely in the Gulf of Mexico based on deepwater exploration results and additional areas assessed. These new areas include the deep, older section of the Central and Western Gulf shelf below 20,000 feet, the Cenozoic section beyond the Sigsbee Escarpment, and the deepwater Mesozoic section not on the Florida Platform. Of the three areas, the last is the most significant. Regional reports are also being prepared that highlight the findings of the 2000 assessment.

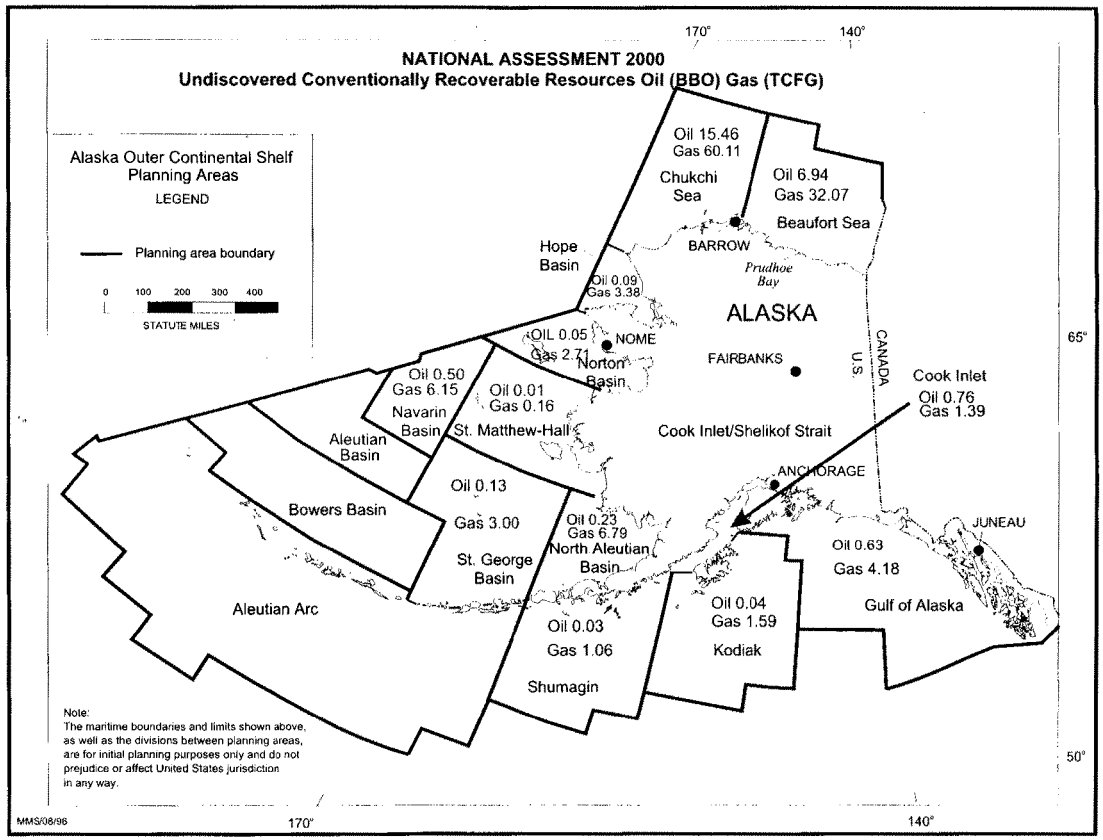
Conclusion

By building on our past efforts and methodologies, we believe our current resource assessment, and thus the resulting information, is superior to previous MMS assessments. We also believe that the extensive amount of materials to be released through our regional reports and the format of such reports will more readily meet the needs of the extensive public and private audiences for such information thereby contributing to efforts to develop balanced resource management policies with regard to OCS resources. While reliable resources estimates are only one of many factors to be considered when making OCS resource management decisions, they are an important component and should be based on high quality science. We are confident that our new assessment produced results that met that high standard.

Madam Chairman, this concludes my prepared remarks. However, I will be pleased to answer any questions Members of the Subcommittee may have.

[Maps accompanying Ms. Kallaur's testimony follow:]


NATIONAL ASSESSMENT 2000
Undiscovered Conventionally Recoverable Resources Oil (BBO) Gas (TCFG)
120°
110°
100°
90°
80°
70°
40°
30°
20°
Washington/ Oregon
Oil 0.36
Gas 2.35
Northern California
Oil 2.08
Gas 3.71
Central California
Oil 2.35
Gas 2.55
Southern California
Oil 5.92
Gas 10.34
North Atlantic
Oil 0.73
Gas 9.04
Mid-Atlantic
Oil 0.81
Gas 9.72
South Atlantic
Oil 0.77
Gas 9.29
Straits of Florida
Oil 0.03
Gas 0.03
Western Gulf of Mexico
Oil 12.99
Gas 74.72
Central Gulf of Mexico
Gas 105.52
Oil 20.40
Eastern Gulf of Mexico
Oil 3.58
Gas 12.31
Outer Continental Shelf Planning Areas
LEGEND
Planning area boundary
0 100 200 300 400 500
STATUTE MILES
Note:
The maritime boundaries and limits shown above, as well as the divisions between planning areas, are for initial planning purposes only and do not prejudice or affect United States jurisdiction in any way.
MMS/00/01


NATIONAL ASSESSMENT 2000
Undiscovered Conventionally Recoverable Resources Oil (BBO) Gas (TCFG)
Alaska Outer Continental Shelf Planning Areas
LEGEND
Planning area boundary
0 100 200 300 400
STATUTE MILES
170°
140°
65°
50°
Oil 15.46
Gas 60.11
Chukchi Sea
Oil 6.94
Gas 32.07
Beaufort Sea
BARROW
Prudhoe Bay
ALASKA
Hope Basin
Oil 0.09
Gas 3.38
OIL 0.05
Gas 2.71
NOME
Norton Basin
FAIRBANKS
CANADA
U.S.
Cook Inlet
Oil 0.76
Gas 1.39
Oil 0.50
Gas 6.15
Navarin Basin
Oil 0.01
Gas 0.16
St. Matthew-Hall
Cook Inlet/Shelikof Strait
Aleutian Basin
ANCHORAGE
Oil 0.13
Gas 3.00
Bowers Basin
Oil 0.23
Gas 6.79
North Aleutian Basin
JUNEAU
Oil 0.63
Gas 4.18
St. George Basin
Aleutian Arc
Oil 0.04
Gas 1.59
Kodiak
Gulf of Alaska
Oil 0.03
Gas 1.06
Shumagin
Note:
The maritime boundaries and limits shown above, as well as the divisions between planning areas, are for initial planning purposes only and do not prejudice or affect United States jurisdiction in any way.
MMS/08/96

Mrs. CUBIN. The Chair now recognizes Dr. Naresh Kumar to testify.

STATEMENT OF NARESH KUMAR, GROWTH OIL AND GAS, ON BEHALF OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS

Mr. KUMAR. Thank you. Madam Chairman and members of the Subcommittee, I am honored to be here as a representative of the 30,000-member American Association of Petroleum Geologists. Let me state I also feel it is a personal honor to be here. Our association is the largest professional geological society in the United States and has membership worldwide.

Our members study the Earth and deeply care for the environment. Our membership is engaged directly and indirectly in searching and looking for the hydrocarbons and the economic development of hydrocarbon deposits. And so our membership is keenly interested in understanding the amount and distribution of those resources.

I have been invited here to make an independent comment on the estimate that is provided by the U.S. Geological Survey and the Mineral Management Service. Let me state right in the beginning that these agencies have done a good, if conservative, job in assessing the undiscovered sources of the United States.

Our committee was formed by the executive committee of the AAPG in 1993. It was a committee that I am vice chairman of. Since inception, we have followed the methodologies of both of these agencies since our committee was formed.

We have consulted with the U.S. Geological Survey on the 1995 national assessment, 1998 Arctic National Wildlife Refuge assessment, and also the 2000 world petroleum assessment. All of these, our committee reviewed their methods, and we made recommendations to the AAPG executive committee to endorse the scientific methodologies and techniques used by USGS, and we publicly stated so. However, we have not endorsed the specific numbers, but have endorsed only the sound scientific process through which these numbers were acquired.

I would like to take a minute here just to point out the difference between reserves and resources. The figure that you see was developed jointly by the American Association of Petroleum Geologists, Society of Petroleum Engineers, and World Petroleum Congress. On the top part of the figure, which is the reserves which have been discovered, volumes that are commercial in nature, are planned, undergoing development, or currently producing. The bottom part of this figure is the undiscovered assessed resources. And we see that the public confuses sometimes between these two.

One example is that we have heard statements such as the Arctic National Wildlife Refuge is the biggest oil field left in North America on the one side, but ANWR only has six months of oil on the other side. Actually ANWR is only a large estimated resource that will not become an oil field with quantifiable reserves unless exploration takes place. The truth is ANWR will not supply anything unless something is done there. Depending on the size of discovery, ANWR could account for 15 to 20 percent of our Nation's supply for 15 to 20 years.

I would like to mention a couple other terms here, which are supply and demand. Again, I want to emphasize that supply is limited only to existing wells, whereas demand is the amount that can be drawn from their supply to meet the energy needs.

On the far left of this figure, we start with these prospective resources. If the size is sufficient, the economy prices, technology favorable, then they become—resources become reserves, and then from reserves, if we have some of those—some other factors favorable, only then they can become supply and provide the Nation's energy needs. Over the last few years our industry has been wrenched when supply exceeded demand, and the Nation has suffered when supply failed to meet demand.

One of the characteristics that I want to point out on our next chart, that these assessments, the sizes, tend to grow in size through time. This is only for gas, but to some extent that would apply to oil as well. We see a trend as additional drilling takes place, as additional technology develops, in most of the producing areas we see the estimates continue to increase.

The resource assessment of USGS and the Mineral Management Service, National Petroleum Council, they all confirm the United States has large remaining oil and gas resources. The agencies have done a good job in using the geological data, scientific knowledge available, and also they have scrutinized the techniques and methods soundly. However, these agencies do not have access to all the necessary data. Exploration thrives and succeeds on the philosophy of multiple hypotheses. We keep finding surprises that were considered played out. Only an active and vigorous exploration and production industry can truly assess the remaining resources through the drilling and discovery, and deliver those surprises to the Nation.

The most prospective resources for natural gas are in the public lands in the Rocky Mountain sedimentary basins, offshore Gulf of Mexico, eastern Gulf of Mexico, and on the Atlantic and Pacific outer continental shelf.

In summary, let me state that our country has abundant energy resources. In order to assure that our way of life is not dramatically impacted, AAPG suggests that the United States must develop a national energy policy that provides dependable, affordable and uninterruptible energy for the public. The resources estimate is a wide planning tool. The agencies that perform the assessments and track oil and gas resources, they have done a good job today, and they deserve our support.

We would also like to state that energy resource development can be accomplished in an environmentally responsible manner. The technology is available to do this.

I thank you for your time, and I will be delighted to answer any questions.

Mrs. CUBIN. Thank you.

[The prepared statement of Dr. Kumar follows:]

Statement of Naresh Kumar, Ph.D., Vice Chairman, Committee on Resource Evaluation, American Association of Petroleum Geologists

A fundamental aspect of any energy policy is a credible assessment of the Nation's energy natural resources. As a representative of the 30,000 member American Association of Petroleum Geologists (AAPG), I have been invited here today to testify as

to the credibility of the oil and gas resource estimates of the United States Geological Survey (USGS) and Minerals Management Service (MMS).

Based on events this winter, there is clearly a critical need to address energy policy if our nation hopes to preserve its economic might, and continue to create jobs and wealth across our great land. A reliable supply of affordable energy is vital to our continued prosperity. The ability to access estimates of oil and gas supplies, reserves, and resources is essential for development of a sound energy policy and strategy by the Federal Government.

Let me begin with a few statistics prepared by the Department of Energy's Energy Information Administration (EIA), to put sources of energy supply in the proper perspective with regard to consumer demand:

Total US Energy Consumption by Primary Energy Source (1998)
Source: EIA Sept. 1999

Petroleum	40.7%	
Natural Gas	24.1%	
Coal	23.3%	(but 50.6% of all electricity)
Nuclear	7.9%	
Hydro	3.8%	
Other	0.3%	(geothermal, solar, wind, biomass, fuel cells)

I would like to emphasize that fossil fuels supply fully 88 percent of the Nation's primary energy requirements.

In its Annual Energy Outlook (2001) Report, the EIA made the following projections regarding energy supply and demand over the next 20 years (1999–2020).

- GDP is expected to increase by 86 percent.
- Total energy consumption will increase by 32 percent. Energy demand grew 20 percent since 1979, yet domestic supply increased by only 4.3 percent.
- Petroleum demand will increase by 62 percent.
- Natural Gas demand will increase by 45 percent.
- Coal demand will increase by 22 percent.
- Electricity demand will increase by 45 percent.
- Nuclear power will decline by 11 percent.
- Despite a 37 percent increase in energy efficiency, crude oil imports will increase 40 percent to a total 64 percent of domestic supply, and petroleum product imports will increase by 148 percent.

Given these significant increases in projected energy demand, and the electricity curtailments and natural gas price spikes of this past winter, the public must be assured that the Nation can indeed supply the energy required to fuel our economy in the 21st Century. It is the job of the USGS and MMS to quantify the Nation's energy mineral resources.

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS

The American Association of Petroleum Geologists was founded in 1917. It is the largest professional geological society in the United States, and has members worldwide. The membership is dedicated to the geological study of the earth and its environment, and the exploration and development of hydrocarbon resources and other energy minerals. Because much of the membership is engaged, either directly or indirectly, in the search for hydrocarbons and the economic development of hydrocarbon deposits, the AAPG is keenly interested in understanding the amount and geographic distribution of hydrocarbon reserves and resources. AAPG advocates a comprehensive national energy policy based on sound science and knowledge of the Nation's resources and reserves.

COMMITTEE ON RESOURCE EVALUATION

In 1993, the AAPG Executive Committee chartered the Committee on Resource Evaluation (CORE) to provide input and facilitate U.S. Government agencies in performing assessments of U.S. hydrocarbon resources. The charter was amended in 1997 to include international assessments so CORE would have a worldwide view of hydrocarbon resources. Since inception, CORE has reviewed the methodologies and scientific methods used for assessments by the U.S. Geological Survey (USGS) and the Minerals Management Service (MMS). In several instances, CORE has made individual AAPG members with specific knowledge of certain geological provinces available to the agencies. To a lesser degree, CORE has offered opinions and

technical information to the Energy Information Administration (EIA). For example, CORE supplied feedback to the EIA regarding its study of the economic impacts of the Kyoto Protocol on U.S. energy markets and made members with Deepwater Gulf of Mexico knowledge available to the EIA for consultation.

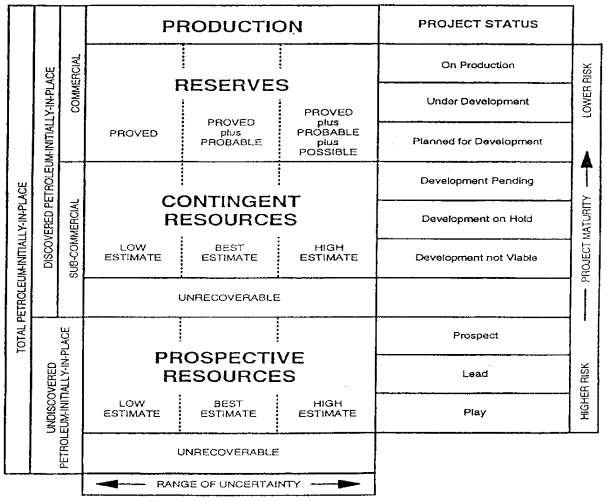
The Committee membership consists of employees of major petroleum companies, independent geologists, two directors of state geological surveys, three past AAPG Presidents, a member of the Potential Gas Committee (Colorado School of Mines), the Canadian Potential Gas Committee (University of Calgary), and the USGS. Although the membership is diverse, all are advanced in their careers and have a great deal of expertise in the science and technology of reserve and resource estimation. At most of its meetings, CORE has invited guests from the USGS, MMS, and other experts who can contribute to our knowledge of the nature, amount, and geographic distribution of potential petroleum resources, and yet to be discovered resources. CORE does not restrict its interest to conventional hydrocarbons but includes basin-center gas in continuous reservoirs, coalbed methane, shale gas, and some level of interest in gas hydrates.

Since its formation, CORE has consulted with the USGS on its 1995 National Assessment of United States Oil and Gas Resources, the 1999 Arctic National Wildlife Refuge 1002 Area assessment, and the 2000 World Petroleum Assessment. For all of these, the Committee on Resource Evaluation has recommended to the AAPG Executive Committee that AAPG endorse the scientific methodologies and techniques used by the USGS, and the AAPG has publicly done so. AAPG has not endorsed specific resource numbers generated by the assessments but has endorsed the sound scientific process used to generate the probability distributions.

RESERVES AND RESOURCES

Often people confuse or use interchangeably the terms reserves and resources . Reserves are known, somewhat measurable, economic accumulations of hydrocarbons, and are readily available as supply to meet demand. Resources are potential, undiscovered, estimated hydrocarbons. The estimates are based on our current state of geological knowledge and existing technology. Whether resources are ever converted to reserves is dependent on economic conditions, policy decisions, and incentives for companies to perform exploration activities. As exploration proceeds and more geological data is collected, our ability to make better estimates of resources increases. Also, as resources are converted to reserves, supply increases and the ability to meet demand improves.

RESOURCE CLASSIFICATION SYSTEM
(showing possible Project Status Categories)



This figure was developed jointly in 2000 by AAPG, the Society of Petroleum Engineers (SPE), and the World Petroleum Congress (WPC), and published by SPE. At the top of the figure, we define reserves as having been discovered, are commercial in nature, and are planned, undergoing development, or currently producing.

We discuss them as being proved; proved plus probable; and proved plus probable plus possible; thus conveying a degree of certainty about the quantity.

At the bottom of the figure we define resources as undiscovered, of higher risk, and as plays, leads, or prospects. We discuss them in terms of low estimate, best estimate, and high estimate. These levels of estimation are driven by our geological knowledge, available data, and technology available to assess them. In order for resources to be converted to reserves and ultimately to supply, exploration has to take place. The exploration process consists of leasing acreage, acquiring and interpreting seismic and subsurface data, and drilling. Depending on location and the required permitting, this process can be conducted over a matter of months or even years.

In the middle portion of the chart is a category named Contingent Resources. These are defined as hydrocarbons which have been discovered, but for which a commercial market does not exist. In earlier years of low natural gas prices, the gas cap at Prudhoe Bay could be considered a contingent resource.

As the debate over energy policy has developed we often see people confusing reserves and resources. An example is ANWR is the biggest oil field left in North America. ANWR is actually a large estimated resource that will not be an oil field with quantifiable reserves (and part of the U.S. supply) unless the exploration process takes place.

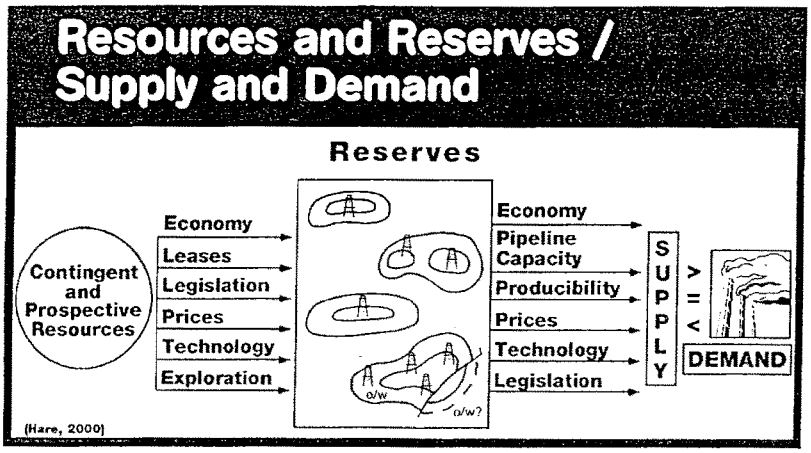
SUPPLY AND DEMAND

Two other terms that need to be better understood are Supply and Demand as they pertain to oil and gas. In a New York Times article (10/17/00), Daniel Yergin said I concluded that there were really just two characters who dominated the industry over a century and half: one named supply, and the other demand. In a 1997 AAPG position paper entitled Energy Data and Analysis For a Sound Energy Policy, prepared by CORE, we defined supply as that quantity of hydrocarbons that is produced from existing wells in a given period of time. Demand is the amount of hydrocarbons that can be drawn from supply to meet existing energy needs.

The key idea to capture is that supply is limited to existing wells. As described earlier, it can take months or years to add new wells to bolster the supply. That is why it is so important for policymakers to understand the difference between reserves and resources. Resources cannot be converted to reserves, and hence supply, by merely flipping a switch—the process takes time. That is why industry needs reasonable access to Federal lands to keep exploration moving forward.

We've all heard the argument that ANWR would only satisfy six month's of U.S. energy needs. This is a fallacious argument that ignores the fact that, depending on size of a potential discovery, it might supply 15–25 percent of U.S. energy needs for 15–20 years. The truth is, it won't supply anything unless exploration takes place and resources are converted to reserves.

The figure below is an attempt to show those relationships. At the far left of the figure is where we start with Contingent and Prospective Resources. If the size of the resource is sufficient, and other factors such as the economy, prices, and technology are favorable, then industry is motivated to conduct exploration and convert the resources to reserves. Then if other factors are favorable, reserves are developed and become the supply. Hopefully, supply is sufficient to meet demand. Over the last few years, our industry has been wrenched when supply exceeded demand, and when supply failed to meet demand.



U.S. ENERGY RESOURCES

AAPG believes the U.S. still has a large energy resource remaining to be tapped. We believe the techniques and scientific methods used by both the MMS and USGS are sound and provide a good basis for discussion of a national energy policy.

The most recent resource assessments of the USGS, MMS, EIA, and the National Petroleum Council (NPC) all confirm that the United States has huge remaining oil and gas resources.

According to the USGS, the technically recoverable onshore U.S. oil resource base is 110 billion barrels. This is five times our onshore and offshore proven reserve of 21 billion barrels. The United States consumes about 7 billion barrels of petroleum liquids per year.

The 1995 USGS assessment concluded that the United States has a remaining gas resource base in the Lower 48 States of 1,074 trillion cubic feet of gas (TCFG). It should be noted that only 135 TCFG, or just under 13 percent of the estimated resource, is considered proven. There are an additional 261.2 TCFG in Alaska; however, this gas is useless without a pipeline to the lower 48 markets. We presently consume about 22 TCFG/year. Even at a projected 32 TCFG/year consumption by 2020, there is more than a 33-year potential supply. Cumulative domestic production over the past hundred plus years is estimated to be about 890 TCFG.

The United States has the potential to be self-sufficient in natural gas supply well into the 21st Century. We have significant oil resources, but they are not likely to be adequate to satisfy future demand. However, unless the petroleum industry is allowed access to the areas where the remaining resources are located, the domestic energy crisis will become worse.

DISTRIBUTION OF THE RESOURCE

There are significant remaining known oil and gas resources in the traditional onshore producing areas of the Gulf Coast, West Texas, and in the Mid-Continent. However, these areas are now intensely drilled and blanketed with 3-D seismic, and are not yielding the large new discoveries required to replace the Nation's depleting proven reserves. Major oil companies and large independents have been exiting onshore exploration, and moving their operations into the sparsely drilled waters of the Deep Gulf of Mexico and overseas. However, recent actual and proposed acquisitions by BP and Shell may indicate a return to the onshore U.S. by the majors driven by the value of natural gas.

Many small oil and gas companies and the majority of the independent prospect originators are having trouble finding partners, as well as the capital, to drill the smaller reserve exploratory prospects that remain in the traditional producing areas. Higher oil and gas prices have significantly increased the drilling rig count; however, over 90 percent of the current drilling activity is for the development of known reserves.

Studies by the USGS and NPC have concluded that the most prospective areas for major new discoveries, particularly natural gas, are on public lands in the Rocky Mountain sedimentary basins, offshore in the Gulf of Mexico, in the Eastern Gulf

of Mexico, and on the Atlantic and Pacific Outer Continental Shelf. The AAPG concurs with this assessment. Despite the huge potential of these areas, Federal law presently prohibits exploration on the Atlantic and Pacific OCS and in the Eastern Gulf of Mexico. Access to much of the remaining resource potential of the Rocky Mountain basins is restricted or closed. The total estimated gas resource of these areas is 213 TCF (per NPC 1999 study) or a 9-year supply at current rates of gas consumption. It is likely that with further exploration, these resource figures would increase significantly.

The total area of the U.S. Federal offshore, including Alaska, to the 200-mile economic limit, is about 2 billion acres. Only 2 percent has been leased. In its 1995 study, the MMS assessed a mean undiscovered recoverable resource of 46 billion barrels of oil and 268 TCF of natural gas in the Federal OCS. This is 2.5 times the offshore reserve found to date. However, by a 1998 Presidential directive, there is presently a Federal moratorium on any exploration of the Lower 48 OCS outside of the Central and Western Gulf of Mexico until 2012.

In its 1995 National Oil and Gas Assessment of Onshore Federal Lands, the USGS estimated that the Northern Alaska province accounts for more than half of the of the undiscovered conventional gas assessed on onshore Federal lands. As previously stated, Alaska's total gas resources were cited in the USGS report as 261.2 TCFG. This represents a 12-year supply at current demand!

There is a huge domestic gas resource, yet access to much of this remaining resource is either closed or so restricted that development is not economically feasible or timely. As part of the policymaking process, the public must understand that the United States actually has the gas resources to meet future demand. Congress then must determine if the public will support continued access restrictions, and if so, is the public then prepared to accept significantly higher gas prices and possible regional supply curtailments during times of peak demand.

ACCESS TO GAS RESOURCES ON FEDERAL LANDS

Natural gas is cited as a cleaner, more environmentally benign, energy resource to fuel our economy. However, access to the huge gas potential of undeveloped public lands is limited, in the Western states and on the OCS. Additionally, the Federal regulatory maze hinders domestic petroleum exploration operations and investment.

With more than a decade of U.S. neglect in developing and implementing a comprehensive National Energy Supply Policy, and the environmental protection priority of the public, gas demand has caught up with, and probably overtaken, peak supply. This situation cannot be blamed on Big Oil and Gas , nor the distribution companies.

The U.S. cannot depend on gas imports from OPEC to meet rising demand. Natural gas is a North American commodity that is locked into a pipeline delivery system. Imports from Mexico will be minimal. The 1999 NPC study projected LNG imports of less than 1 percent of supply through 2015. That same study projected U.S. gas demand in 2010 to be 29 TCFG on an annual basis and projected U.S. production to be 25 TCFG/yr. The shortfall, according to the NPC, will be made up by 4 TCFG of imports from Canada. What happens if the Canadian imports do not materialize? The United States must develop its own gas resources to meet future demand. This requires access to the public lands that are deemed most prospective for natural gas.

Conservation and renewable energy resources often are cited by as the solution to our energy requirements. This is not a realistic expectation if one appreciates the actual tiny magnitude of current alternative energy, and that fossil fuels supply 88 percent of our primary energy. Energy conservation has been effective in certain areas, particularly in regard to increased miles per gallon for automotive engines. Nevertheless, demand for transportation fuels continues to skyrocket.

Despite DOE expenditures of over $9 billion since fiscal year 1980 on solar and other renewable energy research, alternative energy resources provided only 0.3 percent of primary energy supply in 1999, exclusive of traditional hydroelectric power (3.8 percent). Obviously time and effort for research must continue on alternate energy resources.

The AAPG does not advocate any reduction in alternative energy research. However, the fact is, that our economy will continue to depend on fossil fuels for the majority of the Nation's primary energy requirements for at least another generation. On April 18, 2000 at the AAPG Annual Meeting in New Orleans, Jay E. Hakes, Energy Information Administrator, presented a paper entitled Long Term World Oil Supply . One of the conclusions in that paper was that with an estimated mean ultimate recovery of 3.0 trillion barrels worldwide, and production growth rates of 0–3 percent, the estimated peak year of world oil production would range

from 2030–2075. That is over another century of hydrocarbons being a significant part of the energy mix.

NATURAL GAS FOR ELECTRICITY GENERATION

The rise in demand for natural gas for electricity generation has increased dramatically. The Gas Research Institute (GRI) in 1999 estimated gas consumption for electricity generation would increase from 3.8 quadrillion BTU's in 1985 to 5.2 quadrillion BTU's in 2000. They projected the 2015 level to be 9.1 quadrillion BTU's. For purposes of this discussion we can equate 1.0 quadrillion BTU's to 1.0 trillion cubic feet of gas. Over a 30-year period, gas consumption for electricity generation will increase about 239 percent!

The Gas Research Institute also projected the share of natural gas production that would be used for electricity generation to increase from 23.2 percent in 1998 to 33.1 percent in 2015. A full third of all gas produced and imported in the U.S. would go to electricity generation.

These projections are based on normal growth rates of supply and demand. Although the 1999 NPC study concluded that a U.S. demand of 29 TCFG in 2010 could be met, it required massive increases in capital, manpower, and infrastructure. The NPC study estimated $1.5 trillion would be needed to fund the industry from 1999–2015, the number of wells drilled annually would have to double from 24,000 in 1998 to 48,000 by 2015, and that 2,100 onshore and 180 offshore drilling rigs would have to be built. These figures would indicate a massive effort is needed to meet normal projected growth rates of natural gas demand between now and 2015.

However, lurking in the background is the proposed Kyoto Protocol agreed to by 160 countries to limit greenhouse gas emissions. Binding limits for emissions were set for 40 developed nations, with no limits imposed on the remaining countries. The U.S. goal is a 7 percent decrease in emissions relative to our 1990 levels. In order to achieve this reduction in emissions, a significant reduction in the use of petroleum liquids and coal is required. Natural gas will have to replace these fuels. The Energy Information Administration in its 1998 Impacts of the Kyoto Protocol on U.S. Energy Markets and Economic Activity projected natural gas demand for electricity generation with the Kyoto Protocol in place at 12.7 TCF. Compare that with the 7.5 TCF estimated for 2010 without the Kyoto Protocol.

The EIA study also projected the gas price in 2010 with Kyoto in place to be $3.30 per thousand cubic feet ($/mcf). As consumers painfully experienced this winter, gas prices quadrupled, soaring over $10/mcf at one point. Implementation of the Kyoto Accord will put significant additional pressure on gas supply. Accordingly, a sound national energy policy must provide access to additional gas resources, and is going to have to promote the use of all fuels, including coal and nuclear energy, to meet projected energy demand.

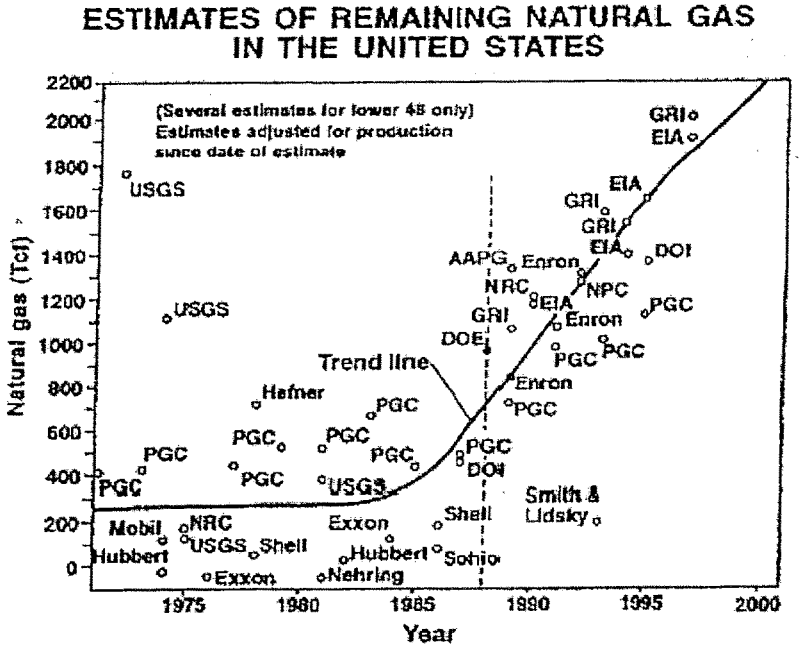
RESOURCE ASSESSMENTS

The ability to access estimates of oil and gas supplies, reserves, and resources is essential for development of a sound energy policy and strategy by the Federal Government. In addition, many companies use these estimates to plan exploration and development strategies in the United States. Some of the agencies engaged in preparing such assessments also estimate international reserves and resources that can have an impact on foreign policy, national security, and understanding global supply and demand.

The agencies for the most part do a good job on these assessments using the geological data, scientific knowledge, and tools available to them. At times the agencies have been behind industry's thinking, especially in the area of new or evolving exploration plays (a play is a geological concept for exploration in a particular rock formation or geographic location). Examples of hot new exploration plays with huge oil and gas potential include: drilling beneath thick regional salt deposits in the Gulf of Mexico; production of natural gas from coal seams in the Powder River Basin of Wyoming; and drilling in the ultra-deep waters of the Gulf of Mexico OCS. As a result the assessments have sometimes been too conservative and have required subsequent revisions. Until these new trends were proven, the agencies assigned limited resources to them, and probably rightly so. Once these kinds of frontier plays have been discovered and proven by the risk takers of industry, the total resource impact can be assessed.

One of the characteristics of assessments we have discovered is their tendency to grow in size over time. This is due to increased exploration and gathering of subsurface data, improvements in geological knowledge, and acquisition of additional seismic data. As our knowledge of a basin increases, so does our ability to estimate

its resources; which generally results in an increase in the size of the resource. That also is why exploration is so competitive. Different interpreters can look at the same data set, and draw dramatically different conclusions about exploration prospects. The figure below illustrates this point. It also illustrates the growth in reserve or field size as production occurs over time.



Note the early 1970's estimates by M. King Hubbert of about 250 TCFG, and the almost ten times increase to 2,000 TCFG in 2000.

ANWR ASSESSMENT

In 1999 the USGS completed an assessment of the Arctic National Wildlife Refuge. The AAPG Committee on Resource Evaluation reviewed the methodologies and scientific techniques used by the USGS. The Committee did not review, nor have any input into the actual resource estimates ultimately generated by the USGS. We concluded that the work of the USGS was scientifically sound, and that they had done a very good job of locating and wisely using all of the available data. This was the first ANWR assessment where the USGS had access to proprietary seismic data. Although the AAPG does not routinely generate resource estimates, a 1991study chaired by AAPG past-president Robert Gunn predicted a mean resource for ANWR of 7.0 billion barrels of oil. This compares very favorably with the USGS 1999 estimate of 6.4 billion barrels for the undeformed portion of the ANWR 1002 Area.

CONTINUOUS RESERVOIR ASSESSMENT

In the 1995 National Assessment of United States Oil and Gas Resources, the USGS assigned 358 TCFG to gas accumulations in continuous reservoirs. Continuous reservoirs are defined by the USGS as pervasive accumulations throughout a large area, which is not significantly affected by hydrodynamic influences, and lack well-defined down-dip water contacts. In other words, these deposits appear to be somewhat stratigraphic in nature, with little or no structural trapping, and produce gas with very little or no associated water. These reservoirs tend to be relatively impermeable sandstones, shales, coals, and chalks.

Such tight sandstone reservoirs are very prominent in many basins of the Western U.S. In its 1995 study, the USGS assigned 200 TCFG of recoverable resource to this type of reservoir in the Rocky Mountain Basins. The USGS is currently embarking on a reassessment of resources in this type of reservoir.

Given the recent events in California and the spotlight on natural gas for electricity generation, this could be one of the most important assessments the USGS will perform. A Subcommittee of the Committee on Resource Evaluation has already held meetings with the USGS to share ideas on the nature of continuous reservoirs, and probability distributions to best characterize the resource they contain.

AAPG ENERGY POLICY RECOMMENDATIONS

The United States has abundant energy resources. However we are now faced with a real energy crisis, because the Nation has not developed and implemented a comprehensive energy policy. In order to assure that our way of life is not dramatically impacted because of energy shortages, the AAPG recommends the following:

- The U.S. must develop a national energy policy that provides dependable, affordable, and uninterruptible energy for the public and commerce, and is based on a sound scientific assessment of the Nation's resources and reserves.
- Energy policy must address the needs of all-stakeholders especially the consumers, and not over react to the demands of the shrillest interests with the most money for publicizing a particular position.
- Energy policy must be strategic and long-term, not quick fixes to short-term crises.
- Energy policy must include a role for all energy sources, including coal and nuclear energy.
- Resources assessments are a vital planning tool for policymakers and industry. The agencies that perform these assessments and track oil and gas resources and reserves need continued support. They have done a good job to date.
- A major, long-term, and capital intensive energy industry effort is required to explore for, develop, produce, and build the infrastructure necessary to deliver the energy supplies required to meet projected demand. Energy policy must facilitate the process of capital formation and energy development, without creating costly and time-consuming regulatory roadblocks.
- Industry access to public lands, which contain hydrocarbon resources, should be a priority to encourage exploration for and production of domestic natural energy sources. We cannot become dangerously dependent on unreliable foreign energy imports.
- The public must be assured that energy resource development can be accomplished in an environmentally responsible manner. The technology is available to do this.
- The impact of the Kyoto Protocol on the ability of the Nation to supply the energy needed to fuel our economy without major disruptions must be carefully evaluated.

We look to the House Committee on Resources to take a leadership role in formulating a sound national energy policy, and thank you for giving the AAPG the opportunity to present its recommendations.

APPENDIX I.

ENERGY DATA AND ANALYSIS FOR A SOUND ENERGY POLICY

Energy is critical to all sectors of our economy and way of life. Data and analyses on supplies, reserves, and resources are critical to a prudent energy policy that provides for needed supply, wise use, and affordable prices. The American Association of Petroleum Geologists supports the continued efforts of the Federal agencies responsible for collecting and analyzing such data.

The U.S. Government, appropriately, collects, maintains, and analyzes data to support the assessment of reserves and resources of energy commodities on an objective basis, chiefly through the Energy Information Administration of the Department of Energy, and the U.S. Geological Survey and Minerals Management Service of the Department of the Interior.

In times of budget constraints, some suggest that these basic data collection, assessments, and analyses can be eliminated, deferred, or significantly reduced from their current modest funding levels. Such action, however, would eliminate or severely reduce our national capability and adversely affect good energy policy.

Crude oil and natural gas are particularly important because they are the source of 65 percent of the Nation's total energy supply. These sources can be described as follows:

- Supply: That quantity that is produced from existing wells in a given period of time.
- Reserves: The estimated amount that eventually can be recovered from existing reservoirs and fields under current technology and pricing conditions.

• Resources: The estimated amount that remains to be discovered based upon geological knowledge and exploration and development technologies.

Information about supply is available from both public and private sources. Regulatory agencies in producing states and Federal regulatory agencies concerned with public lands commonly collect production data and make them available. At a national level, these data are collected, aggregated, and analyzed, and made available by the Energy Information Administration of the U.S. Department of Energy. Private companies also provide selected data organized in ways convenient for client usage.

Information about reserves is important to be able to estimate the quantity of future supply from existing production. Historically, the American Petroleum Institute (API) and the American Gas Association (AGA) developed this information on an annual basis. The blue book , jointly produced by a committee of these trade associations, was considered a standard reference for such information.

Following the energy crisis of 1973, the Executive Branch and the Congress determined that information on supply, reserves, and resources was so vital to the development of sound public policy in meeting the Nation's energy needs that the collection and analysis of such data should be done by a public entity. Accordingly, in the creation of the U.S. Department of Energy at that time, a quasi-independent agency, the Energy Information Administration (EIA), was established to collect, analyze, and disseminate a broad range of energy information to aid in the development of national energy policy.

The EIA developed a program that was implemented in 1978 to estimate annually the U.S. reserves of crude oil, natural gas, and natural gas liquids. This program was operated in parallel with the API/AGA blue book for 5 years to establish a connection with historical data for time-series analyses. The EIA reserves estimation program has served the Nation well for almost 20 years. The data collected and reserves estimated by this program are the only comprehensive source of such data for the U.S. As such, these data are used extensively by both public and private entities for a broad range of applications. Continuation of this program of developing estimates of reserves on an annual basis is a vital component of a sound public policy that addresses the Nation's future energy needs.

Over the longer term, estimates of crude oil and natural gas remaining to be discovered are important for both public-policy decisions and private-sector business considerations. Such estimates provide policymakers with a view of the quantities of crude oil and natural gas that might be discovered through future exploration to meet a part of the Nation's growing need for transportation fuel and other energy requirements. These data can be factored into policies that could encourage domestic exploration or the development of alternative energy supplies. These data also are important for the private sector in considering long-term plans for domestic versus international operations.

Estimates of resources have been made by various public and private sector organizations over the past several decades. Because of the important policy considerations attendant to such estimates, the Congress has requested that the U.S. Geological Survey and the Minerals Management Service provide such estimates on a periodic basis for the onshore lands and in state waters, and the offshore public lands, respectively. The U.S. Geological Survey recently completed a national assessment, and the Minerals Management Service will soon release a report on their area of responsibility.

Resource estimates conducted by the U.S. Geological Survey and the Minerals Management Service are important activities that need to be continued in future years. Likewise, reserve estimates conducted annually by the Energy Information Administration also are important in support of sound public policy. This nation's energy policy can be no better than the basic data and analyses on which it is based. Therefore, the American Association of Petroleum Geologists urges that the Congress and the Administration continue to support these important activities.

Mrs. CUBIN. I thank the panel for their valuable testimony.

I would like to start with Dr. Leahy on the questioning round.

In your written statement you referenced the inventory required in section 604, the Energy Act of 2000, and I am very pleased to see that the USGS and other agencies have begun to scope out the work necessary to comply with this mandate. As you know, that provision became law after the fiscal year 2001 Interior appropria-

tions act was passed. Can you give me any notion at this time of the cost that the Department needs to budget for this work?

Mr. LEAHY. We are in the process of defining those numbers, and, frankly, I think we need to work with the Department before we move them forward because they do involve other bureaus as well as the USGS.

Mrs. CUBIN. So at this time do you have any idea if—I guess you probably wouldn't—if a reprogramming request would be sent to the appropriators to get it done?

Mr. LEAHY. Yes. That is correct.

Mrs. CUBIN. Okay. What level of detail—I will just not ask that question, because if you don't know what you are going to need yet, you can't answer what level of detail is going to be incurred.

Mr. LEAHY. We certainly would define the Federal lands in more detail than we did in our earlier assessments. So that the information is more usable in terms of the purposes of act.

Mrs. CUBIN. Good. And in your testimony I think you said it would be 2004 before that would be complete?

Mr. LEAHY. No. I believe the legislation actually calls for it to be completed two years after enactment.

Mrs. CUBIN. Right. So that would be 2002.

Mr. LEAHY. That is right.

Mrs. CUBIN. Do you think it will take the full two years to do that? Certainly I think this is a place that we really need to begin with this issue, and at the IPAA convention last week or the week before, Dan Yergin stated that he thinks that is something that should be done right away. But you do think it will take the full two years to do that?

Mr. LEAHY. We are in the planning stage, and certainly two years is moving right along. And I think the two years was identified because whoever wrote the legislation realized this was a big order.

Mrs. CUBIN. Big task. That is right. Actually that was my amendment. It is a big task, but I think that it will be certainly useful in the time to come.

Ms. Kallaur, six offshore fields with estimated reserves of 3-1/2 trillion cubic feet of natural gas are being developed near Sable Island off Nova Scotia in the Canadian waters. Have these developments impacted MMS estimates for the North Atlantic area at the OCS?

Ms. KALLAUR. When we did our 2000 assessment, we did look at the drilling results in Canada and updated our numbers from the 1995 assessment.

Mrs. CUBIN. Would you repeat that? I am not sure I understood your answer.

Ms. KALLAUR. The answer is that we did take into account the drilling in eastern Canada in developing the numbers for our own 2000 assessment.

Mrs. CUBIN. Okay. Is it within the Secretary's authority to acquire seismic data in areas which are off limits by reason of annual appropriations riders or Executive Order?

Ms. KALLAUR. I believe it is, because I know we are able to acquire environmental information, so I believe that we would also be able to acquire seismic information.

Mrs. CUBIN. Thank you.

Mr. Kumar, what level of drilling in the United States do you think would be required to stabilize all production at current levels?

Mr. KUMAR. One of the estimates that was published by the National Petroleum Council, it addressed primarily gas, and I believe for the gas the estimate was that from 24-, 25,000 wells per year, we would have to go to 40- to 50,000 wells per year to maintain the level needed to supply the gas.

Mrs. CUBIN. You said 25,000 wells?

Mr. KUMAR. Yeah.

Madam Chairman, we would have to essentially double the number of wells we are drilling right now for the last few years in order to stabilize the available supply.

Mrs. CUBIN. Okay. I would like to ask each one of you—then I am sure my time will be up even though the clock isn't working—based on the USGS oil and gas assessment, what—this is for each one of you in your areas—what do you think the most promising frontier area is for finding new oil reserves and gas reserves? Dr. Leahy, do you want to start?

Mr. LEAHY. Yes. Certainly in my opening remarks I said our assessment was targeting some areas that showed potential for natural gas, and coal-bed methane—the Rocky Mountain area is an area that is of interest. Alaska is clearly an area of interest as well. We are actively doing an assessment of the National Petroleum Reserve up there as we speak.

Ms. KALLAUR. Clearly the Gulf of Mexico, central and western Gulf of Mexico, continue to be viewed as being highly prospective. As I mentioned in my testimony, it is the oil production that is increasing more so than the natural gas production. Industry's number one priority at this point is having access to the Eastern Gulf of Mexico, both for the near-shore natural gas potential as well as having access to the deep water, where they expect to find some large oil fields because the area straddles the very prolific central Gulf of Mexico.

Mrs. CUBIN. Thank you.

Mr. Kumar, do you have anything to add?

Mr. KUMAR. Yes. I concur with the areas that have been mentioned, and, as I mentioned in my oral presentation, the Rocky Mountain sedimentary basins, offshore Gulf of Mexico, the eastern Gulf of Mexico, Atlantic, Pacific outer continental shelf, north slope of Alaska. I would like to mention again for the record that on the north slope of Alaska, the total gas resource was cited in the range of 260 trillion cubic feet of gas. That represents a 12-year supply at the current demand.

Mrs. CUBIN. Twelve years?

Mr. KUMAR. Twelve years. Because currently we use 22 to 23 TCF per year, and this is 260 trillion cubic feet on the north slope of Alaska.

Mrs. CUBIN. I think you touched on a very important point, because every time an area is brought up, whether it is ANWR, wherever it is, someone jumps up and says, oh, well, that is only 18 minutes' supply, so we don't need to open that up. That is only six months supply, so we don't need to open that up. But cumulatively

there has to be—all of those minutes or days or hours or months or years or whatever, it has a big effect.

So, okay. Thank you for your answers.

The Chair now recognizes Mr. Kind.

Mr. KIND. Thank you, Madam Chair.

Thank you again for your testimony. I really believe it is helpful for us to have as accurate a picture as possible in regards to the resources that are available on the public lands.

But, Dr. Leahy, let me start with you, and following up on my opening statement with regards to some of the comments I made with geothermal potential and that, are you aware, has USGS done any studies or reports in the past exploring the potential of geothermal sources on public lands in this country?

Mr. LEAHY. We did an assessment of geothermal resources, I think, in about 1979, so it is quite dated.

Mr. KIND. Do you have the potential under the existing budget right now to do a more modern update of that study looking into the potential? If not, what resources would you need in order to conduct such a study, and do you have the expertise in the Department to carry out such a study?

Mr. LEAHY. We certainly have the expertise. It is a question of priorities and funding.

Mr. KIND. Are you saying that you don't have the resources right now in your existing budget to conduct such a study, and would you need some authorization from us and some appropriation from us?

Mr. LEAHY. That is correct.

Mr. KIND. I certainly appreciate the concern, the need to look at our short-term managing needs and what already exists and the potential for extraction given our current energy consumption, but it is astounding to me when you have such an abundant and clean and inexhaustible source of geothermal energy, and we are at virtual standstill in this country in exploring this potential, and you have a country like Kenya that is way ahead of the curve even in relation to this as tapping into this, why more attention isn't being devoted in this area as well.

With your permission I would like to follow up and see what we may do to explore this in a little bit greater detail, and find out what we can accomplish here to get you those resources so we can start looking into this in a much more comprehensive fashion.

On an unrelated subject we were informed, or we discovered, actually, from Greenwire, which is an online news service, which reported that USGS finds 16 new national monuments have energy potential. And apparently this came from a request from some members, Republican members, on the Parks and Public Land Subcommittee of the Resources Committee for USGS to conduct this report. But also apparently we didn't receive an original copy of that report. We have since been able to obtain an original copy. But I wonder if we could have an understanding whenever you are supplying reports, whether they are official or unofficial, to the Majority, can you can shoot a copy our way, too?

Mr. LEAHY. We would be happy to do that. This was—as you very accurately stated, a request from a Subcommittee staff, and, frankly, having a National Assessment of resources allowed us the

ability to do these qualitative appraisals very quickly. And we are more than happy to satisfy the needs of individuals in Congress.

[Provided below is a response to Representative Kind's request of Dr. Leahy for follow-up information on geothermal energy}

The Geothermal Energy Research, Development and Demonstration Act of 1974 (P.L. 93–410) assigned responsibility for the evaluation and assessment of geothermal resources to the USGS through the U.S. Department of the Interior (DOI). The assessment efforts initiated under this Act led to the publication of USGS Circular 726, Assessment of Geothermal Resources of the United States - 1975 and USGS Circular 790, Assessment of Geothermal Resources of the United States - 1978. These reports established the methodology for geothermal resource assessments and provided estimates of potential electric power generation that have guided geothermal energy research and development for the past 22 years.

With USGS staff working in collaboration with universities, BLM and the Department of Energy, the USGS can deliver a new geothermal resource assessment of the Great Basin and adjoining areas within 3 years. After completion of the Great Basin assessment, continued geothermal studies would focus on other regions with the significant geothermal potential. The USGS has the expertise to help reduce uncertainties in the assessment of domestic geothermal resources and to participate in research efforts in geothermal science and technology to benefit the development of geothermal energy. In order to accurately assess the geothermal resources of the western U.S., significant progress needs to be made on understanding the processes responsible for the formation of geothermal systems, particularly in the Great Basin. Recent investigations of the interrelationships among heat flow, groundwater circulation, active faulting, volcanism, and geochemical fluid-rock interactions suggest that the Earth Science community is on the verge of developing a new, comprehensive understanding of geothermal systems. The resulting models for the nature and extent of geothermal systems would not only improve the accuracy of any new assessment but also enable the development of more economical exploration and development strategies for geothermal energy.

What is the geothermal energy resource base? For the potential geothermal electric power yield from identified systems, estimates vary from 6300 to 27,400MW, depending on the analysis of specific systems and assumptions regarding the impact of new technologies. The electric power potential from undiscovered resources is far less certain. The estimates in Circular 790 range from 72,000 to 127,000 MW, although these are almost certainly overstate the extent of undiscovered resources.

What is USGS doing now in geothermal resources? The USGS conducts research into the nature of volcano-hosted geothermal systems as part of the Volcano Hazards Program. This research is focused on volcanic systems posing a significant hazard and only involves existing or potential geothermal reservoirs in three places - Long Valley and Medicine Lake in California and Kilauea in Hawaii. The USGS also continues to monitor the thermal features contained within Yellowstone National Park.

Mr. KIND. Apparently the report I am referring to was an unofficial report, not an official. Can you tell me the difference?

Mr. LEAHY. Basically it is a request for information. It is not a published report. It would be much like someone calling in and asking a question, a citizen, in terms of what are the Appalachian Mountains made out of. It was not a major effort to put together a response to that request.

Mr. KIND. I believe we do have copies of that report. I would ask unanimous consent to have that included in today's hearing as well.

Mrs. CUBIN. Without objection. We haven't seen this either.

[The aforementioned report was too lengthy to be included in the printed hearing. It has been retained in the Committee's files.]

Mr. KIND. All right. I appreciate that. Thank you, Dr. Leahy.

Dr. Kumar, let me move to you. Within the last week obviously many of us are aware of the reports of the Brazilian oil rig that

has sunk now in the South Atlantic due to fire and explosion, and one of the pillars collapsing, and it going down. There appears to be every effort being made in order to contain any type of spill that may result from the sinking of that oil rig, but what we are looking at is a potential of 312,000 gallons of diesel fuel and 78,000 gallons of crude oil that could potentially be released into that environment. Do you have any more information perhaps in regards to what happened down there resulting in this sinking of the oil rig, and could you speak to the potential off our own shores of such an accident occurring here?

Mr. KUMAR. Congressman Kind, I am not personally aware of exactly what happened. I haven't seen the reports myself. I do know the country of Brazil quite well. I have done a lot of geology there. I have published papers on the geology of Brazil.

In this particular incident we don't know whether it was a human error or a machine failure or something else. Obviously these kinds of things are possible in Brazil. Each incident has to be looked at in its own way, and the incidents that have happened in the past, many times they have been related to transportation. Exploration and production accidents are actually much, much less than the transportation errors. In transportation things happen over many years.

Mr. KIND. Perhaps, Madam Chair, I may suggest that might be an appropriate area for future hearing exploring into what happened down there with that Brazilian oil rig, and also exploring in a little more detail the potential here off our own coast, because obviously when you are exploring and drilling, you also have to transport it. I think we need to be sensitive to those safety concerns as well. So I thank you, and I appreciate your testimony.

Mrs. CUBIN. The gentleman's time has expired. I ask unanimous consent to insert into the record an article about that spill from the Chicago Sun Times where the article says that this spill poses minimal threat to the environment, that there is a plan in place to protect the environment. "scientists"—this is a quote—"Scientists said the environmental impact would likely be negligible. The lighter diesel fuel oil tends to evaporate in just a few days." so, we just need both sides of the story on that.

[The article referred to follows:]

Oil rig sinks in Atlantic

Spill said to pose minimal threat

Chicago Sun-Times, 03/21/01

RIO DE JANEIRO, Brazil The world's biggest floating oil rig sank in the South Atlantic on Tuesday, and the state oil company Petrobras said some of the 300,000 gallons of diesel fuel on board had apparently already started to leak.

A cleanup flotilla of 11 ships with floating barriers and oil- dispersing chemicals surrounded a slick at the spot 75 miles off the coast where the 40-story-tall rig, crippled and listing after an explosion last week, went down in heavy seas.

But scientists and the government said the environmental impact would not be great, in part because the spill was so far from the coast.

Workers who had been trying to save the rig were evacuated to another floating platform after it "shifted suddenly" before dawn, the company said.

Around 10:30 a.m., the rig tipped over and sank in about 10 minutes. Film footage showed the platform disappearing into the water until only the green heliport was visible above the waves. Oil workers looked on, many sobbing for comrades who died in the disaster.

Two workers were killed in the explosion, and eight others are missing, presumed dead inside the sunken rig.

Petrobras Chief Executive Henri Philippe Reichstul said all the oil would eventually leak into the sea. He said there was already a "fine film" of diesel oil on the surface.

He said containers holding 312,000 gallons of diesel fuel, would collapse under water pressure on the sea bottom at a depth of 4,455 feet. The rig also had 78,000 gallons of crude-most of it in hoses between the wells and the rig. Those hoses were attached when the rig went down and could break, he said.

As barriers were set up around the spill, a second slick was sighted, Petrobras said. It wasn't known whether the new spill was crude or diesel.

"There is a plan in place to protect the environment," Reichstul said. "We are not terribly worried about the environmental question."

Four ships carried 20 miles of floating oil barriers, "enough for a spill 10 or 15 times this size," said Irani Varela, the company's safety and environment director. Four other ships were prepared to skim oil off the surface and three had chemicals to break down the oil.

But Varela said that the barriers would have little effect in high seas, where swells late Tuesday were 4 feet high.

Scientists said the environmental impact would likely be negligible. The lighter diesel oil tends to evaporate in a few days, while the crude oil would separate and the heavier sediment would sink.

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Mrs. CUBIN. The Chair now recognizes—I don't know who was here first.

Mr. THORNBERRY. Thank you, Madam Chairman.

I would like to ask unanimous consent, Madam Chairman, that a letter I received from a constituent, Mr. Dwayne Cochran, who is an engineer with some considerable expertise with ANWR, be considered as part of the record. It is a very detailed discussion of some of those issues. I think it would be important to include as part of the record.

Mrs. CUBIN. Without objection.

[The letter from Mr. Cochran follows:]

Mac Thornberry
House of Representatives
131 Cannon Building
Washington, DC 20515

March 6, 2001

Subject: Justification for drilling in the ANWR

Rep. Mac Thornberry:

I worked for Parker Drilling as their Arctic Specialist. As a Mech. .cal Engineer we developed several mobile rig packages for Purdhoe Bay, Kuparuk, Colville Delta, and the Mc Intyre fields. The latest rig package was Rig 245 that was mounted on self propelled tracked vehicles. In 1983 we designed and built the offshore platform Rig 217 Beaufort Sea 1. The platform and rig were designed for drilling in Harrison Bay for Exxon. The rig was later (1990's) was moved into Camden Bay, off shore from the ANWR and just East of the Eskimo village Kaktovik. Rig 217 was used to drill the well for ARCO off shore of the ANWR.

The Tool Pusher responsible for drilling this well grew up an Eskimo and went south to Louisiana to get his degree in Mechanical Engineering. The bear watcher was a young man from Kaktovik. The bear watcher's job was to protect both the drilling crews and the bears from each other whenever we had to get down on the ice. They both discussed what it was like to grow up in the arctic, live and hunt on the coastal plains, to respect the polar bears, to fish in the arctic winters along the beaches, sleeping in igloos, and working from dog sleds. The bear watcher explained the migration of the caribou, seals, bears, ducks, and the other wild life that live on this coastal plain.

During these last 20 years I have had many opportunities to be on the North Slope as part of the drilling operations. We would spend months during the winter and summers rigging up the new rigs. I would go back to assist with the moving of these rigs. I have been part of the development of the new environmental sensitive drilling rigs.

I am proposing someone put out the true story of the Drilling and Production facilities that exist now in these areas of the North Slope. There are new rig packages in the works to do the drilling of the future. Once again these packages are being designed for minimum environmental impact. Many of the new technologies these Engineering groups are working on will also be used in the lower 48 to enable the drilling in the government lands and wilderness areas.

President George W. Bush and Vice President Cheney both know Bob and Bobby Jr Parker. These guys can get you pictures for the ads to show to the public the real picture of what has been the truth of drilling in the Arctic Regions. I know these two gentlemen would be more than willing to help you all in any way.

I have pictures taken of the arctic foxes during the arctic winter with their solid white coats huddled in the winter snow all around the rig location. When they huddle up, they hide their black nose with a paw while they close their black eyes and the blowing snow and ice hide them from their predators. I also have the pictures of these same arctic foxes in the summer when they are brown and setting just off the steps of the quarters.

During the summer months, Prudhoe Bay was alive with major projects. New drilling rigs being moved in and rigged-up, new pumping and production facilities were coming in off the barges and being placed in Prudhoe Bay as well as the Kuparuk Field. The roads were busy with traffic. When we were moving

Rig 191 to its next pad, the caribou were all over the place. They occupied most of the area around the edge of the Prudhoe Field and on into the Kuparuk Field. These caribou, ducks, foxes, and wolves were everywhere and were not bothered by the activity. The caribou would come up to the camp and stand outside my window. They were so close I could almost reach out the window and touch them.

We were wildcatting (exploratory drilling) in a part of the Kuparuk field. The drilling rig was located on a 5' deep gravel pad built up above the tundra. From the gravel platforms we were drilling out under the tundra. The pads allowed us to drill many wells and reach out several miles into the reservoir. This kept damaging of the tundra to a minimum. The caribou would get upon the 3' high road beds and the drilling pads to get away from the mosquitoes and other insects that lay in waiting in the tall grass of the surrounding tundra.

There are thirteen distinct herds of caribou in Alaska. These large caribou herds all have been named in order to monitor and record their movements during their migrations. Three of these herds spend the summer around the drilling and production areas of the North Slope. The Arctic caribou herd spends the winter months in the Kobuk Valley National Park & the Gates of the Arctic National Park and Preserve. This Arctic Herd ranges over both of these national parks during the winter. Both of these parks are located just south of the mountain range that stretches across the northern part of Alaska. This range of mountains is known as the Brooks Range. The Arctic caribou herd is estimated to contain more than 20,000 head. This Arctic herd will move across the Brooks Range from the Gates and through the pass and onto the coastal plains. They will summer throughout the oil fields (Prudhoe Bay, Kuparuk, and the Colville delta) of the North Slope. Twenty years ago this Arctic Herd was counted at about 3,000 head. Today it is measured at 20,000 plus head. This is the herd that wanders through the drilling pads, pipelines, and on the gravel roads that cross the oil fields. This herd is doing quite well.

The Porcupine herd also winter's south of the Brooks Range. Their wintering grounds are located on the Eastern side of Alaska. The Porcupine and the Fortymile herd combine during their over all migration. These two herds will move onto the North Slope and will spend the summer months throughout the ANWR area and on into Canada. I was not able to find the latest count on these two herds, but am sure it is larger than the Arctic herd. The estimates I have been able to find list this herd at 500,000 plus. See the attached maps of the region that show the documented migration routes of the Porcupine Herd of caribou. Notice the herd does not get out onto the beach area where the drilling is planned.

All of the wildlife on the North Slope is monitored by the Security Police on patrol. These people take good care of these animals. The Security Police stopped us from driving through a part of the herd of caribou that was up on the road. We had to back up and go the long way around the herd to get to the Dead Horse Airport. These rules or laws are very strictly enforced on the slope.

They enforce the do not feed rules as well as put on training sessions to inform all of the personnel about rules concerning Polar Bears, wolves, foxes, and the ducks. There are many rules that govern spills, trash, and many other important items concerning maintenance of the environment. We co-exist with the Arctic environment by having a minimum effect on the tundra and the wildlife.

The tundra is so sensitive to damage. Everyone on the Slope has learned how to protect this marshy delicate mat. If a vehicle gets off onto the tundra and makes ruts, these ruts will last forever. We have used the cold arctic winter to lay down Ice Roads so the heavy equipment can be moved into place on the small gravel pads. In some areas (Barrier Islands) we drill in the winter when the ducks and geese have gone south. We are gone off the Islands before the Ice melts and the ducks return. When we drilled in Harrison Bay and Camden Bay with Rig 217, we waited to start drilling until the whales had finished their mating. The drilling noise disturbed the whales so we sat and waited.

I have pictures of the Arctic caribou herd coming into the Kuparuk field. There were thousands of these caribou coming over the horizon. They looked like little black ants. The next morning, these caribou were all around us running in all directions. They were up on the drilling pad, walking around the drilling rig and its supporting camp structures. The drilling crew had to be very careful when walking from the rig back to the camp.

I have seen the caribou crawl under the gathering lines. The caribou would also jump the same gathering lines where they were coming out from under the road. In fact I had a photograph taken on the spur of the moment that caught two caribou approaching a gathering line. The gathering line went under the gravel road. The camera caught one caribou walking under the line while the other one was jumping the same line at the same time. We had both animals in the same photo. This photo was used in several Show and Tells at the kid's elementary school.

I have spent a lot of time in the Alaskan Arctic as well as in the Caspian Sea. We are quire capable of designing, building and operating drilling rigs in Environmentally sensitive areas. Helicopter rigs are being used in the Rain Forrest of New Guinea, the jungles of Columbia and now are working all over Russia and Kazakhstan. I have been in many meetings with the major oil companies and have listened to oil company management personnel describe the critical nature of the environmental concerns. We have had to design and develop rig packages that would meet their requirements or our rigs would not be allowed to work for the companies.

One point about the Arctic Oil Fields most people must understand. The people in management as well as the workers in the field live in this environment. These are the people that hunt, fish, and hike these same sensitive areas. These same people do not want these areas messed up. Expressing the same feelings are the native people in the village of Kaktovik. These people will live and survive in the ANWR during the exploration and production of the oil. They know the future survival of their children depend upon the development of the region. They also know the survival of their heritage is also dependent upon the successful environmental production of the oil and gas from this region. These people have seen the success in Prudhoe Bay, Kuparuk, Colville Delta, and the drilling on the Barrier islands, the final resting place for the migrating birds and ducks.

We need to do a special for television that shows the truth about the drilling in the Arctic Regions. Show the people just how serious these "Big Oil Companies" are about these regions. I sat for a many a day and watched the ducks and Geese fly in from the South and Fly out for the winter. Millions of ducks would gather everyday on the shallow ponds. I saw swans, two to four, setting on the ponds near the spine road. For an ole West Texas Boy this was really something to see. We would never have done anything to spoil that. I saw my first arctic wolf close up while flying back from Point Thompson. They are huge, I thought this one was a bear, could have been but this one had a tail.

The rig we built for the Caspian Sea has fish swimming around the well bore. Spotted seals were swimming around the rig. The Balooga Caviar comes from this region of the Caspian. This is the highest quality caviar in the world. It is the fish eggs of the Sturgeon. The fluids we dumped overboard had to meet the stringent water quality standards set for that area. OKIOC (Shell, BP, British Gas, Exxon/Mobil etc.) could not tolerate a major incident for this project. It would not be ECONOMICALLY FEASIABLE to disturb the environment. Guess what, these people do not want to mess up the area. It is a personal concern for the employees of these oil companies. These people are environmentalist themselves. Environmental damage is now considered part of the economic analysis of the oil fields. Not because of the fines levied for failure to comply, nor clean up expenses, but because damage effects the local population which makes it more expensive for the people that work in these areas. Environmental

safe areas require proper maintenance of machinery, following proper safety standards, as well as training to set standards of operation. All of these items have been proven to be cost effective to both the drilling and production operations.

The required drilling equipment for the new drilling demands will be big rigs equipped with top drives, large drawworks, and big mud pumps needed to drill the deep wells. The deep holes will be required for the far out reach into the reservoirs in the ANWR. These rigs are now working the horizontal drilling programs back in the fields now in production. They also come with the latest state of the art Blow-Out-Preventers and well control systems. All of this equipment and the training of personnel are required for the prevention of well blowouts and drilling mistakes that lead to accidents.

There will be special problems that arise which are peculiar to the ANWR region. I know many of these problems have been studied and proposals set forth. These same proposals are now being developed and tested in the drilling and production from the new fields in and around the Old Prudhoe field. The use of small pads, built on the beach, has been proposed. Drilling Rigs and Production equipment could be placed on the pads during the summer by off loading barges right on the pads. The new horizontal drilling and far reaching technologies that are being used now would allow access to the oil reservoirs back in under the ANWR and outward in under the Beaufort Sea. Oil production could be tied back into the Alaska Pipeline that is close by in the Prudhoe Bay Field. Some other problems have to do with the lack of gravel for pads and the lack of fresh water for drilling. There are other design problems that have surfaced and have already been resolved.

New engineering developments for the safety of drilling in environmentally sensitive areas.

1. Use of small drilling pads with the close spacing between wells (10 ft to 12 ft). This is possible due to the drilling of highly deviated holes that can fan out in all directions under the surface. Presently we can drill wells of close to 30,000 ft total depth with a shallow 6,000 to 8,000 vertical depths. It is very important to know the exact location of the hole at all times. New high technology is in use that produces accurate hole telemetry results back to the surface. The driller knows exactly where his hole is and where the bit is headed.
2. Use of injection wells on the pad to dispose of drilling fluids and cuttings from the hole. By using down hole cementing and casing techniques, the drilling crews can pump the cuttings and spent drilling fluids into safe formations far below the fresh water formations. This allows the drilling and production facilities to properly dispose of fluids that normally would have been transported to a surface disposal site. This greatly decreases the chance for a spill on the Tundra.
3. New Well Control and Blowout Prevention equipment, training, and quality control procedures are in place and monitored weekly. Efforts at proper training and the use of the latest quality control monitoring techniques have almost eliminated the risk of a major blowout. Instead of trying to handle a blowout at the surface of the well, more efforts have gone into controlling the well down hole. Using hydrostatic pressure of the drilling mud and controlling the viscosity of the drilling fluid, the higher pressure gases and fluids can be pushed back into the formations. These gases never get into the well bore because the drilling crew is trained to work with the mud engineers to keep the well and "Mud" conditioned and cleaned.
4. Water treatment facilities at the Rig and Facilities Camps have been in a constant development and change. The object is to take the brackish water from the local water sources (rivers and ponds) and process this into potable water. Using proper water treatment and processing this water may be re-cycled and disposed of in the latest method

allowed by regulations. As we learn more and the equipment technologies change these improvements are implemented. The basic types of water we have to deal with are as follows:

Grey Water – water coming from the kitchen such a dishwashing and garbage disposal. In some camps, this also includes the laundry of clothes. These waters are also treated by filtrations and chemical treatment back to potable water that can be recycled through the Boiler / Steam systems make up water.

Sewage or Black Water – water coming from Toilets and Urinals and showers. These are treated with sewage treatment systems that produce Potable water and solids that are continually being processed biologically.

Oily Water – Drainage from the drilling equipment, Engines, and drill floor areas that have oily drilling fluids. Some of these fluids can be filtered and the oil separated from the water. Now the oil can be incinerated in special incinerators and the water used for certain drilling operations. The "toxic" hydrocarbon based fluids and drill cuttings are pumped into the safe formations within a disposal well.

Rain Water – Water that is collected from the decks, walls, and other structures on the drilling rigs from melting snow and ice and rain. Most of these waters are treated as if they were Oily water and injected down into the disposal well.

5. Ice Roads: The Ice Roads allow winter travel and drilling without damaging the tundra and minimizes the disturbance to the wildlife. Ice roads are built out across the Tundra during the winter months. These 7" to 9" thick ribbons of ice are used as roads to move the large drilling rigs and their support packages to the remote sites. The structure of the mat we call Tundra is not harmed by the ice. When the ice melts, the tundra springs right back. The technique of designing and constructing of ice roads has been a development of the last 20 years. The projected weight and weight distributed loading as well as the average low temperature are the variables determining the thickness of the ice for the winter. The construction technique is to use water trucks that slowly start driving across the frozen tundra spraying a thin layer of water. These water trucks follow each other spraying this water as they go until they have a build up of ice that will require leveling. Road graters follow the water trucks leveling and grooving the road surface. Most of these roads are about 70 ft wide and are easy to drive on without slipping and sliding.

I am concerned when I see the major networks distorting the ANWR with their filmstrips that I know are not accurate. I have seen the actual ANWR where the drilling is to take place for a few seconds one time on the Fox News Network. All the other networks are showing shots of the Arctic Herd coming over the pass on their way into Prudhoe Bay and the Kuparuk River basin. They talk about the damage the "Big Oil Companies" have done to these herds and other wild life.

I hear how the pipelines, drilling pads, and drilling operations have "separated the females" from the herds that will disrupt the feeding and breading. They were talking about the Arctic herd that has grown from 3,000 to 20,000 head while living within the drilling and production operations.

The networks discuss the "pristine wilderness" that will forever be damaged. From what I have seen over the past 20 years is just the opposite. I believe the ducks and geese are at an all time high count and are

ADDITIONAL DATA

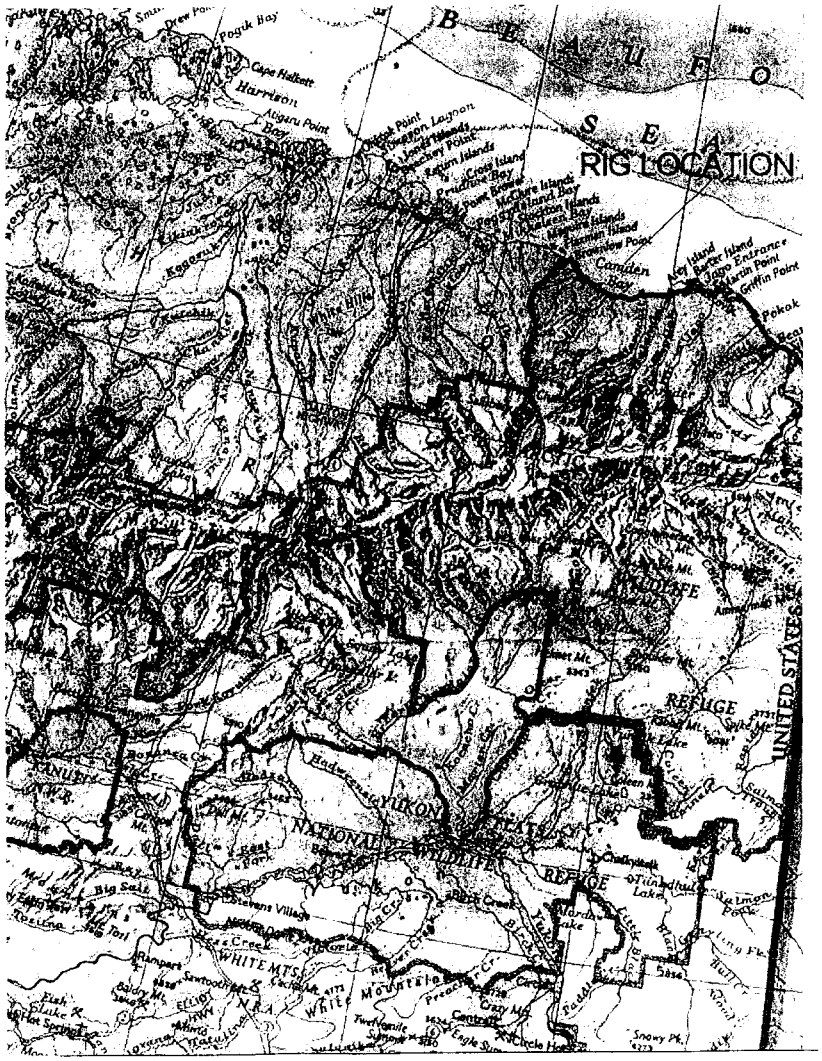
I. Map of Northeastern Alaska: This map relates the ANWR to the Alaska Pipe Line, Dalton Road (Haul Road), Prudhoe Bay, Kuparuk Field, Colville Delta, Harrison Bay, and Oliktok Point. Note that these areas to the West of ANWR are the coastal plains where the Central Arctic Herd calve and spend the summer. This herd has been doing well co-existing with the drilling and production within these areas. It has grown from 3,000 head to 20,000 plus.

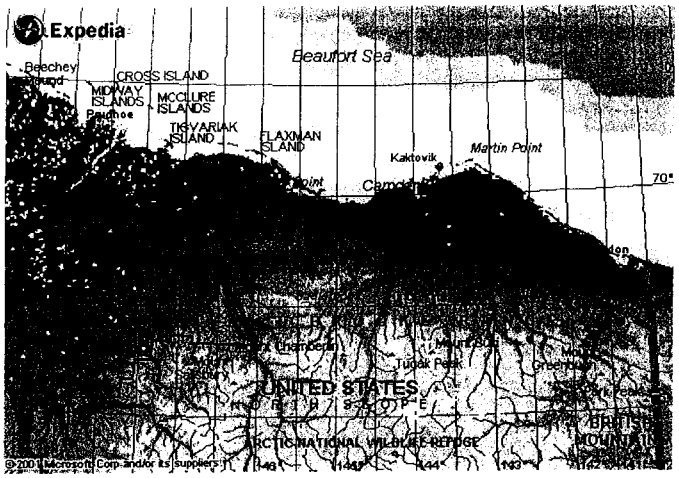
II. Map of the Coastal Plain of the ANWR Region: This map locates the village of Kaktovik and also shows the local rivers and their deltas. It also illustrates the lack of surface water as compared to the Prudhoe Bay area. Use this map to study the migration maps of the Porcupine Herd.

III. Alaska Caribou Herds: Compare the herd locations with the other maps to see where these herds summer and calve.

IV. Porcupine Herd Migration: These are the results of Satellite Tracking by radio-collared caribou for the five-year period from 1985 thru 1990.

V. Porcupine Herd Migration: These are the results of Satellite Tracking by radio-collared caribou for the year 2000.


B E A U F O
S E A
RIG LOCATION
Pogik Bay
Cape Halkett
Harrison
Atigaru Point
Bay
Camden
Bay
Griffin Point
Pokok
WILDLIFE
REFUGE
UNITED STATES
YUKON
NATIONAL
WILDLIFE
REFUGE
Big Salt
Stevens Village
WHITE MTS
Mountain
Snowy Pk.


Expedia
Beaufort Sea
Beechey
CROSS ISLAND
MIDWAY ISLANDS
MCCLURE ISLANDS
Prudhoe
TIGVARIAK ISLAND
FLAXMAN ISLAND
Kaktovik
Martin Point
70°
Tuktak Peak
UNITED STATES
ARCTIC NATIONAL WILDLIFE REFUGE
BRITISH
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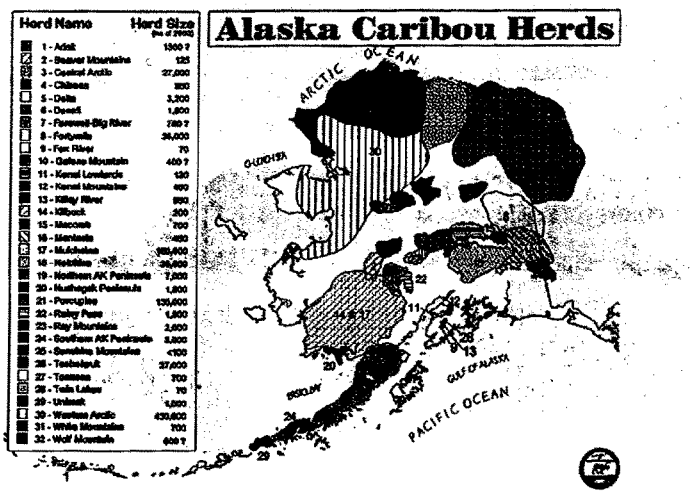
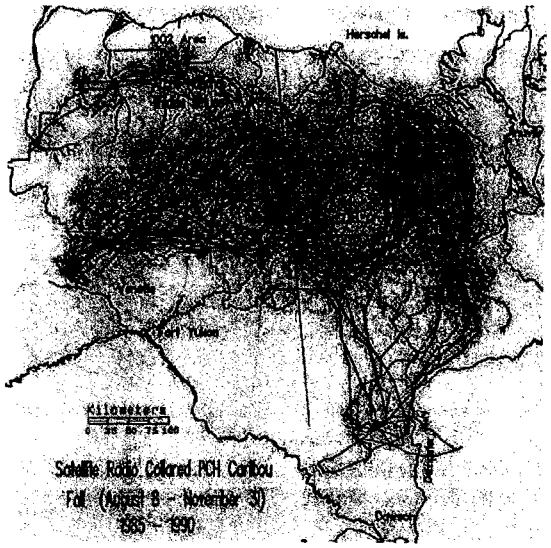

Alaska Caribou Herds
Herd Name
Herd Size
1 - Adak
2 - Beaver Mountains
3 - Central Arctic
4 - Chibugadakh
5 - Delta
6 - Denali
7 - Farewell-Big River
8 - Fortymile
9 - Fox River
10 - Galena Mountain
11 - Kenai Lowlands
12 - Kenai Mountains
13 - Killey River
14 - Kilbuck
15 - Macomb
16 - Mentasta
17 - McKinley
18 - Nelchina
19 - Northern AK Peninsula
20 - Nushagak Peninsula
21 - Porcupine
22 - Paley Pass
23 - Ray Mountains
24 - Southern AK Peninsula
25 - Sunshine Mountains
26 - Teshekpuk
27 - Tonsina
28 - Twin Lakes
29 - Unimak
30 - Western Arctic
31 - White Mountains
32 - Wolf Mountain
ARCTIC OCEAN
GLACIER
BERING
GULF OF ALASKA
PACIFIC OCEAN

BACK Home

Satellite Tracking of Fall Migration



Map from U.S. Fish and Wildlife Service, Anchorage, AK

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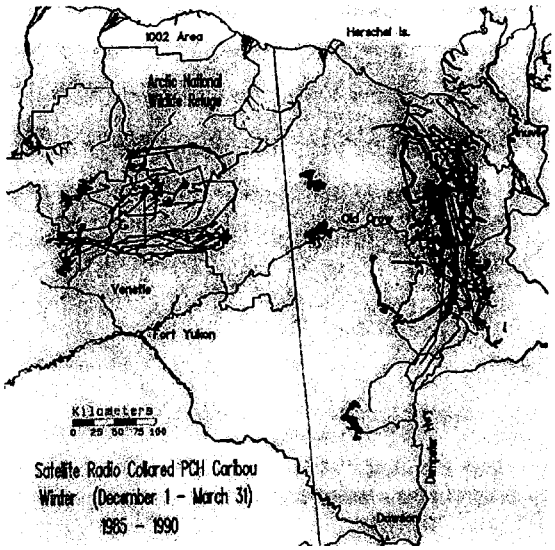
BACK Home

Satellite Tracking of Winter Distribution



Map from U.S. Fish and Wildlife Service, Anchorage, AK

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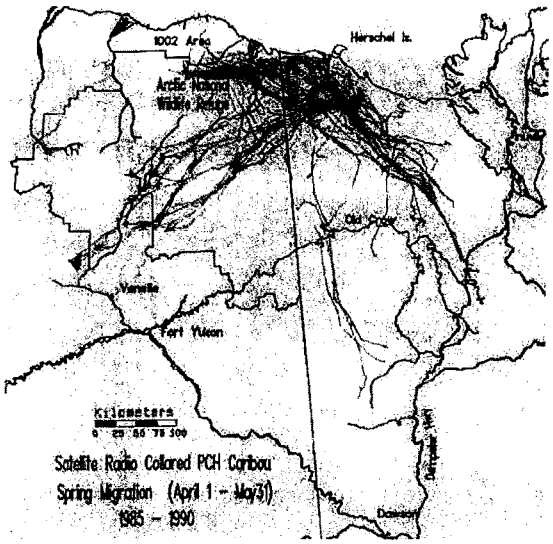
BACK Home

Satellite Tracking of Spring Movements



Map from U.S. Fish and Wildlife Service, Anchorage, AK

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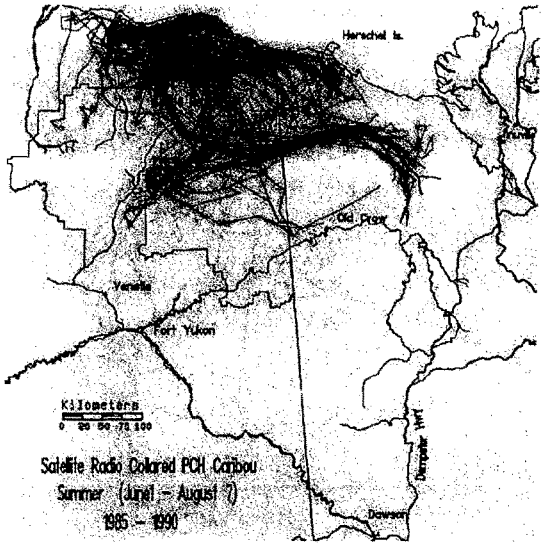
Satellite Tracking of Calving and Summer Distribution



Map from U.S. Fish and Wildlife Service, Anchorage, AK

↑ UP

Mr. THORNBERRY. Dr. Kumar, I think you started out your testimony in a way that is helpful to kind of put these discussions in a bigger context. You cite the energy information statistics that now 88 percent of our energy comes from fossil fuels, and their estimate is that over the next 20 years, total energy consumption is going to go up by about a third. The petroleum demand is going to go up by about twice that fast. Natural gas demand will go up faster than total energy demand will go up. And they also find that even if we get a 37 percent increase in energy efficiency, crude oil imports will increase to about 64 percent of our domestic supply. And so not only are we going to continue to be dependent upon oil and gas—and actually it seems like grow more dependent upon oil and gas—our dependence upon foreign sources of oil and probably gas are also going to increase.

I think that is what makes these assessments important as we try to figure out how we can keep from sinking as fast into greater dependency.

I thought it was interesting in your testimony you, as I understood it, said that as we do these various assessments along, they tend to increase. In other words, the more we are out there drilling, exploring and surveying, the more we seem to find.

You know, we have all heard over a number of years that we are running out of oil and gas. We are running out of oil and gas. But it doesn't seem to work out that way. You say we keep finding surprises. Is that what is happening, that the more we are out there finding, the more supply we tend to discover?

Mr. KUMAR. Congressman, my State, which was one of the earliest States to produce oil and gas in the United States, there are basins that have been producing for 70 years, and yet we are finding new significant reserves in the east Texas basin and Fort Worth basin, in Oklahoma. These are places that have people been studying and producing for 60, 70 years, and yet we are finding new reserves, new discoveries that are commercial and making money for people today. In the north slope of Alaska, Prudhoe Bay, giant field, major work has been done there, and yet in the 1980's Point McIntyre was discovered, which was a 500-million-barrel field, the largest discovery of the 1980's for the United States, and that was primarily a surprise because a few years earlier, few wells had been drilled through it without recognizing a 500-million-barrel field until ARCO and partners went back and drilled there.

Yes, sir, the technology has improved. Technology has provided an additional efficiency. So between surprises and technology, and attempts to keep doing things and having different ideas from different people working the same area, those are all the things that contribute to our resources.

Mr. THORNBERRY. You don't have any reason to believe that we are at the end of technological development for finding new supplies of oil and gas, do you?

Mr. KUMAR. No, sir.

Mr. THORNBERRY. Ms. Kallaur, let me ask you, as I look at your map and your assessment around the country, it looks to me like the highest numbers are the places where there is the most drilling. So I listen to what we have just been talking about, and I wonder, you know, those places that have for whatever reason been

placed off limits, isn't it difficult for you to make your assessments where there is not the kind of activity that there is down in the Gulf of Mexico? It looks to me like where there is the most drilling, the most work, the most surveying, that is where we have the most reserves.

Ms. KALLAUR. I agree with you, Congressman, because even in my testimony I say our numbers for the moratoria areas are much more uncertain because of the lack of activity. I think those who are familiar with the Gulf of Mexico realize that in the late 1980's, it was viewed as the "Dead Sea", and then companies began to develop prospects in deeper water. Now it is a world-class production province.

So things do change with additional activity, even though there are some areas companies have spent a lot of money drilling dry holes. But generally, particularly now with the new technology, more prospects are found if there is further drilling activity.

Mr. THORNBERRY. Dr. Leahy, would you agree with this point that generally everybody else has agreed with: As we explore more and survey more and drill more and find out more information, generally there is more available?

Mr. LEAHY. I would just like to refer to the chart I had up before, and this is our 1995 Natural Oil and Gas Assessment. If you look at the dark green pieces of the pie, which is reserve growth, that is really what we are talking about here. The development of technology, 3-D seismic and directional drilling, has improved the amount of our estimate in terms of what may be in these known fields.

Mr. THORNBERRY. Thank you.

Mrs. CUBIN. The Chair now recognizes the gentleman from Oklahoma Mr. Carson.

Mr. CARSON. Thank you so much, Madam Chairman. I just have a couple of questions to the panel about the proven reserves versus the prospective resources, a distinction that Dr. Kumar so eloquently presented to us in the testimony.

A couple of you mentioned that we are consuming, if I am not correct, about 7.5 billion barrels of petroleum liquids per year. Dr. Kumar, would that be roughly correct?

Mr. KUMAR. Yes, sir.

Mr. CARSON. And about 22 trillion cubic feet of gas per year are being consumed as well; is that correct?

Mr. KUMAR. Yes.

Mr. CARSON. Now, the estimates from the USGS as well as your organization a few years ago talk about the prospective oil reserves or resources. If you could clarify which of those it was, in the studies in ANWR, that talks about a mean value of about—I think it was between 6 and 7 billion barrels of oil in ANWR; is that roughly correct? Or perhaps Dr. Leahy from the USGS.

Mr. LEAHY. In terms of the USGS 1998 Assessment, in the 1002 area, there was a mean estimate of 7.7 billion barrels of oil.

Mr. CARSON. And that would be seen as resources or reserves in Dr. Kumar's distinction?

Mr. LEAHY. This would be resources.

Mr. CARSON. Understood.

It is probably an elementary question. In the testimony you talk about the amount of resources there, Dr. Kumar, and you emphasize how highly contingent these are. What is the likelihood of realization of a resource into a reserve?

Mr. KUMAR. I can refer to that chart here, Congressman Carson. These assessments that MMS and USGS does, they are based on the data that is available and yet they are only estimates. The only way the resource can be converted to a reserve would be through exploration activity, actual drilling and proving that resource.

So at ANWR today, the numbers that Dr. Leahy just mentioned, that is still the resource, and in their publication there is a whole range and that 6.8 billion barrels is the means of that estimated resource. There is no way that is going to be considered a reserve until that has been drilled and meets the definition of the Security and Exchange Commission on what the reserves are, which has to be commercially producible with the current technology.

Mr. CARSON. I am sympathetic to opening up ANWR for exploration production, but it seems under the predictions of USGS and what you present in your testimony that our consumption is 7 billion barrels of petroleum liquids per year. The mean value of resources at ANWR is roughly 7 billion barrels of oil. We are talking about, under the mean value, ANWR might produce about 1 year's worth of petroleum liquids consumption for the country? Is that an accurate statement?

I know that obviously if the reserves in ANWR prove to be far above the mean value that that could change.

Mr. KUMAR. Congressman, the way I look at it, Prudhoe Bay has produced almost 10 billion barrels of oil so far, and all of these oil fields, as you know in your own State, they stay producing and contributing to the national mix for a long, long time. So ANWR, if it produces roughly one million barrels a day, we are looking at 15 percent of national production for the next 10, 15, 20 years. I think that is probably the more appropriate way to look at a resource because I hope it never happens that everything else in the country would be shut down and there would be only one field in the whole area that will be supplying the rest of the country.

Mr. CARSON. Right. Understood. Understood. Across the country, what is the natural gas production per year? How many trillion cubic feet of natural gas production do we have in this country right now? Perhaps Dr. Leahy from the USGS, you could answer that question.

Mr. LEAHY. I believe you mentioned 22 trillion cubic feet, and I believe of that about 4 trillion cubic feet is imported. The rest is domestic.

Ms. KALLAUR. I believe the OCS produces 5 TCF, and that is approximately 25 percent of domestic production. So I am assuming it is about 20 TCF that are produced domestically with the remainder imported from Canada.

Mr. CARSON. For all of the major areas of Federal lands that were discussed here, the Rocky Mountain Sedimentary Basin, the Eastern Gulf, Alaska, the Central and Western Gulf, what are the mean values of predicted resources there for both gas and oil? Do you have that information at your disposal?

Ms. KALLAUR. In terms of the offshore, the mean conventional resources is 362.2 trillion cubic feet of natural gas.

Mr. CARSON. That would be between both Pacific, Atlantic, as well as the Gulf?

Ms. KALLAUR. Yes it includes moratoria areas as well as non-moratoria areas.

Mr. CARSON. Thank you very much, Madam Chairman.

Mrs. CUBIN. The Chair now recognizes the gentleman from Nevada, Mr. Gibbons.

Mr. GIBBONS. Thank you very much, Madam Chairman.

I was very interested in the statement of the Ranking Member when he opened his comments about the need for developing geothermal. I come from Nevada, a State that has very little oil and gas, although it does have some, but it has a great deal and a great potential for geothermal energy.

One of the big problems we have, however, in the State of Nevada is the continual attempt at the restrictions of areas that have these potentials. In fact, just last year the creation of the Black Rock National Conservation Area put off limits one of the largest geothermal producing areas in the State of Nevada, with about 1.3 million acres in Nevada off limits to geothermal.

If we continue to go in this direction where we restrict the development of geothermal, we will at some point find that the development of those geothermal resources is nonexistent, that we cannot make that difference.

I want to get back to the testimony of Dr. Leahy and Ms. Kallaur. The USGS—and this is one where I would ask you to help me—the USGS and the Minerals Management Service use two different terms. One of them is technically recoverable resources and the other, Minerals Management, is "conventionally recoverable resources." .

Will each of you tell me what you mean by that? Are they the same terms and, if they are, why are you using two different terms?

Ms. KALLAUR. Let me try to answer that question, sir. They are the same terms, and I think if we had to do it over again we might use the same terms. I think the one difference is that when USGS comes up with a number for what they call "technical", they include coalbed methane, tar sands and some of what I would consider more exotic fuels; whereas, our "conventional" number only includes oil and gas.

Mr. GIBBONS. So would there be a difference then in the definition of total reserves available to the United States, based on your terminology versus USGS?

Ms. KALLAUR. No, I think we can do a comparable chart so you would be able to see what the total amount is for conventional resources, both onshore and offshore, as long as we were able to do it from the USGS resource estimates, including tar sands and coalbed methane.

Mr. LEAHY. I would agree with Ms. Kallaur on the comparability of the numbers.

Mr. GIBBONS. Okay.

Mr. LEAHY. Also, I would like to state that the definition of "technically recoverable" is in my written testimony, but the way I guess

I would characterize it very simply, it is the quantity that can be extracted with current technology.

Mr. GIBBONS. Very good. Would you, for the record, submit to this Committee the refined estimates based on a common terminology for the use of reserves?

Ms. KALLAUR. Yes.

Mr. GIBBONS. Just submit it for the Committee. I would appreciate it.

Ms. KALLAUR. Yes, sir.

[The information referred to follows:]

MMS/USGS Aggregate Resource Assessment Numbers

Geologic Resources

	Oil (Bbbl)	Gas (TCF)
Undiscovered Conventional/Technically Recoverable Resources[1]		
MMS	75.0	362.2
USGS	30.3	258.7
NGL	7.2	
Total	112.5	620.9
Undiscovered Unconventional/Technically Recoverable Resources		
USGS	2.1	308.1
NGL	2.1	
Coal Bed		49.9
Total	4.2	358.0
Measured Reserves[2]		
MMS (Proved)	3.8	31.3
USGS	20.2	135.1
NGL	6.6	
Total	30.6	166.4
Unproved Reserves		
MMS	2.3	6.0
Reserve Growth		
MMS	7.7	68.1
USGS (inferred reserves)	60.0	322.0
NGL	13.4	
Total	81.1	390.1
Total Geologic Number[3]	230.7	1541.4

[1] USGS numbers are from USGS Circular 1118. Numbers include onshore and state waters. Technically recoverable resources are defined to be resources postulated from geologic information and theory, to exist outside of known oil or gas fields. They are producible using current technology but without reference to economic profitability. Conventionally recoverable resources are defined as the portion of undiscovered hydrocarbon potential that is producible using present or reasonably foreseeable technology, without any consideration of economic feasibility. Conventional and technical are considered to be equivalent.
[2] USGS numbers are as of 1994. MMS numbers as of Dec. 31, 1998.
[3] These numbers are not additive in a strict sense as they represent different levels of certainty.

Economic Resources

	Base Case		High Case	
Conventional [4]	Oil (Bbbl)	Gas (TCF)	Oil(Bbbl)	Gas(TCF)
MMS	26.6	116.8	46.7	168.1
USGS	9.239	77.505	17.417	121.826
NGL	3.048		4.555	
Total	38.887	194.305	68.672	289.926
Unconventional[5]				
USGS				
Continuous gas				
NGL	0.148		0.204	
Non Assoc. Gas		20.979		45.230
Continuous oil				
Oil	0.145		1.092	
Assoc. Gas		0.072		2.293
Coal Bed Gas		14.880		26.907
Total	0.293	35.931	1.296	74.430
Total Economic Number	39.180	230.236	69.968	364.356

[4] USGS numbers are from Circular 1145. MMS & USGS oil prices are the same for both cases, $18/bbl & $30/bbl respectively. Gas prices are slightly different, $2.11/MCF compared to $2.00/MCF and $3.52/MCF compared to $3.34?MCF. This difference has been ignored as insignificant for policy determinations and not worth the significant effort for either agency to rerun the models.

[5] Numbers are from Tables 2&3 of 1145.

Alaska Geologic Resources[6]

Conventional /Technically Recoverable Resources[7]

	Oil (Bbbl)	Gas(TCF)
MMS	24.9	122.6
USGS (technical)	8.44	68.41
NGL	1.12	
Total	34.46	191.01

Unconventional/Technically Recoverable Resources

USGS	Not evaluated	

Measured Reserves

MMS(proved)	0.0	0.0
USGS	Not Reported	

Unproved Reserves

MMS

Reserve Growth

MMS	Not Evaluated
USGS	Not Evaluated

Alaska Economic Resources

	Base		High	
Conventional	Oil (Bbbl)	Gas (TCF)	Oil(Bbbl)	Gas(TCF)
MMS	3.3	1.6	10.1	3.0
USGS	0.913	1.033	3.828	3.556
NGL	0.009		0.058	
Total	4.222	2.633	13.986	6.556

[6] Does not include ANWR 1002 area
[7] Circular 1118 Numbers

MMS Moratoria Areas

Conventional /Technically Recoverable Resources

	Oil(Bbbl)	Gas(TCF)
Alaska (NAB)	0.23	6.79
Atlantic	2.31	28.05
Pacific	10.71	18.95
EGOM	2.73	8.45
Total	15.98	62.24

Economic Resources	**Base**		**High**	
	Oil (Bbbl)	Gas (TCF)	Oil (Bbbl)	Gas (TCF)
Alaska	0.02	0.88	0.036	1.272
Atlantic	0.53	6.65	1.339	12.78
Pacific	5.31	8.30	7.23	11.62
EGOM	1.18	5.34	2.114	6.494
Total	7.04	21.17	10.719	32.166

Mr. GIBBONS. Mr. Leahy, the crude oil, the estimated resources that are based on the USGS studies, presented in testimony to this Subcommittee on March 21st, in 1996, appears to differ significantly from that presented in Circular 1118, and indeed your testimony here today, which is different. Specifically the 1996 testimony, total estimated technically recoverable reserve, crude oil reserves were 142 billion barrels versus the 112.3 billion barrels in Circular 1118 in your testimony. Can you explain this difference to us?

Mr. LEAHY. Yes, I can. The results of the USGS 1995 National Oil and Gas Assessment, I believe it is on page 2 of my testimony, what we did in that earlier assessment is to combine the estimates for oil, which is 112 billion barrels, with the natural gas liquids; and these are liquids. They call them condensates, too. When the pressure in the reservoir is reduced, they go from a gas phase to a liquid phase, and we included them with the oil estimate. That estimate is about 30 billion barrels. So if you add them together, the number is the same as that earlier testimony.

Mr. GIBBONS. Dr. Kumar, you indicated in your testimony and state that we have very large natural gas and oil reserves in the United States. If this is the case, why aren't we using, drilling, producing these resources today? What is the barrier? What are the limitations that you see?

Mr. KUMAR. Well, one of the main barriers, Congressman, is access. We just heard how many of the areas that have significant potential are off limits, the East Coast of the United States, Arctic National Wildlife Refuge, the Pacific OCS, and the resources can never be converted to reserves and supply unless the industry can go and have access.

In addition, since the 1980's, while in our own country oil companies were having trouble getting access, the permitting process was getting more and more onerous year after year after year. I personally dealt with that in Alaska for almost 10 years. At the same time the rest of the world was opening up, and companies found going outside the United States sometimes they could find bigger targets to look at and the climate was sometimes more welcoming to them outside the country than in their own country.

Mr. GIBBONS. I see my time is up, Madam Chairman.

One last statement or question. Dr. Kumar, could you for the Committee and for the record submit to us your estimate, your agency's or organization's estimate, of what oil and gas reserves or resources are precluded, locked up and unavailable out of the total that this country may possess? Can you give us that kind of an estimate on paper at a later date?

Mr. KUMAR. We can provide a summary of what has been already generated by various agencies. Our association, as I mentioned in my testimony, we do not generate numbers, and the reason is that our thousands of entities in the United States are actively working for oil and gas, and we thrive on having differences of opinion. So we would be happy to submit a summary that was published actually by the National Petroleum Council recently, which actually right now in front of me there is a map that shows the areas that have been locked up and that are not available. So we will be very happy to submit our AAPG position on that.

Mr. GIBBONS. That would be fine.
Thank you, Madam Chairman.
[The information referred to follows:]

American Association of Petroleum Geologists
An International Geological Organization

April 5, 2001

The Honorable Jim Gibbons
Vice Chairman
Subcommittee on Energy and Mineral Resources
100 Cannon House Office Building
Washington, D.C. 20515

Dear Congressman Gibbons:

During the oversight hearing on "Estimated Oil and Gas Resources on Federal and Submerged Land: How much oil and gas can these lands produce?" held by your subcommittee on March 22, 2001, you had asked American Association of Petroleum Geologists to submit its views on the amount of oil and gas resources in the United States which are subject to restrictions.

During my response I had cited the National Petroleum Council's (NPC) 1999 study, "Meeting the Challenges of Nation's Growing Natural Gas Demand" which had reviewed this question on gas resources for the Lower-48 states. I have built on this information to estimate the *total oil and gas resources for the entire country* that are subject to restrictions.

The following table and the enclosed map summarize the information. The figures used by the NPC study were mean technically recoverable gas resources subject to restrictions. We have obtained equivalent oil numbers from the Mineral Management Service, 2000 assessment for the OCS areas. The Alaska numbers for oil and gas are from the United States Geological Survey's (USGS) Arctic National Wildlife Refuge (ANWR) assessment published in May 1998. The figures for oil subject to restrictions in the Rocky Mountain area are based on the USGS National Assessment, published in 1995. The NPC study concluded that almost two-third of Rocky Mountain resources were subject to some restrictions (14% closed to development). We have utilized the same ratio to total oil resources to estimate the amount of oil subject to restrictions in the Rocky Mountain area.

Table 1: Amount of U.S. Oil and Gas Resources Subject to Restrictions

Area	*Oil (Billions of Barrels)**	*Gas (Trillions of Cubic Feet)**
ANWR	7.6	2.7
Atlantic OCS	2.1	31
Eastern Gulf of Mexico	3.6	24
Pacific OCS	10.7	21
Rocky Mountain Region	2.7**	137 ***
Total	**26.7**	**215.7**

* Figures are estimated to be Mean technically recoverable resources
** 0.6 Billion Barrels are closed for development, 2.1 Billion have some restrictions
** 29 TCF are closed to development, 108 TCF have some restrictions

Mail: P.O. Box 979, Tulsa OK 74101-0979 USA • Street: 1444 South Boulder, Tulsa OK 74119 USA
Phone: 800-364-2274 (U.S.A./Canada) • 918-584-2555 (Other Locations)

As you can see, these figures amount to be a significant resource that could be utilized towards solving our nation's energy needs. We at AAPG firmly believe that oil and gas resource development can be done in conjunction with protecting the environment. The alternatives, even if available, will not be "risk free" to the environment either.

We sincerely appreciate your interest in our views. The American Association of Petroleum Geologists will be happy to help you in any manner it can to deliver a sound energy policy to the nation.

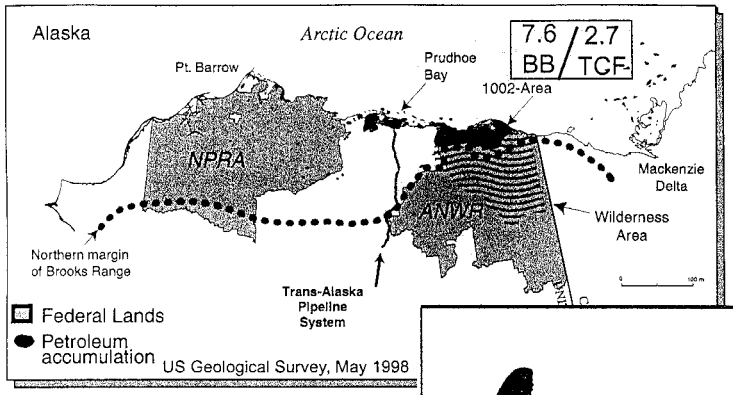
Thanking you for your interest.

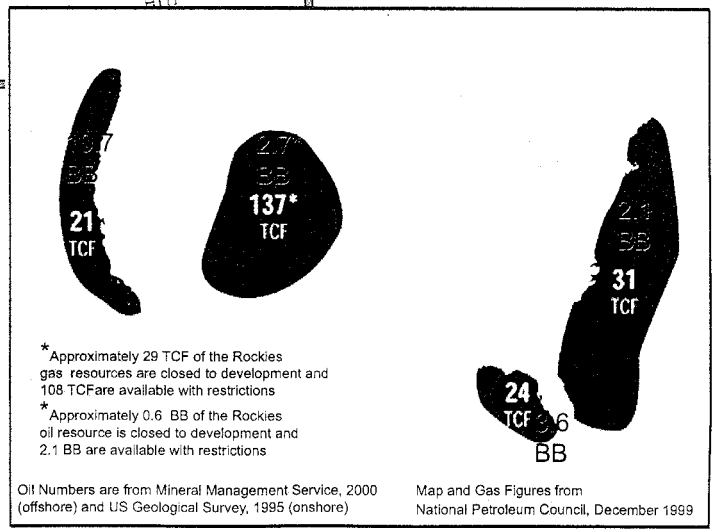
Sincerely,

Naresh Kumar, Ph.D.
Vice Chairman, Committee on Resource Evaluation
American Association of Petroleum Geologists
P.O. Box 835961
Richardson, Texas 75083-5961

Enclosure: Map
Xc: Congresswoman Barbara Cubin, Chair, Subcommittee on Energy and Mineral Resources
John Rishel, Legislative Staff
Marlan W. Downey, President, American Association of Petroleum Geologists

Oil and Gas Resources Subject to Restrictions





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

*Approximately 0.6 BB of the Rockies oil resource is closed to development and 2.1 BB are available with restrictions

Oil Numbers are from Mineral Management Service, 2000 (offshore) and US Geological Survey, 1995 (onshore)

Map and Gas Figures from National Petroleum Council, December 1999

The resource figures shown here are technically recoverable (mean, F50) numbers

Mrs. CUBIN. The Chair now recognizing the gentleman from Massachusetts, Mr. Markey.

Mr. MARKEY. Thank you, Madam Chair.

Dr. Leahy, "technically recoverable" is a term of limited usefulness in the real world. Don't you agree?

Mr. LEAHY. Yes.

Mr. MARKEY. Since it presumes that you have infinite money to spend. So, for example, if I ask you to tell me how many technically recoverable kilowatts of solar energy fall in California each day, it is a lot. I mean, it is technically recoverable, every single ray of sun that hits in California, but it is not available at a reasonable price.

So proponents of drilling in ANWR often use the number 16 billion barrels of technically recoverable oil, citing the USGS as their authority. If you were trying to give Congress an accurate idea of what ANWR might contribute to our energy supply, would you use that number?

Mr. LEAHY. What you raise is an interesting issue, and, of course, the economics are a key element here.

Mr. MARKEY. Would you call that number misleading?

We need help here. We are trying to make big decisions.

Mr. LEAHY. I think the number, as stated, as technically recoverable, is correct.

Mr. MARKEY. But, again, solar energy is technically recoverable. We are talking about—remember now, there has been an EIS that has been approved for 18 years to bring the natural gas down from Prudhoe Bay. That is economically recoverable under your definition, is that not true?

Mr. LEAHY. Technically.

Mr. MARKEY. Technically, I mean technically recoverable?

Mr. LEAHY. Yes.

Mr. MARKEY. Yes, okay. So we need a little bit of help now as we are looking over at this other issue.

Mr. LEAHY. I think, again, I will go back to my earlier statement that the economics come to play here. Frankly, one has to add that economic piece in terms of cost.

Mr. MARKEY. That is not your job?

You would agree with me that there is a tendency for that term "technically recoverable" to be misleading, though, would you not?

Mr. LEAHY. Well, we have attempted in our assessments to add the economic piece. In my testimony, I believe there is a chart at the end that demonstrates how these estimates change as a function of the market price of oil.

Mr. MARKEY. What is economically recoverable at $30 a barrel?

Mr. LEAHY. I will use the mean value—.

Mr. MARKEY. Yes, please.

Mr. LEAHY. —in terms of the probability. Approximately six billion barrels.

Mr. MARKEY. Six billion, okay; not 16.

Okay. Thank you.

Now have you ever done a study such as the one you have done on the refuge for the National Petroleum Reserve?

Mr. LEAHY. Excuse me?

Mr. MARKEY. Have you ever done a study such as the one you have done on the refuge, the Arctic Refuge, for the National Petroleum Reserve?

Mr. LEAHY. We have one in progress as we speak.

Mr. MARKEY. When was the last one you conducted? Have you ever conducted one?

Mr. LEAHY. Approximately 20 years ago.

Mr. MARKEY. Now, the National Petroleum Reserve, that is not a refuge, is it?

Mr. LEAHY. No, it is not.

Mr. MARKEY. It is a wilderness in the legal sense, is it not?

Is it a wilderness in the legal sense, the National Petroleum Reserve?

Mr. LEAHY. No.

Mr. MARKEY. No, absolutely not. It is intended to provide a source of oil and gas for our country, is it not?

Mr. LEAHY. That is correct.

Mr. MARKEY. Democrats and Republicans, as far as you know, agree on that?

Mr. LEAHY. Yes.

Mr. MARKEY. So why have you spent so little time analyzing what is legally approved by Democrats and Republicans instead of spending so much time on what is legally prohibited in terms of your analysis of technically recoverable oil and gas?

Mr. LEAHY. Well, I think we try to look at frontier areas across the board.

Mr. MARKEY. But why would you look at them before you have looked at the National Petroleum Reserve where we all agree that there should be drilling?

That doesn't make a lot of sense to me, sir.

Mr. LEAHY. We look at areas that have potential. As I stated in my testimony, this issue—.

Mr. MARKEY. But there is a prohibition on the refuge, as this Committee is well aware, and there is none in—what I am saying is I don't think you have been providing the right focus for your agency in terms of what would have been useful for Congress and for the private sector.

Now, BP recently announced that they are looking at a very large structure in the NPRA. Are you familiar with it?

Mr. LEAHY. Yes.

Mr. MARKEY. Now BP says it is the same size as Kuparuk Field structure. Kuparuk is the second largest field in the North Slope, second only to Prudhoe Bay, is that correct?

Mr. LEAHY. I will have to check.

Yes, that is correct.

Mr. MARKEY. It is. Okay. Good.

Mrs. CUBIN. Would the gentleman yield if I make up the time for him?

Mr. MARKEY. Yes.

Mrs. CUBIN. The reason they did ANWR was because in a lame duck session in 1980, when Jimmy Carter was the President, the Congress told them they had to do it, told USGS they had to do it. So that is why they did it.

Mr. MARKEY. Has there been any updating since 1980 in the Arctic Refuge?

Mr. LEAHY. 1998 was the recent one.

Mr. MARKEY. Was that because of a Jimmy Carter lame duck session or request, do you know?

Mr. LEAHY. No. There had been some seismic information collected on ANWR. There was new information on drilling in State lands adjacent to ANWR.

Mr. MARKEY. All right. I appreciate it, but not in the National Petroleum Reserve, yes.

People are still blaming Jimmy Carter for the energy crisis. They are giving Ronald Reagan credit for the entire 1990 economic recovery, which I appreciate.

Do the economics of searching for natural gas on the North Slope change once a pipeline is built?

Mr. LEAHY. They certainly will.

Mr. MARKEY. They would. So all of that oil that has now been a by-product of—all of that natural gas that has historically been a by-product of looking for oil takes on a different light, does it not, once a pipeline is built?

Mr. LEAHY. That is correct.

Mr. MARKEY. We approved the building of a natural gas pipeline back in 1982, but it has never been built. Democrats and Republicans agreed on that. Now I am told by those who hold the permits that it is now econometrically likely that it could be built and a full return could be given.

How much more gas could we expect to find up there if there was a pipeline in place to bring it out?

Mr. LEAHY. Technically recoverable, and this is—the only numbers I have are the ANWR 1002 area, but there are other numbers for more of Alaska and we would be glad to share those with you, but in terms of ANWR it would be about 3.5 TCF at the mean value.

Mr. MARKEY. Okay. Let me ask one final question. BP, the largest player in the North Slope, recently sent me an estimate of oil dependence in the year 2010. It was based on the estimates of a leading consultant whom they respect. The estimate is that assuming no significant change in current policies our oil dependence will fall, not increase, over the next 10 years. Instead of rising to 61 percent, as estimated by EIA, it will fall to 50 percent. Fifty percent is the 10-year goal in the Senate energy bill, as you know, that we would basically reach if we drilled in the ANWR.

In other words, if BP and their consultant are correct, are we already going in the right direction and would we reach the Senate goal even if we don't touch the Arctic Refuge? Do you agree with that analysis?

Mr. LEAHY. That is a policy issue and, frankly, our role is to provide the estimates of the resource.

Mr. MARKEY. Mr. Kumar, could you give me your view on that? Do you agree with BP?

Mr. KUMAR. I have not seen that report or the statement or the consultant that provided that, but I personally think it would be very unlikely that we can reduce our dependence on foreign oil.

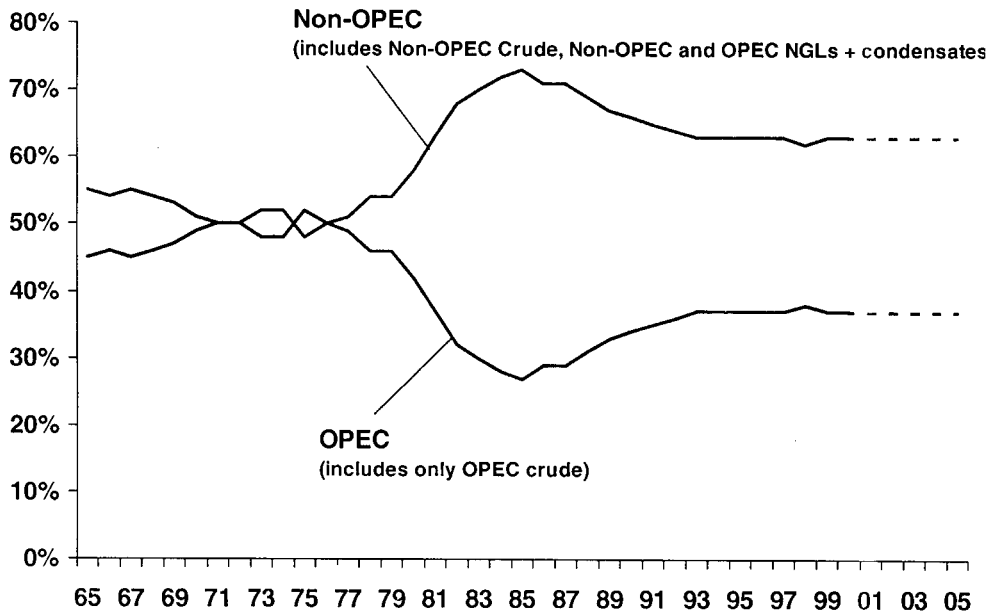
Mr. MARKEY. I have the BP report here, Madam Chair, and I would like to get permission to put it into the record.

Mrs. CUBIN. Without objection.

Mr. MARKEY. I think it would be very helpful to our discussion.

[The information referred to follows:]

Share of Global Oil Production 1965-2005



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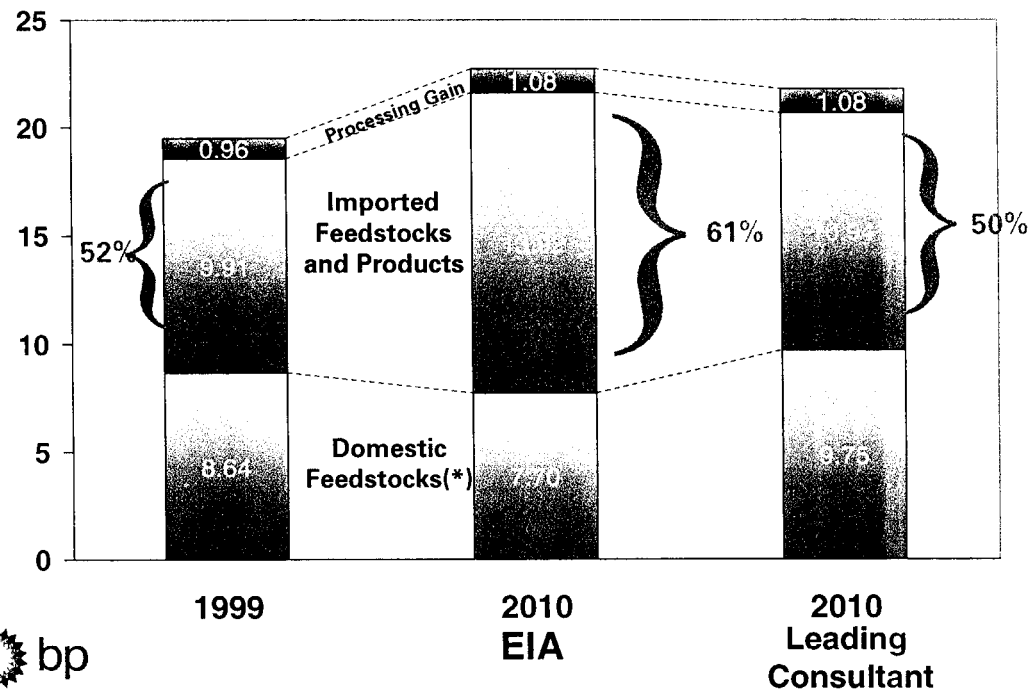
US Oil Import Dependence: 2 Views



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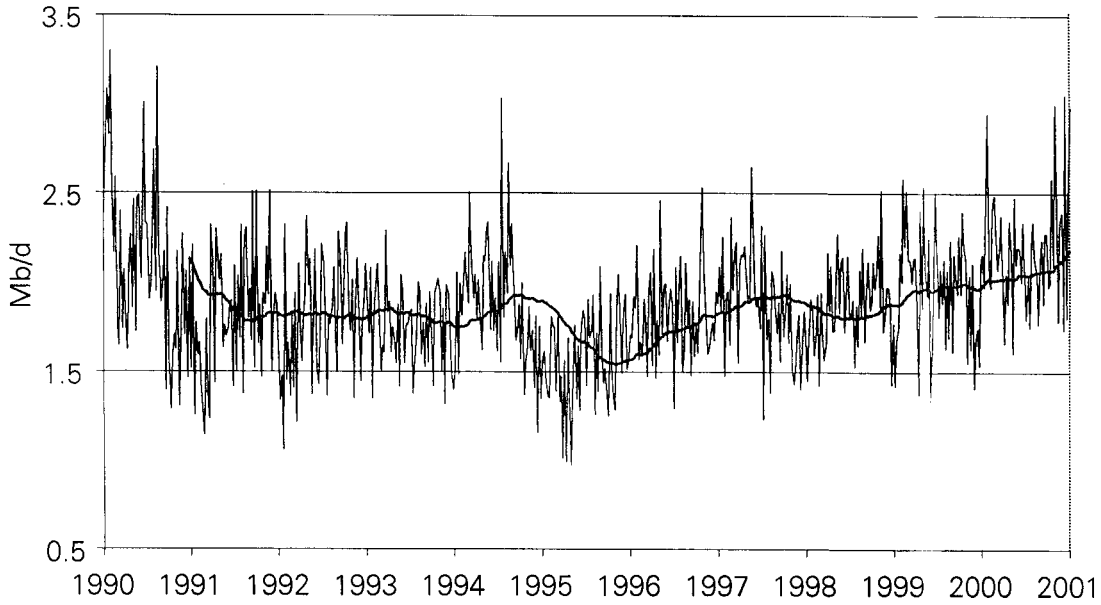
US Oil Product Imports



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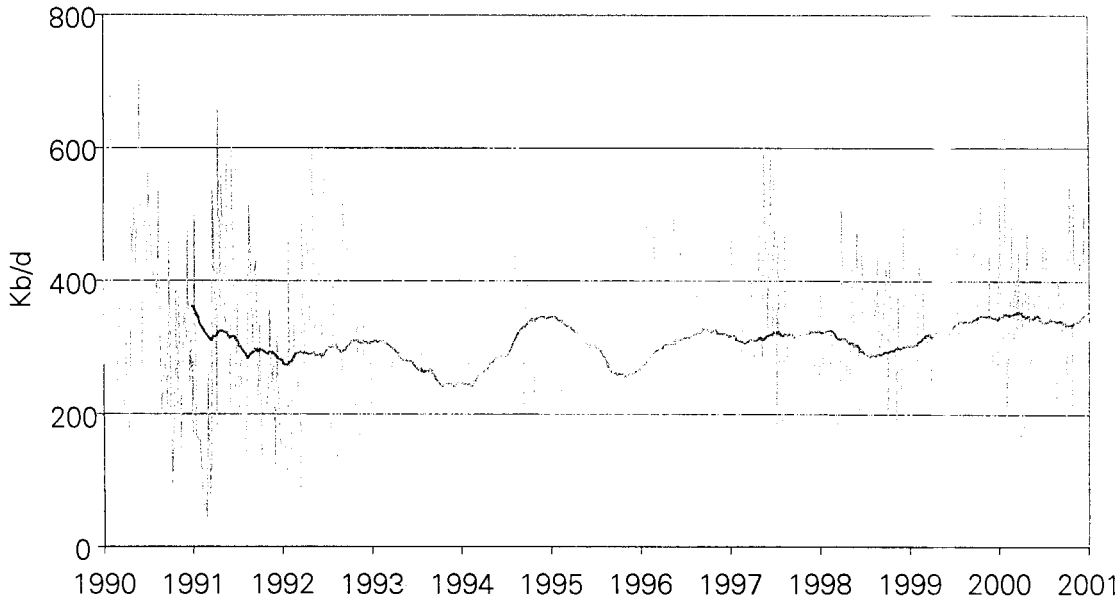
Source of data: API

US Gasoline Imports



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Source of data: API

Mrs. CUBIN. Last week Mr. Downey testified in front of the Committee that if you take the gas out of the ground first then you can't get the oil out so you are wasting the oil resource, and that is one of the biggest reasons why it hasn't been economically feasible to do that because they don't want to waste the oil that is in there.

The Chair now recognizes Mr. Tancredo.

Mr. TANCREDO. Thank you, Madam Chairman.

Ms. Kallaur, the MMS revised its estimates upward, significantly upward, on conventionally recoverable resources in the Gulf of Mexico.

Ms. KALLAUR. Yes.

Mr. TANCREDO. Could you give us a little more detail as to why these estimates increased and perhaps where the identified resources exist?

Ms. KALLAUR. Yes. The majority of the increase is attributable to the new finds in the deep water, and in addition there were several new prospects that were analyzed in the 2000 assessment that were not analyzed in the 1995 assessment.

Mr. TANCREDO. If you can segregate the data, how about in Sale Area 181; if you could identify it specifically how would the resource estimates compare to the NPCS estimate of 7.9 trillion cubic feet of gas?

Ms. KALLAUR. The numbers that we are currently using for Sale 181 are 396 million barrels of oil and 2.9 trillion cubic feet of natural gas. And I note that the NPC numbers, or the industry numbers, I have seen are much higher.

Mr. TANCREDO. Thank you. That is all the questions I have.

Mrs. CUBIN. The Chair now recognizes Mr. Inslee.

Mr. INSLEE. Thank you, Madam Chair.

I have some articles from the New York Times about the sinking of the oil rig, the Brazilian rig. If I may enter these into the record, I would appreciate that opportunity.

Mrs. CUBIN. Without objection.

[The articles referred to follow:]

WIDOWS OF OIL WORKERS MOURN IN BRAZIL

BY MICHAEL ASTOR, ASSOCIATED PRESS WRITER

MACAE, Brazil (AP)—Widows of oil workers tossed rose petals from a helicopter Wednesday over a mile-long oil slick in the South Atlantic where the world's biggest floating oil rig sank Tuesday, taking eight bodies with it.

Meanwhile, the president of Brazil's Environmental Protection Agency, Hamilton Casara, flew over the site of the spill to assess the damage, and an 11-boat flotilla worked to contain the oil.

According to the state oil company, Petrobras, some 80,000 gallons of mostly diesel fuel already had leaked but thanks to cleanup efforts and evaporation only 3,000 gallons remained on the surface.

"The slick is moving northeast out to sea but there is absolutely no risk whatsoever that it will hit beaches," said Petrobras' Environment and Safety Superintendent Irani Varela.

An overflight of the area revealed a slick about a mile-and-a-half long and a half-mile wide along with scattered debris from the platform, which sank about 75 miles off the coast.

"It's not a disaster. But the oil could affect migrating species and possibly ecosystems near the coast, like banks of coral," said Roberto Kishinami, the head of Greenpeace in Brazil. "This will have an impact on the environment and Petrobras is glossing over it." Petrobras President Henri Phillipe Reichstul said he believed

containers holding 312,000 gallons of diesel fuel would collapse under water pressure on the sea bottom at a depth of 4,455 feet.

The rig also had 78,000 gallons of crude—most of it in hoses between the wells and the rig. Those hoses were attached when the rig went down and could break, he said.

The 40-story-tall rig began sinking on Thursday after three unexplained explosions ripped through it. Two of the 175 workers were killed, and eight others are missing, presumed dead inside the sunken rig. Rescue workers wept as the rig sank beneath the waves on Tuesday.

Petrobras said it had done everything possible to recover the bodies.

Relatives of the victims, however, believe otherwise.

"I won't leave here without his death certificate, and I won't stop fighting to get his body back," said Rita Araujo.

"They can turn the rig upside down, do anything they have to. I want Charles's body. Even if it's just the bones, I want them," said Vanusi Oscar, widow of oil worker Charles Oscar.

Varela, the Petrobras safety official, said recovering the bodies would be almost impossible given the depth of the water of about a mile.

Built in Italy and later modified in Canada, the rig was the top producer in the oil-rich Campos Basin, which accounts for most of the 1.5 million barrels of oil Brazil produces daily. The platform was pumping about 83,000 barrels of oil and processing 1.3 million cubic meters of gas daily, but the company had plans to raise its production to 180,000 barrels a day.

Oil workers plan to stage a 24-hour work stoppage to protest safety conditions and honor the dead on Thursday.

OIL RIG SINKS; SOME LEAKING IS "INEVITABLE," OFFICIAL SAYS

BY LARRY ROHTER

The New York Times Company, March 21, 2001

RIO DE JANEIRO, March 20, 2001—After 5 days of frantic efforts to keep it afloat and recover the bodies of nine workers left onboard, the world's largest offshore oil platform sank into the South Atlantic this morning.

Henri Philippe Reichstul, president of the state-controlled oil company, Petroleo Brasileiro, or Petrobras, which operated the rig, said today that it was "inevitable" that at least some of the nearly 400,000 gallons of oil stored on it would spill into the ocean.

Brazilian television showed the platform, which was 40 stories high and weighed more than 31,000 tons, tipped over sideways and almost entirely submerged this afternoon, with little more than a helicopter pad still above water.

The giant rig, known as P–36, was built in Italy and later modified at shipyards in Canada and Singapore before Petrobras acquired it through a Bolivian intermediary; it was insured for $500 million.

It began operating a year ago this month in the oil-rich Campos Basin in the South Atlantic, about 78 miles off the coast of Rio de Janeiro state. Drilling to a depth of more than one mile, the platform had been producing 83,000 barrels of oil a day, about 5 percent of the total output of Petrobras.

But early on March 15, the rig was shaken by a series of explosions and began to list.

With fires raging and one firefighter already dead, all but 9 of the 175 workers were evacuated to another platform, and then to the mainland. Petrobras workers immediately began to try to stabilize the platform and find their missing co-workers, who are presumed dead.

Rough weather and high waves have hampered their work. "Sea conditions undoubtedly complicated the work of the divers and contributed to the sinking of Platform P–36," Mr. Reichstul said today at a news conference. "Certainly the bad weather accelerated its sinking." He also said that the rig's oil and gas wells had been sealed before it was evacuated. But oil and diesel fuel were stored in tanks aboard the rig, and industry experts said the tanks would almost certainly be ruptured by mounting water pressure as the platform sank. The ocean is about 4,400 deep at the site of the rig.

Petrobras officials said that more than a dozen vessels equipped with floating barriers have been sent to try to contain any spill.

Meteorologists said today that prevailing winds were blowing to the south, away from the coast, but that high winds were also preventing effective use of the barriers.

"There is a plan in place to protect the environment," Mr. Reichstul said. "We are not terribly worried about the environmental question." The demise of P–36 is the latest in a series of problems for Petrobras, whose stock price fell more than 2 percent as soon as the sinking was announced.

Two major oil spills in 14 months have led to large fines and heavy criticism of the company, Brazil's largest, which produces nearly all the country's oil and reported a profit of $5.2 billion in 2000.

The platform disaster is also a setback for Brazil's drive to become self-sufficient in oil.

Petrobras had been producing about 1.5 million barrels a day and hoped to raise its output to 1.8 million barrels by 2005. But now, the company will need to spend an estimated $500 million importing oil to replace P–36's lost production until a new rig can be bought and put in place.

"We're going to increase oil production this year, despite the accident, " Mr. Reichstul said. "Production in 2001 will exceed that of last year."

STRICKEN RIG ADDS TO PETROBAS WOES

BY JENNIFER L. RICH

March 20, 2001, The New York Times Company

SAO PAULO, BRAZIL, March 19, 2001—With its largest offshore oil platform still listing after a series of deadly explosions last week, Brazil's state- owned oil company, Petroleo Brasileiro, or Petrobras, is struggling to ease the damage to its bottom line and to the international reputation it has painstakingly built.

The accident is the latest in a string of problems, including environmental disasters, that Petrobras has had to answer for.

"It has been a pretty bad last 14 months, and clearly the company has suffered as a result of that," said Myles McDougall, senior petroleum analyst at ABN Amro in Sao Paulo.

After three explosions crippled one of the oil platform's support pillars on Thursday, causing the 40-story rig to sink more than 13 feet, Petrobras has been frantically working to keep the $350 million rig afloat. Ten of the platform's 175 workers are presumed to have died in the explosions and one is seriously injured, making the accident the deadliest on a Brazilian oil rig since 1984. Petrobras today named a commission to investigate the cause of the explosions.

The platform, situated in the oil-rich Campos Basin, 120 miles off the coast of the state of Rio de Janeiro, had stopped sinking by Sunday, but a storm front brought larger waves today, causing the rig to lean further.

Petrobras is hoping that the rig, which is covered by $500 million in insurance and is one of the world's largest platforms, can be saved. If so, the company said it would take at least a year to repair the structure, resulting in a loss of production worth $450 million this year.

If the rig sinks, the 400,000 gallons of crude and diesel fuel on board will probably spill, increasing clean-up costs and leaving the company open to fines for environmental damage.

Analysts say that the financial damage to Petrobras, while significant, should account for only about 6 percent of the company's earnings. Last year, the company reported net profit of $5 billion, up from $880 million in 1999.

More damaging, the analysts say, may be the short-term effect of having to import additional oil on Brazil's already precarious trade deficit. At present prices, the imports could cost as much as $40 million a month.

The platform, called P–36, has been in production since March 2000, processing around 80,000 barrels of oil a day, or slightly more than 5 percent of Brazil's daily production of about 1.3 million barrels. Production on the rig was to reach 180,000 barrels a day by 2003, helping the country, which consumes about 1.8 million barrels of oil a day, reach oil self-sufficiency by 2005. Such production was also expected to increase Petrobras's oil and gas exports, currently a tiny portion of its business.

Analysts say that the accident should not affect Brazil's long-term oil plans. But to resume production as soon as possible, Petrobras is considering subcontracting P–36's oil processing to smaller production ships or diverting a new platform, which recently arrived in Brazil and was going to be used elsewhere, to replace the damaged one.

After a 50-year monopoly, the Brazilian oil industry recently opened to private and foreign companies. To compete with the multinational newcomers, Petrobras

has been modernizing and streamlining domestic operations, cutting staff to 33,000 from around 70,000 the last 7 years while stepping up development and production.

Employee unions say that in Petrobras's rush to expand production, it has overlooked security precautions that could have prevented last week's accident. And they say that the downsizing and the hiring of contract laborers have resulted in 82 deaths nationwide at company facilities the last 3 years, including the deaths earlier this year of two workers on a natural gas platform also in the Campos Basin.

"For Petrobras to outsource these jobs creates a certain level of risk for us, since these workers are often not as prepared as we are," said Coaracy Guimar es, a director at Sindipetro, the Brazilian petroleum workers union.

The unions organized protests last Friday, demanding stricter attention to workers' safety.

Analysts say a combination of faulty technology and human error has caused two major oil spills the last 14 months, the worst of which dumped 325,000 gallons of oil in Rio de Janeiro's Guanabara Bay in January 2000, two months before the Carnival holidays filled the city with international tourists.

Petrobras denies the union's arguments and says that the spills were caused by years of neglect that will take time to rectify. In response to the Guanabara Bay spill, the company's president, Henri Philippe Reichstul, announced a 3-year, $900 million program to improve operational security and lessen environmental impacts.

"The Brazilian market has only been open for 5 years, and this type of evolution is normal to the process," said Jean-Paul Prates, a petroleum lawyer in Rio de Janeiro. "Things are going to be learned little by little." In the meantime, he said that last week's accident should have little or no effect on foreign business interest in Brazil.

"The amount of investment in the sector is unprecedented and that opening is not going to close because of this," Mr. Prates said. "You have 20 more operators that are beginning to enter into the Brazilian scene. It's a boom."

Mr. INSLEE. These are broad-based questions. I was looking at a national assessment of undiscovered conventionally recoverable resources on the outer shelf, and it includes two outer shelves, one around Florida that I am interested in and one off Washington and Oregon. It is my understanding, just if you can tell me if you know the administration's position on this, that at the request of the Governor of Florida, the President of the United States has decided to take those areas off limits, that he intends—of all the offshore areas, the Governor of Florida has requested those not be subject to exploration. It is my understanding that in honoring that specific request the President of the United States is not going to seek exploration in those areas.

Is that your understanding?

Ms. KALLAUR. Congressman, the Minerals Management Service has responsibility for leasing and regulating all offshore oil and gas activity. We are completing the final EIS on Sale 181 in the Eastern Gulf. It is scheduled to be released in June of this year and then we would be issuing a proposed notice of sale in July. We have received no direction from the President to stop our work.

Mr. INSLEE. I am sorry. Which?

Ms. KALLAUR. Sorry. We have received no direction from the President to stop doing the work we are currently doing right now on Sale 181 in the Eastern Gulf of Mexico.

Mr. INSLEE. That would include waters off Florida, then?

Ms. KALLAUR. That is correct, sir. Sale 181 is principally offshore Alabama, Mississippi, but there is also a portion that is offshore Florida.

Mr. INSLEE. So you are telling me you are not sure what the Administration's position is regarding Governor Bush's suggestion?

Ms. KALLAUR. All I know is what my staff is working on right now, sir.

Mr. INSLEE. I see. Well, assuming that the President honors the Governor of Florida's request not to drill off his shores in Florida, if the Governor of the State of Washington requested that you don't drill off the Washington shores or, in fact, national monuments like the Hanford Reach in Washington, is there any reason not to honor those other Governors' requests that you are aware of?

Ms. KALLAUR. I can speak to the offshore, and there is currently both a presidential withdrawal that was issued by President Clinton that goes through the year 2012, and congressional moratoria language that precludes any type of leasing activity along the West Coast, the East Coast and a portion of the Eastern Gulf of Mexico and one area in Alaska.

Mr. INSLEE. But with recent experience, we can't be entirely confident that those environmental policies will remain standing, unfortunately.

So I guess this is a question I have, if President Bush honors Governor Bush's request for Florida, is there any geological or economic reason you can see why he shouldn't honor other Governors' requests about territory in their areas?

Ms. KALLAUR. That really isn't an issue before the Minerals Management Service. As I previously said, there are congressional restrictions currently in place for all of the areas that I cited.

Mr. INSLEE. Okay. Thank you.

Can you tell us about any assessments that have been done about the potential energy that could be obtainable through conservation or efficiency measures taken by the United States, those from a whole gamut of sources, energy savings that would be obtained, essentially free oil, if you will, by having more efficient cars and trucks, by having more efficient light bulbs, by having more efficient refrigerators, by having more efficient heating systems in the home? Do you have any assessments of the available energy to the United States of America from those sources?

Ms. KALLAUR. That work is done by the Department of Energy and not prepared by the Department of Interior.

Mr. INSLEE. Do you have any information of how those relate to one another? Which one is larger? Do we have larger potential through conservation and energy efficiency or do we have larger potential through drilling in offshore, national monument areas, do you know?

Ms. KALLAUR. The one thing I do know is when the National Petroleum Council did a study of future natural gas needs for our Nation, they also took into account estimates of conservation. They said that the OCS would need to produce 7 to 8 TCF of natural gas in the year 2012 in order to allow consumption of natural gas to go from 22 TCF to 30 TCF, and I believe they took into account conservation in coming up with those numbers.

I think you know in this area reasonable people can disagree.

Mr. INSLEE. Thank you. That is something I totally agree with.

Ms. KALLAUR. Yes.

Mrs. CUBIN. The Chair now recognizes Mr. Rehberg.

Mr. REHBERG. Thank you, Madam Chairman.

I apologize for coming late. This is something I am particularly interested in, representing the State of Montana and the entire Rocky Mountain front.

I get a little sweaty-palmed when we talk about wells because having been a rancher and having drilled dry wells, I don't think I could ever be in the oil and gas business. But we all know there is uncertainty in estimating undiscovered oil and gas resources. How is the uncertainty, and this is for the entire panel, how is the uncertainty for making the estimates, in your assessments, how can they be reduced, in your mind?

Mr. LEAHY. Why don't I start? More information. Our assessments are based on geologic information, and the more geologic information we have, the more we can reduce the uncertainty.

Ms. KALLAUR. I would agree with that. I mean, clearly you don't know what is out there until you either acquire additional seismic information and then the only definitive way to know whether or not oil and gas is present is through exploratory drilling.

Mr. KUMAR. Congressman, in all of these areas, as assessments are made, they are made on the basis of existing data and we have seen significant revisions. As a certain play becomes more economic, more drilling is done, more information. That is one of the things when I mentioned surprises, we are all good at assessing what is known. It is the unknown part that sometimes becomes the most important play in a given area, and that can only happen with additional seismic and drilling information.

Mr. REHBERG. Okay. Ms. Kallaur, I understand that the MMS has recently sought the comments of the coastal state Governors with respect to the next OCS 5-year plan. Were any comments received suggesting that areas currently under the moratoria should be studied further by your agency as to the natural gas potential, even if they are not to be considered for leasing before 2002?

Ms. KALLAUR. We are in the process of developing the next OCS 5-year program, and we did not receive any comments from Governors at this time suggesting that we relook at the moratoria issue. Even so, we do have in place an advisory committee that is an advisory committee to the Secretary of the Interior that has coastal state members, and they have formed a Subcommittee to look at the question of the role of natural gas—of the role of the offshore in providing natural gas to our Nation. They are going to be setting forward some recommendations to Secretary Norton at a meeting that is scheduled for late May. They are coming up with some innovative approaches. They are looking to the success that has occurred in Eastern Canada, particularly with respect to natural gas, and thinking sort of broadly as to whether or not there might be a way to target small U.S. areas along the Atlantic, perhaps to see whether or not we could develop some OCS natural gas resources offshore in the United States.

Mr. REHBERG. Thank you.

Dr. Kumar, from your perspective, what will be required in order for the United States to meet projected natural gas demand over the next 5 years?

Mr. KUMAR. We mentioned earlier that we would probably need to double the number of wells being drilled currently. That would require significant capital commitment.

One of the things our industry is also facing is the lack of trained personnel. The oil industry has not been an area where a lot of students are wanting to go. So we will need to make a major national commitment to developing our resources, making the areas available and creating the drilling and providing the access.

Mr. REHBERG. Thank you. Thank you, Madam Chairman.

Mrs. CUBIN. We thank you very much for your valuable testimony and for your patience in answering our questions.

Some of the Subcommittee members may have some additional questions and if you would answer those in writing, the record of the hearing will be open for 10 more days.

If there is no further business, this Subcommittee on Energy and Minerals is adjourned.

[Whereupon, at 3:40 p.m., the Subcommittee was adjourned.]

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