Congressman Roscoe Bartlett
Congressional Record
GAO REPORT ON PEAK OIL
House of Representatives
March 29, 2007

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@4:14 pm

The SPEAKER pro tempore (Mr. *Hill*). Under the Speaker's announced policy of January 18, 2007, the gentleman from Maryland (Mr. *Bartlett*) is recognized for 60 minutes as the designee of the minority leader.

Mr. BARTLETT of Maryland. Mr. Speaker, I come to the floor today to address two very timely items. One is a just-released report by the General Accountability Office entitled: ``Crude Oil: Uncertainty about future oil supply make it important to develop a strategy for addressing a peak and decline in oil production." [**GAO-07-283]** This report was released at a news conference at two o'clock today, and so we want to spend some time discussing this report.

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@4:40 pm

Mr. Speaker, there is another very important thing that happened today, as I mentioned as I began. That is the GAO, the report is dated February 2007, but it was embargoed until today until our press conference, which released it.

I have several charts here from that report. I think that might be a good way to begin this discussion. Let's look at the first chart.

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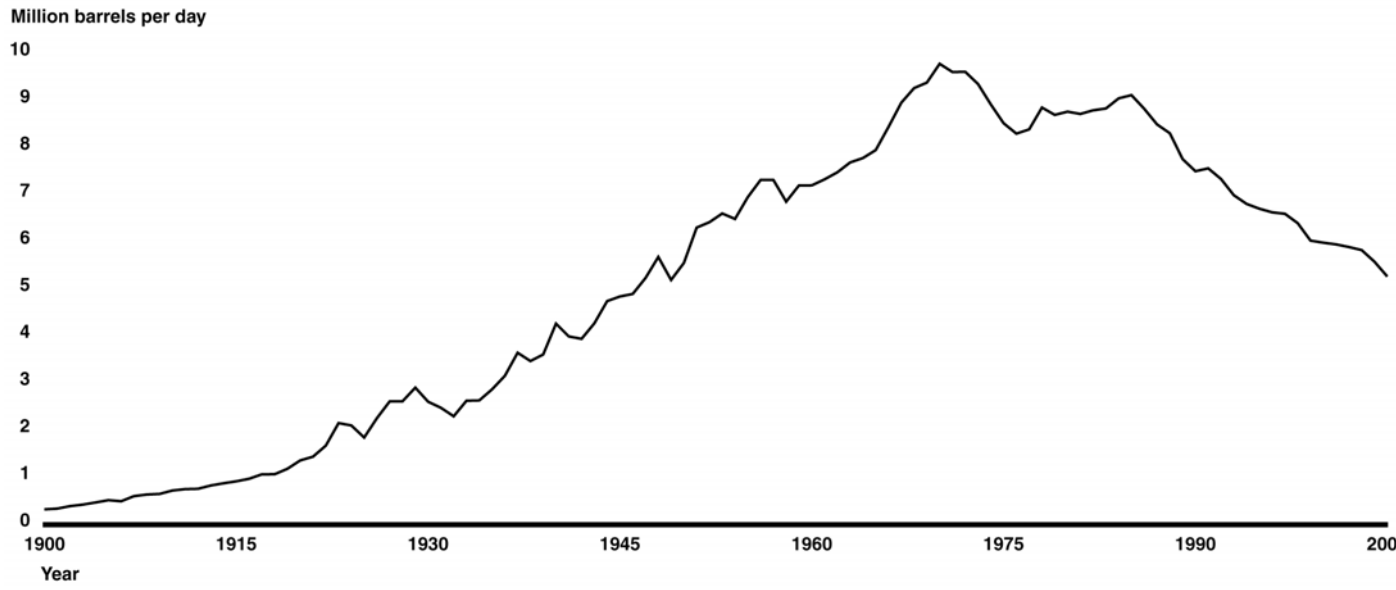
U.S. Oil Production, 1900 - 2005



Source: GAO analysis of Energy Information Administration data.

Now, I have been to the floor a number of times before, and I have shown other versions of this same phenomenon, and that is the reality that our country a number of years ago reached its maximum oil production, and it has been downhill since then. This was predicted in 1956 by a Shell Oil Company scientist to a group of oil engineers and executives in San Antonio, Texas, on the 8th day of March, just a little over 51 years ago.

In 1956, he predicted that the United States would reach its maximum oil production in 1970. Now, in 1956, we were perhaps the largest producer of oil in the world. We were a large exporter of oil, and oil was king.

The industrial revolution was in full swing, and Shell Oil company told M. King Hubbert that he should not give that speech because he would certainly embarrass himself and them because he was employed by them. He gave the speech anyhow. For 14 years, he was a pariah.

On schedule, as he predicted, in 1970, we reached our maximum oil production. He had indicated that at that point about half of all the oil that we would ever produce would have been produced, and the second half, which is reasonable, would be harder to get and, therefore, would be produced more slowly. It would be downhill after that.

Yes, you know, advertise a little bump on the downhill. That little bump is that huge supply of oil that we found in Prudhoe Bay, up in Alaska. M. King Hubbert's predictions were for the lower 48. He didn't include the Gulf of

Mexico. There is a little wiggle in the curve, hardly discernible by those discoveries in the Gulf of Mexico. But there was a little blip in the downhill slope, when we lowered the top of Hubbert's peak. So, right on schedule, we peaked in 1979. M. King Hubbert indicated, I think, it was in 1969, he predicted that the world would be peaking about now.

The question I always asked myself, if M. King Hubbert was right about the United States, and he gave us the basis of his analysis, which was very logical, if he was right about the United States, and since the United States is obviously a microcosm of the world, why shouldn't he be right about the world? If he was right about the world, shouldn't we have been doing something in anticipation of reaching a maximum oil production beyond which additional oil production would be impossible, prices would rise, oil, $65 a barrel today, and production would inexorably decline.

There is nothing that we have done in the United States to stop that. We have drilled more oil wells in the United States than all the rest of the world. Still we have not stopped that downward slope, just that blip from Prudhoe Bay; and now we are down to a bit over half of the oil that we produced in 1970, in spite of a vastly improved technique for enhanced oil recovery, for discovery of oil, 3-D seismic computer modeling and so forth.

The next chart that they showed is an interesting contrast, and this is a chart from the International Energy Agency. In spite of the fact that they know that M. King Hubbert was right about the United States, that we did peak in 1970, and in spite of the fact that they know that he predicted that the world should be peaking about now, and there is every indication that he may have been right, they still are forecasting that the total production of oil, which is now they have it about 80, I think it's now about 85 million barrels a day, will do nothing but go up and up. They have this clear through 2030.

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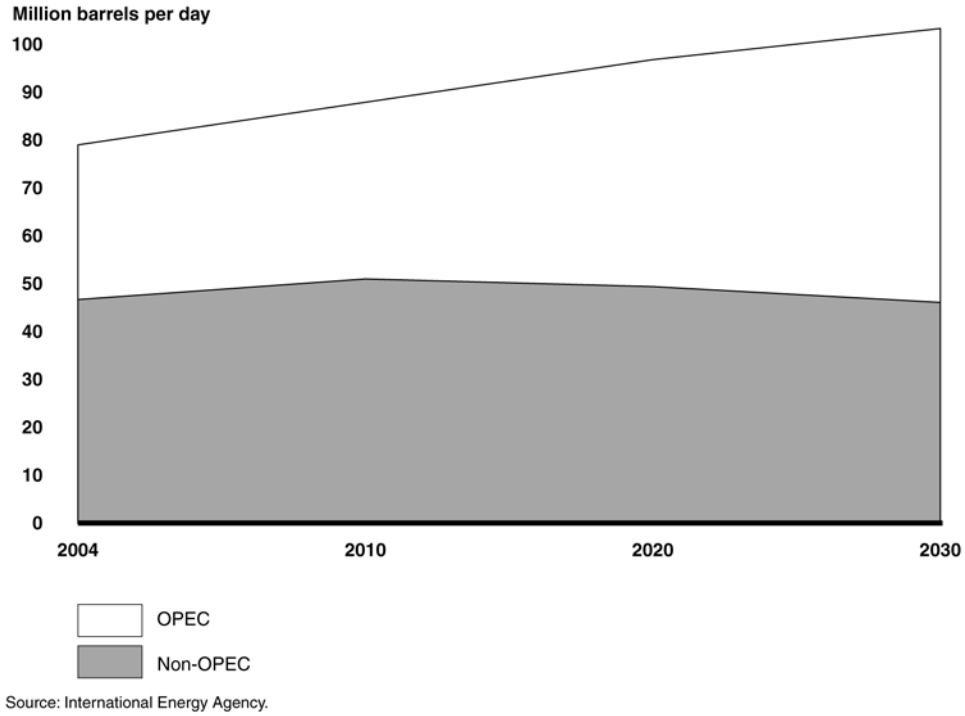
World Oil Production, by OPEC and Non-OPEC Countries, 2004 Projected to 2030



Source: International Energy Agency.

Now, they do show that the non-OPEC nations are peaking and will fall off. That is true. Most of them have peaked, and they are falling off. But they believe their oil production will simply go up and up.

The chances that that is true, by the way, Dr. Lahere, who has written a couple of books on this subject, says it is absolutely impossible, considering the vastly improved techniques we have for finding oil. They are predicting that we will have as much more oil as all of the reserves we now know to exist in this country, that we are going to find at least that much more oil.

The next chart is a compilation of a number of authorities and their predictions of when peaking will occur. Some of them have very, narrow projections. A number of people think that peaking has already occurred. Others have gross uncertainty in their predictions. It could be any time between now and the next century. But if you look at the preponderance of these, most of these authorities believe that peaking will occur or could occur before 2020.

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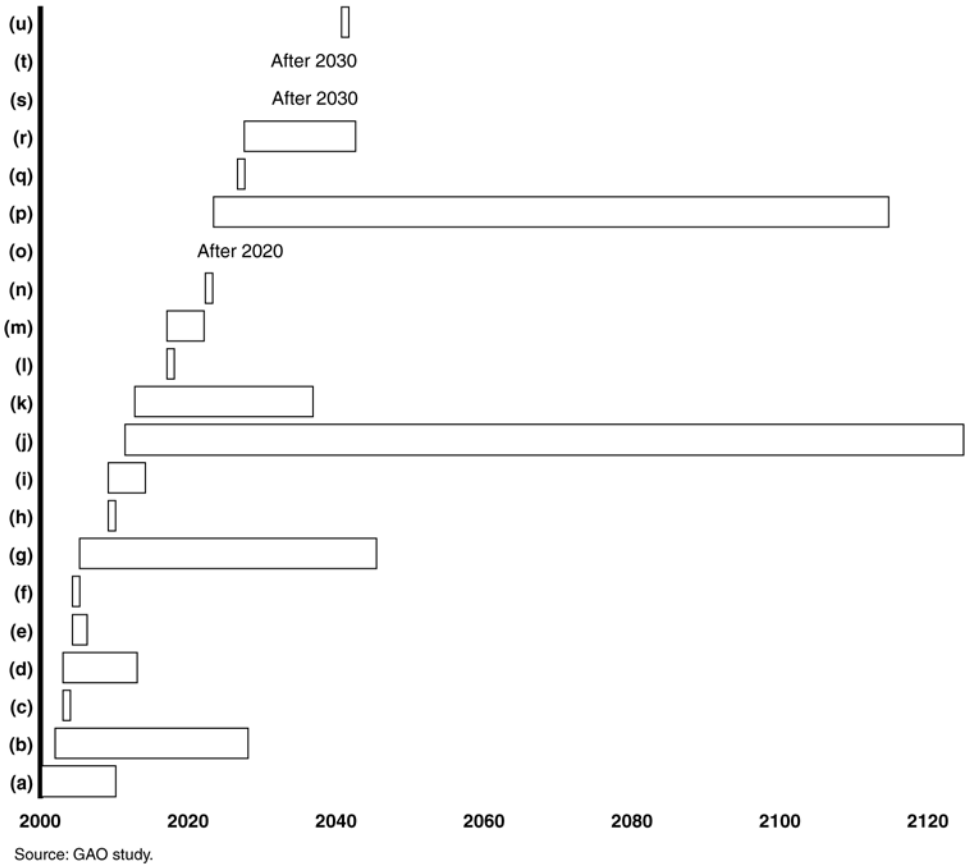
Key Estimates of the Timing of Peak Oil



Source: GAO study.

Now, of course, this kind of a consensus by the world's leaders is grossly inconsistent with the chart that we just saw where the International Energy Agency is projecting an ever upward and upward projection for the production of oil.

The next chart is an interesting one which they showed us, and this is worldwide proven oil reserves by political risk. This is a very good report, and they are a very credible organization, which is why I asked them to do this report a bit more than a year ago. I am pleased it is out now, because they do have a lot of credibility. When the GAO speaks, people tend to listen.

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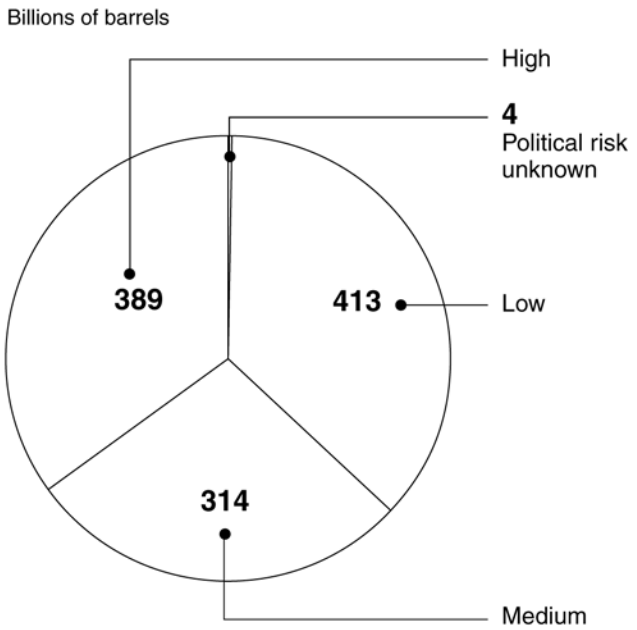
Worldwide Proven Oil Reserves, by Political Risk



Source: GAO analysis of *Oil and Gas Journal* and Global Insight data.

[Using a measure of political risk that assesses the likelihood that events such as civil wars, coups, and labor strikes will occur in a magnitude sufficient to reduce a country's gross domestic product (GDP) growth rate over the next 5 years, **we found that four countries—Iran, Iraq, Nigeria, and Venezuela—that possess proven oil reserves greater than 10 billion barrels (high reserves) also face high levels of political risk. These four countries contain almost one-third of worldwide oil reserves. Countries with medium or high levels of political risk contained 63 percent of proven worldwide oil reserves, on the basis of Oil and Gas Journal estimates of oil reserves**. (GAO-07-283 Page 21)]

They note that there are a lot of uncertainties about when the peak will occur, and probably the biggest uncertainties have less to do with how much oil is under the ground rather than risks above ground. One of these risks is a political risk. A lot of oil comes from places like Saudi Arabia and Venezuela and Iraq and Iran and Kuwait and so forth. So they list here the high political risk, the medium political risk, and the low political risk.

You see here that about two-thirds of all the oil in the world is in countries where, by their judgment and the judgment of experts which they quote, either high risk or medium

risk. Indeed, the night before last, when England and Iran were kind of yelling at each other over the sailors that Iran has taken, oil jumped up $4. Now, it quieted down by yesterday morning, so oil was only up a bit more than $1 yesterday. But this shows the volatility of the market relative to the political uncertainty in these areas.

The next chart is a really interesting chart, and it shows another risk, and that is investment risk. A venture capitalist is unwilling to invest in places where they may lose their capital or a country, for instance, which now will permit venture capital but tomorrow may decide they are going to nationalize all the oil fields. Then you have lost all of your investment. So they are listing this by high and medium and low.

[According to our analysis, 85 percent of the world's proven oil reserves are in countries with medium-to-high investment risk or where foreign investment is prohibited, on the basis of Oil and Gas Journal estimates of oil reserves. (GAO-07-283 Page 24)]

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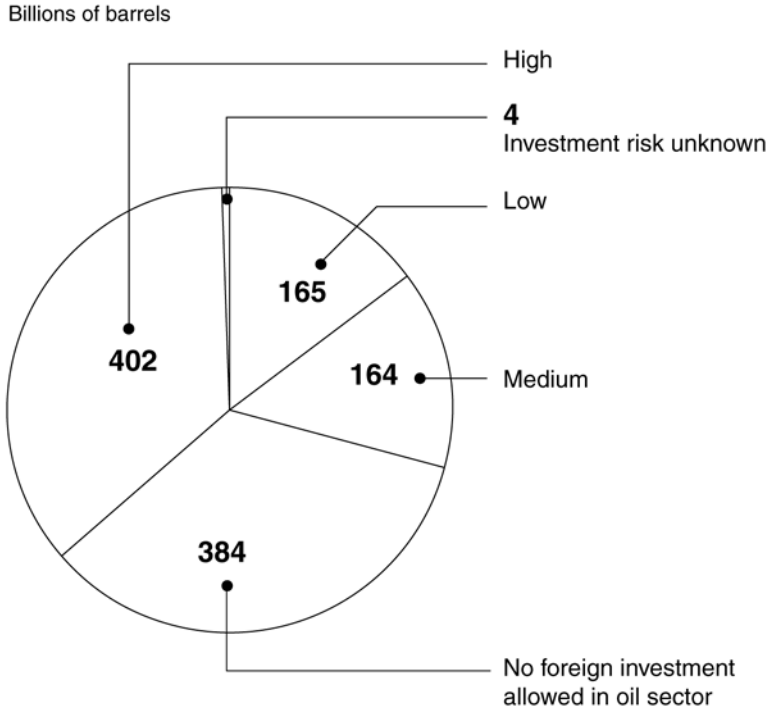
Worldwide Proven Oil Reserves, by Investment Risk



Source: GAO analysis of *Oil and Gas Journal* and Global Insight data.

By the way, for about a third of all the places that oil comes from, there is no foreign investment, also no foreign visibility. We just have to go by faith on how much oil is in their reserves, because they won't let our people in. You can't make any investments there.

[Time: 16:45]

But I think here about 85 percent of all the oil in the world represents, in their view, high and medium risk. So when you add the political risk and the investment risk, you have a lot of uncertainty as to how much oil we are going to produce in the future, and this is added to the uncertainty of how much is there and when we will, in fact, reach that maximum capacity for producing oil.

The next chart is an interesting one. And I should have brought another one that shows it in a very poignant way by showing what the world would look like if the nations' size was determined by how much oil they have. [The World According to Oil is on the www.Bartlett.house.gov/EnergyUpdate site]And of course we are dwarfed in that because Saudi Arabia has many, many times as much oil as we. We represent a fourth of the world's economy and we have two percent of the world's oil. We use a fourth of the world's oil and import almost two-thirds of what we use.

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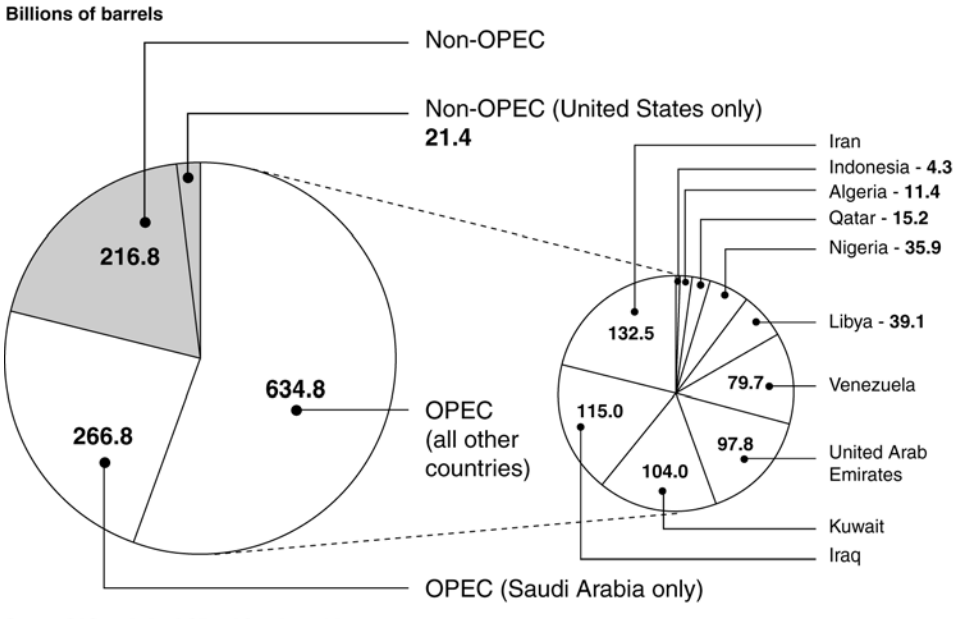
World Oil Reserves, OPEC and non-OPEC, 2006



Source: GAO analysis of *Oil and Gas Journal* data.

Here they have the oil in the non-OPEC nations and the oil in Saudi Arabia. Look how big Saudi Arabia is. And then the rest of the OPEC nations, and then they have blown this up over here so you can see who else is involved in the OPEC nations. Notice that, what, over three-fourths of all of the oil is controlled by OPEC nations, and about a fourth of all of that oil comes from Saudi Arabia alone.

The next chart is a really interesting one and this shows, the two bars here, and one, these are the top 10 companies on the basis of oil production and reserve holdings. Now, these reserve holdings are sort of iffy, because for most of these countries there is little or no transparency, and they really won't let us look at their data. But we do know who is producing oil.

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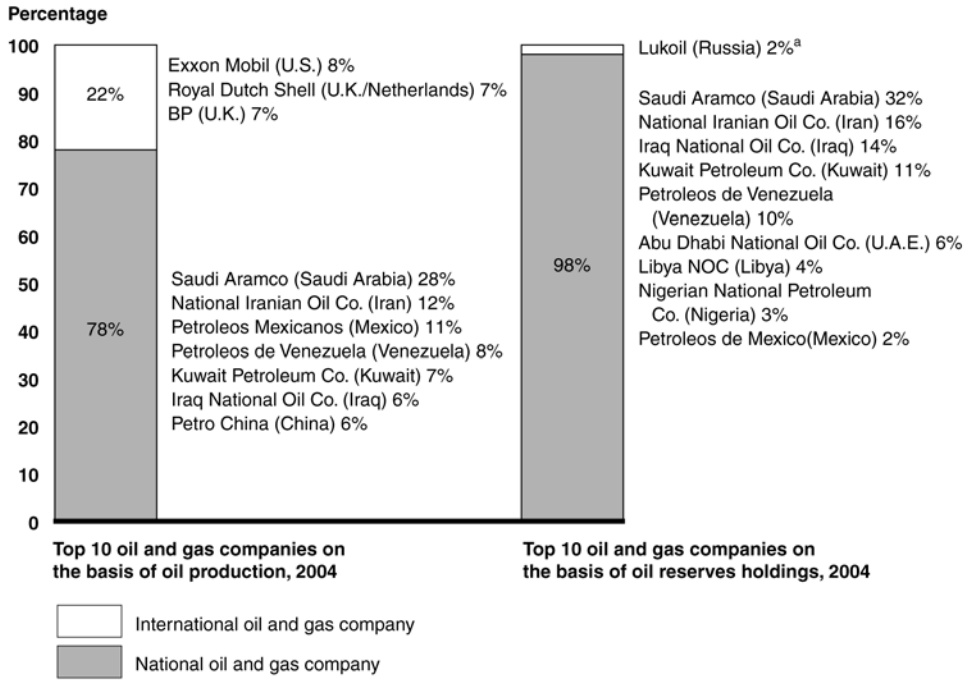
Top 10 Companies on the Basis of Oil Production and Reserves Holdings, 2004



Source: GAO analysis of data from *Petroleum Intelligence Weekly* (Dec. 12, 2005).

And here we see that big guys like ExxonMobil and Royal Dutch Shell and BP and so forth are producing 22 percent of the oil. And Saudi Arabia, a bunch of national companies are producing 78 percent of the oil.

But look at the next bar over there, and that shows you who owns the oil. Ninety-eight percent of all that oil is owned, our big guys here that are pumping it, they don't own any of it. They have leases. They don't own the oil. The oil is owned by mostly OPEC Middle East countries and there they have up top, and that ought to be shaded gray because

Lukoil, I don't know if Lukoil is private or whether it is national. It is a huge oil company in Russia.

Well, this points to the problems that we have, and these problems encouraged 30 of our prominent citizens, Boyden Gray and Jim Woolsey and McFarland and 27 others, a couple of years ago to write a letter to the President with these facts in mind saying, Mr. President, the fact that we have only 2 percent of the known reserves of oil and we use 25 percent of the world's oil, and import two-thirds of what we use, and as the President says, much of that from countries that don't even like us, read down that list, this represents a totally unacceptable national security risk. And, Mr. President, we really need to do something about that.

Well, the next chart is the one that I stopped with a couple of weeks ago when I was on the floor here, and I

want to spend the rest of the time that we have today in talking about this chart. And, indeed, we could spend a couple of weeks talking about the chart, because what this looks at is the potential alternatives to these fossil fuels.

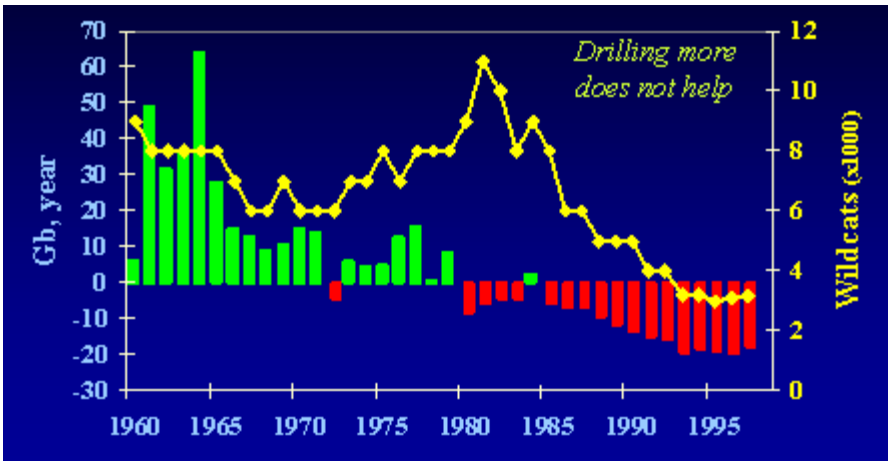
- Potential Alternative Solutions
  - Finite Resources:
    - Tar Sands
    - Oil Shale
    - Coal
    - Nuclear Fission
    - Nuclear Fusion
  - Renewable Resources:
    - Solar
    - Wind
    - Geothermal
    - Ocean Energy
    - Agricultural Resources:
      - Soy/Biodiesel
      - Ethanol
      - Methanol
      - Biomass
    - Waste to Energy
    - Hydrogen from Renewables

I would like to mention that there are several groups that have common cause in that area. Al Gore came to the Congress last week, I believe it was, and testified before obviously a packed committee room. He believes that we have global warming. Indeed, I think, a majority of our citizens and a majority of scientists now believe that we have global warming. You may or may not agree with whether our Earth is warming or not, but if you believe that we have a national security risk because we get too much of our oil from overseas, or if you believe that it simply may not be there because the world will peak out and there won't be enough oil because the demand keeps going up at about 2 percent, exponential growth, then you would want to do pretty much exactly the same things that those people who believed we have global warming want to do.

They want to get away from the fossil fuels because what we are doing in using these fossil fuels is releasing carbon dioxide that has been locked up by nature for a very long number of years. And we are now releasing that over a very short time period. We have about 5,000 years of recorded history in the world, and the age of oil, from pumping that first barrel of oil to pumping the last economically feasible barrel of oil, will probably be about 300 years. We are about 150 years into the age of oil, and in another 150 years we will probably have transitioned out of the age of oil and gas and coal. This is a relatively short time in the history of the world.

As I mentioned before, with the knowledge that M. King Hubbert was right about the United States, and we knew that of a certainty by 1980, because when we were already 10 years down the other side of Hubbert's peak. And the Reagan administration, my second most favorite President, decided that the thing to do, which by the way was totally the wrong thing to do, the thing to do was to encourage, to give our oil people a profit motive to go out and find oil. Now, you can't find oil that is not there. And you can't pump oil you haven't found.

But they were encouraged to drill, and drill they did. We now have 530,000 operating oil wells in our country. That is more oil wells than drilled in all of the rest of the world. They drilled and drilled. And if you have a pot that compares drilling with production, you will see that there was little or no increase in production as a result of this drilling, because this was 1980.



We are already 10 years down the other side of Hubbert's peak and you can't pump what is not there. And M. King Hubbert was right, and we couldn't reverse that by drilling more wells. So now we are faced or will be faced very shortly in the future with the reality that we can't pump more oil; that we will have reached peak oil. And as you saw, a majority of all the experts in the world believe that that is either present or imminent. So we began to look for alternatives for this.

Now, I know that for the last several years we have had some programs in Congress where we have been sponsoring green things like corn, ethanol and so forth; and this is supposed to free us from our large dependence on fossil fuels. There are some finite resources. These are fossil fuels, but they are not the oil that we ordinarily, or gas or coal we ordinarily exploit. And they are exploitable. And we will get some energy from them. How much is yet to be determined.

Let me mention some of those. There are the tar sands in Alberta, Canada. These are huge reserves. They represent as much potential oil as all the known reserves of oil in the world, perhaps more than that. So why should we worry since there is that much there? They are now aggressively exploiting those fields. They have a shovel that lifts 100 tons at a time. They dump it into a truck that hauls 400 tons, and they haul it to a big cooker where they cook it and this oil, which is too stiff to flow, now is heated up so it will flow and some short chain volatiles are added to it so it will continue to flow when it is cooled.

And they are now producing about a million barrels a day. Boy, a million barrels a day. I can hardly count to a million. That sounds like a lot. And it is a lot.

But it is just barely over 1 percent of the 84 or 85 million barrels a day that our world produces and our world consumes. And they are using enormous amounts of energy, from what we call stranded natural gas. Now, natural gas is stranded when it is in a place where there aren't very many people. And since natural gas is hard to transport, it is very cheap there and so we say it is stranded. So they have some cheap gas there and they are using this gas, and I am told, everything you are told is not true, but I am told that they may be using more energy from the natural gas than they are getting out of the oil.

But from a dollar and cents perspective, it makes good sense because it takes them somewhere between 18 and $25 a barrel to make the oil, and it is selling today I think for about $65 a barrel, so that is a pretty good markup.

But the profit ratio you really should be looking at is the energy profit ratio. How much energy do you get out per unit of energy that you put in. And they may be getting out less than they put in. They know that what they are doing now is not sustainable for two reasons. One is the natural gas there will not last forever. Indeed, talking about natural gas, we have peaked in natural gas in our country. That stunned us. It was a couple of years ago we reached our maximum production of natural gas. We thought that was way off in the future. We reached that a couple of years ago. They know the natural gas will run out so they are talking about building maybe a nuclear power plant there to get energy to cook this oil. But another problem looms.

This vein, if you can think of it as a vein, is now near the surface or on the surface and so they are in effect mining it with huge pits. And they have a huge lake they call a detailing lake. It is really pretty noxious stuff there. And environmentalists are very concerned about it. But, soon, this vein will duck under an overlay and economically, they won't be able to take off that overlay. So what they are going to have to did is develop it in situ [in place]. And they yet don't know, economically, whether that is doable or not. So although there are potentially enormous amounts of energy available there, how much can we really get out, net energy?

Now, we may be getting out less than nothing net energy. We may be putting in more energy from natural gas than we are getting out of the oil. But the natural gas is stranded. It is hard to ship and the oil is in high demand and so it makes dollar and cents sense to do this.

Then we have the oil shales and they are a little different. They are not just a very heavy oil. It is bound in a rock, and it can be released with heat and pressure. And these reserves, primarily in Colorado or Utah, are enormous, perhaps as large as the tar sands in Alberta, Canada. So why aren't we sanguine about our future since we have a lot of this in our country?

None of this has really been economically exploited so far. In the last few years, Shell has conducted an interesting experiment there. They have gone in and drilled a number of holes and frozen those so as to kind of make a frozen vessel because they don't want this oil they are producing to leak out to contaminate aquifers. And then they cook it for a year, drill some other holes in the middle and cook it for a year. And they have gotten meaningful amounts after some processing because it doesn't start out as an oil. They get some meaningful amounts of oil from it. But, you know, how much can we surge that? How much will it cost to build? What is really the energy profit ratio from that?

The news accounts of this have been much more optimistic than the Shell Oil scientist who gave a report in Denver, Colorado, a couple of years ago that I attended. And he said, I think, that it would be 2012 or 2013 before they even knew whether it would be

economically feasible to develop those oil shales the way they were developing them. Potentially, there is an enormous amount of energy there.

Let me note also that there is an incredible amount of energy in the tides. The moon lifts the whole ocean, what,

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2 or 3 feet. I carry two 5-gallon buckets of water, and they are heavy. This is a lot of energy. So why should we worry about the future? We have got all that energy from the tides. The reason to worry is that the energy is out there, but it is frightfully difficult to harness it. There is an old adage that says energy, to be useful, must be concentrated; and it is certainly not concentrated in the tides. And we have huge engineering problems in getting energy out of these oil shales. It may be there, but it is not something you would want to bet the ranch on.

The third one is coal. And there will be people who tell you don't worry about our future; we have 250 years of coal at current use rates. That is true. But be very careful when people say at current use rates because if we increase our use of coal only 2 percent, and I submit we will have to ramp up its use more than that as we run down the other side of Hubbert's peak and more and more energy is needed, but if we increase our use of coal only 2 percent, that 250 years shrinks to 85 years. You have to understand that at 2 percent increase, it doubles, that it is compounded, exponentially compounded, it doubles in 35 years. It is four times bigger in 70 years. It is eight times bigger in 105 years. This phenomenon, Albert Einstein said, was the most powerful force in the universe. He was asked, after the discovery of atomic energy, Dr. Einstein, what will be next? And he said, well, the most powerful force in the universe is the power of compound interest, and that is what we have here in this exponential compound growth.

[Time: 17:00]

But for most of our uses, we can't use coal. You can use electricity with it, but you can't run your car with it. So if we are now going to gasify or liquefy the coal, which, by the way, is very easy to do. Hitler ran his whole country on it, and South Africa did a lot of that, too. So we know how to do that, but it takes energy to do that. And if the energy to do that comes from coal, now you have reduced the supply of coal to about 50 years.

But we live in a world economy, and we share our oil with the world. It really doesn't matter today who owns the resource. He who has the dollars can buy it. It is bid up, which is why it is different prices different days, and he who has the dollars buys it.

So if we have to share our oil with the world, there is not much of a way to do that. Since if we keep all our coal, we won't be buying oil from someplace else, and they will therefore have the oil, and to a very large degree energy is fungible. So our 50-year supply of oil, if we share it with the world, shrinks to 12 1/2 years. Big deal. With only a

2 percent increase and the use of coal, if we convert it to a gas or a liquid and share it with the world, our 250 years shrinks to 12 1/2 years. There is a lot of energy there.

And, by the way, when you use coal, you have produced more greenhouse gasses than using either gas or oil. So those who are concerned about climate change will have some big concerns about using coal. If your only concerns are national security and peak oil, you have less concerns about using coal.

But, in any event, it is not our savior. You can't sleep well tonight because we have 250 years of coal at the current use rate. Because with an increased demand of only 2 percent, converting it to a gas or a liquid and sharing it with the world, that shrinks to 12 1/2 years.

The next two subjects we are going to talk about briefly are sources of energy from nuclear. We get 8 percent of our total energy from nuclear. We get 20 percent of our electricity from nuclear. When you drive home tonight, note every fifth business and every fifth house would be dark if it weren't for nuclear energy.

I have some friends who were strong opponents of nuclear energy. They are very bright people. And now they are looking at a future where the trade-off may be between having more nuclear and shivering in the dark without enough energy for light and heat. And when they look at those two alternatives, they are taking a new look at nuclear.

There are problems with nuclear. There are three fundamentally different ways you can produce nuclear energy. One is from the light water reactor. That is the only energy source we use. It uses fission nuclear uranium, and there is a finite supply of fission nuclear uranium in the world. We need an honest broker to tell us how much is there at current use rates and how much will be there if we ramp up the use, and we will ramp up the use.

China is now aggressively designing new nuclear power plants. They are building a coal-fired power plant, two a week. They have got to. They have got 1.3 billion people who want to abandon their bicycle and buy a car, and they are faced with kind of a mass revolt if they don't permit their people to enjoy the benefits of an industrialized society like the rest of the world does.

By the way, China has a bit less coal than we. They are mining more of it, so their coal will end before ours. So they are building a lot of coal-fired power plants, but they are also, I understand, planning to build 50 nuclear power plants. We haven't built one in about 30 years in our country. There has never been an accident or a death. There are accidents in coal mines, a lot more in China than here. We do a pretty good job, but still we have accidents and people die. They die from black lung disease from breathing polluted air. They die at the railroad crossing being hit by the train. We never seem to have a concern about the people who die as a result of using coal.

No one has ever died, there has not been any serious accident with nuclear, and a large number of people are concerned about nuclear. And there are problems with the waste product of nuclear because the second choice is a breeder reactor. If, in fact, we run out of fission nuclear uranium, then we will have to go to a breeder reactor. Our only experience with that in this country is building nuclear weapons. We have no commercial breeder reactors. They do, as the name implies, produce fuel; and they produce more fuel than they use. So you are kind of home free, except you have a huge problem with moving this stuff around and enriching it, and it is weapons grade kinds of stuff, so there are a lot of concerns.

I just have a notion, Mr. Speaker, that anything that is so hot that I can't get close to it for a quarter of a million years ought to have enough energy left in it to do something useful in it, wouldn't you think? You see, we call this spent fuel, and we have taken out only a relatively few percent of the energy of this fuel.

I would like to challenge our engineering and scientific people, and we have the most creative and innovative society in the world, to figure out what we can do with this thing which is now a huge liability and we are fighting over where to put it. We have put billions of dollars into Yucca Mountain out in Nevada, and we may not put it there. It is now stored in the back 40 or underwater in our roughly 800 nuclear power plants in this country. So there are problems with nuclear.

But there are also problems with not having energy and not going to be able to make nitrogen fertilizer for corn and not having heat for your house, and we need to rethink those.

The type of nuclear that gets us home free is fusion. By the way, we do have a huge fusion reactor. It is called the sun. That is what it is doing up there, and we have lots of energy from the sun. I understand that more energy from the sun falls on the Earth on any one sunny day than we use in a whole year if we could only capture that.

By the way, we are using sun energy, of course. Almost every energy source we use comes from or came from the sun. It was the sun that caused the plants to grow from which coal was made. Boy, do I know that. As a little kid in Western Pennsylvania, we had a coal furnace and we bought coal, which went from dust to big blocks of coal, some so big I couldn't put them in the furnace. There was a sledgehammer there leaning against the wall, and I would break the lump of coal to put it in the furnace, and sometimes it would break open and there was a fern leaf. Boy, I remember the feelings that went through me, and they still kind of do, when I looked at that fern leaf. And I said to myself how long ago did that grow and fall into the bog and with time and pressure and Earth being washed over, it became coal.

Most people believe that all of the oil and gas that we have is the result of subtropical lakes from a very long time ago. We see it now in algae that grows and it falls to the bottom. It has

a cycle. It matures and falls to the bottom. Dirt washes in from the surrounding hills, more the next year. More dirt washes in. So most of our oil and gas is not in big lakes down there. It is trapped between grains of sand and rock and so forth. All of this, of course, is secondhand sun energy.

We get some direct sun energy. You can warm your house if your window faces south. It can produce electricity for you if you put solar panels on your roof. If you put a wind machine up, by the way, that is secondhand sun energy because the wind blows because of differential heating of the Earth.

It is no wonder, Mr. Speaker, when you look at what the sun does for us why many of our ancients worshipped the sun. As a matter of fact, the first Sunday after the first full moon after the vernal equinox was an ancient pagan holiday because a new spring had come. The day and night were of equal length. So the first Sunday after the first full moon, and I have no idea why after the first full moon, it was a celebration to the goddess of fertility. Let's have lots of animals and let our crops grow well, and they were appealing to the goddess of fertility to make that happen.

I wondered as a little kid what relationship chickens and eggs and bunnies had to the Resurrection, because we call it Easter; and I was a big boy before I learned that, of course, it didn't have any relationship. But as a little kid I lived on a farm, and I knew rabbits didn't lay eggs, but in my Easter basket were rabbits and eggs, and that confused me. And then I went to church and we talked about the Crucifixion. What in the heck do rabbits and eggs have to do with the Crucifixion? The answer, of course, is nothing.

But very early in Christianity we wanted to make it attractive to the pagans, so we attached pagan significance to Christian holidays, and these are symbols of fertility. I once had a few rabbits, and pretty soon I had a whole lot of rabbits. And we now have bantam chickens, and if you let them do what they would like to do, they steal a nest out and they hatch and you would have a lot of bantam chickens by fall. So these were examples of fertility, and that is why we had them there.

If you are counting on nuclear fusion to solve our problems, you are probably counting on the lottery to solve your personal economic problems. I would have plan B, and I support all the money, about $250 million a year, we spend in nuclear fusion. But, boy, I want to have a plan B. We are really home free if we have nuclear fusion, because it is producing the same kind of energy that is produced from the sun. We have essentially an infinite supply of the raw materials here to make it, and it is nonpolluting except for the heat that it produces. But that is my personal conviction. Others think that they are better; some think they are worse. I think the odds are about the same as the odds of your winning the lottery. So if you are comfortable with solving your personal financial problems winning the lottery, you are probably comfortable believing we are going to solve our energy problems with nuclear fusion.

Well, once we are through those and whatever we can get from nuclear for the long term and are willing to live with, then we come to the true renewables: solar and wind

and geothermal and ocean energy, agricultural resources. There are a whole host of those. Let's just look at those one by one.

The solar industry, that is, the solar panels, quite miraculously just a little bit of silicon there, and it is converting sun rays into electricity, and I have them and they produce electricity and charge some big batteries, and we get lights and run power tools and so forth from the energy stored in the battery. That industry in 2000 represented .07 percent of our total energy. That has really grown since 2000. Today, it still represents far less than 1 percent. It is growing 30 percent a year, more than 30 percent a year.

They had some recent problems with silicon, because they are competing with the semiconductor industry, and they are growing so rapidly, and there weren't enough silicon plants. The silicon people were very edgy because they built some plants in the 1970s when oil was way up and then it dropped down to $10 a barrel and nobody wanted solar panels anymore, and they got stuck with factories for which they had no market for their product, and so the investors were unwilling. I think they are kind of getting by that because most people think that oil is not going down to anything near $10 a barrel in the future.

Solar electricity today is produced at about 25, 26 cents a kilowatt hour. That is high. But the cost of electricity is going up. And, by the way, the more we learn about these solar panels, the more we make and the cost comes down. But, unfortunately, the price of lead is going up; and still the cheapest, most cost-efficient battery for storing energy is the lead acid battery. So as the cost of the solar panels comes down, the cost of batteries goes up. So if you want a self-sufficient system, the cost of that total system is not declining. If you simply want a grid tie, produce enough electricity, you can run your meter backwards.

We are trying to get legislation through to encourage our States, and I think that is all we ought to do, because I am an advocate of States' rights, to enact what is called net metering (H.R.729), that if you produce more electricity to use, they will buy it from you. This distributed production, by the way, is enormously important from a national security perspective.

Unlike electricity, if you put a gallon of oil in a pipe and it goes a thousand miles, you get a gallon of oil out. You put electricity in a wire and if you run it far enough, you don't get anything out the other end, what is called line losses. So having distributed production has a lot of advantages. Not everything is down when the power plant is down. And, furthermore, you have less line loss because you are producing it closer to where it is used. So we ought to be using that a whole lot more than we are.

There are thin films and there are still some technical problems in developing those economically, but these thin films, and some of the silicon things, too, can be put in things like the shingles on your roof. They look just like any other shingle, but they produce electricity. The siding on your house. Indeed, there is glass that you can get. It will look like the glass with a dark filter on it, but there is glass that you can put in your

windows that will let light in and produce electricity at the same time. So there are some exciting things that are being developed in this area.

I spent New Year's Eve in Shanghai, and we met in China and had lunch with the young man who about 5 years ago started what is now the second largest solar panel manufacturer in the world.

[Time: 17:15]

Suntech, I think he calls his industry, and they now have a subsidiary in this country.

By the way, the top five producers of solar cells are in China and Japan. Number one is Sharp, and that is Japan. We used to have Solarex out in my district, now BP Solar, used to be number two in the world. Now they are not even among the top ten in the world.

This is the most creative, innovative society in the world that invented the solar cell. I worked at Johns Hopkins Applied Physics Lab. We put the first solar powered satellite in space. The United States invented that. Like so much of the technology we invent, somebody else is benefiting from it.

I want the United States to be a leader in these areas. Indeed, I believe that we have such a creative, innovative society, that if we really challenge our people, we can become a world leader again; not just a world leader in how much oil we use, but a world leader in moving to these alternative ways of producing energy.

So I think there is a great future for solar, and I would like legislation out there that encourages people to put it on their roofs and encourages companies to build the plants. It is a national security issue.

Wind. Wind is now producing electricity in our country at about 2.5 cents per kilowatt hour. By the way, the leader in this in the world is little Denmark. Again, shame on us. The largest industrial country in the world, the leader technologically in the world, and Denmark is leading the world in building wind machines. They are really efficient.

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The little ones we used to produce, the blades turned very fast and they might kill birds and baths. Now they have huge blades. A single blade may be 60, 70 feet long. You may have seen them being moved down the highway. They move very slowly. It would have to be a really debilitated bat or bird that got caught by one of those.

Indeed, if you are really concerned about bats and birds, then don't have picture windows. I am sure, not so many for the bats, but the bird, you are are going to lose more birds on your picture window than you will ever lose from that wind machine that you put up to produce electricity.

We have wind farms out in the West. In the East here there are some Senators that are big proponents of wind, but not in my backyard. The NIMBY factor is very prominent. They would like that, but not in their view shed, thank you.

You know, pretty is as pretty does, and I think these wind machines are beautiful. Knowing what they do, I think they are very stylish just on their own. But knowing what they are doing they become even handsomer.

Geothermal. Now, this is true geothermal. If you go to Iceland, there is not a chimney in Iceland because all of their heating, all of their energy like that in Iceland comes from geothermal. They are close enough to the molten core of the Earth that they can get hot water. That is how they heat their houses and produce their energy there.

We call geothermal something which is a really good idea, but it is not geothermal. We call geothermal those heat pumps that we tie to ground or groundwater, rather than rather stupidly to the air.

If you think about your air conditioner in the summer, what you are trying to do is heat up the outside air. That may be 90 degrees. If you are trying to heat up groundwater in Maryland here, it is 56 degrees. That is really cool compared to 90 degrees, isn't it? And what you are trying to do in the wintertime is to cool the outside air with your heat pump.

It is a whole lot easier to cool 56 degree air. That looks really warm compared to 10 degree air. That 60 degree water is very warm compared to 10 degree air. So you get a lot more efficiency out of your heat pump. People will call that geothermal. That is okay. Please put it in quotes, because it is not true geothermal. True geothermal ties you to the Earth.

We are going to have to come back another day to talk about the rest of this, because I just wanted to skip down here to ethanol. Because there was this week, and we have only about 5 minutes remaining, there was this week in the Washington Post on Sunday {March 25, 2007] http://www.washingtonpost.com/wpdyn/content/article/2007/03/23/AR2007032301625.html], the Outlook Section, a really interesting article. ``Corn Can't Solve Our Problem,'' it says.

The first paragraph is really interesting. ``The world has gone full circle. A century ago our first transportation, biofuels, the hay and oats fed to our horses, were replaced by gasoline. Today, ethanol from corn and biodiesel from soybeans have begun edging out gasoline and diesel. Lost in the ethanol induced euphoria, however, is the fact that three of our most fundamental needs, food, energy and a livable and sustainable environment, are now in direct conflict.''

Interesting. I have here an article, and again we will come back again to talk about this, a really interesting talk given by Hyman Rickover 50 years ago the 14th of this May to a

group of physicians in St. Paul, Minnesota, and he talks about this. He cautioned that if we try to get energy from our agriculture, we are going to be in competition with food.

Let me read from the jump page here what they say about this. It is really interesting.

``But because of how corn ethanol currently is made, only about 20 percent of each gallon is new energy.'' Eighty percent of all the energy you get out of a gallon of ethanol simply comes from the fossil fuels that are kind of recycled. The natural gas which made the nitrogen fertilizer, almost half the energy producing corn comes from that. The oil that made the tractor and the tires and the diesel fuel that pulled it through the fields and the energy used to mine the phosphate and potash rock and so forth, only 20 percent of every gallon represents new energy.

So they say this: If every one of our 70 million acres on which corn was grown in 2006, if we use all of that corn to produce ethanol, we would displace only 12 percent of our gasoline. And if you discount that for the fossil fuel simply recycled by growing the corn and processing the corn to produce ethanol, you now get just 2.4 percent of our gasoline displaced by ethanol. If we use all of our corn to produce ethanol, they very wisely note that you could have reached that same objective by getting your car tuned up and putting air in your tires.

Now, we are making a lot of corn ethanol. But compared to the 21 million barrels of oil that we use a day, 70 percent of that in transportation, we have produced relatively negligible amounts of ethanol. But it was enough to drive the price of corn from $2.11 a bushel in September to $4.08 a bushel in November, and up from that. And the poor Mexicans now are hungry because their tortillas have doubled in price, and my dairy farmers are going bankrupt because the cost of the food they feed their cows is up.

Just a caution, that one needs to be realistic rather than euphorically optimistic about how much energy we are going to get out of these alternatives.

I would like to say in closing, Mr. Speaker, that I am exhilarated by this. There is no exhilaration like meeting and overcoming a big problem. And we have a huge challenge. I believe with proper leadership, we may not have much energy, we have even less real leadership in this area, with proper leadership, I think that Americans could be exhilarated by the challenge. I think we would again become a major exporter with all of the technologies for producing energy from these alternatives.

Mr. Speaker, this is not a bad news story. This is a really good news story. America can lead the way. They can again be a real leader in the world. And I can imagine Americans going to bed at night saying, today I used less energy than I did yesterday and I am just fine. Tomorrow I am going to do even better. I think there would be fewer people on alcohol and watching bad movies and so forth if they had some real direction.

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