PEAK OIL -- (House of Representatives - November 01, 2007)
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The SPEAKER pro tempore. Under the Speaker's announced policy of January 18, 2007, the gentleman from Maryland (Mr. *Bartlett*) is recognized for 60 minutes.

Mr. BARTLETT of Maryland. Mr. Speaker, today oil's about $93 a barrel. It was higher than that a couple of days ago. If you look at CNBC, they're still scrolling it in red which means it's kind of out of previous limits.

There are two bills before the Congress, and I want to mention those before we start. These would be pretty good bills if we were offering them 25 years ago, but this is not 25 years ago. And I would submit that these bills are woefully inadequate to address the challenges that we have today. Let me just mention briefly what's in these bills, and I will note and I hope you will agree after we've spent these few minutes together that these bills do little more than nibble at the margins of the problem.

Our children, our grandchildren looking back on today will wonder how could we ever have thought that these bills would address the enormous challenge that we face today in energy.

H.R. 3221, the House-approved omnibus energy bill, which they say promotes efficiency and renewable energy, it includes a controversial renewable portfolio standard and a net tax increase, but it excludes increases in CAFE standards, the standards that we set for how many miles per gallon you're going to get from your car or your pick-up truck, and it also excludes mandated volume increases in biofuels.

Now, the Senate bill does quite the opposite. It increases CAFE standards and a mandated volume increase in biofuels, but excludes a renewable portfolio standard and the tax provisions.

Now, President Bush wisely has indicated that he's going to veto either one of these bills, or a combination of these bills that might come out of conference.

I note these two bills before we begin our discussion because I hope you will agree with me when we have finished our discussion that they might have been pretty good bills to start down the road that we should have been traveling for 25 years, but they're woefully inadequate to meet the challenges of today's world.

Here we have a chart which I think kind of says it very well. Here is the fellow standing by the very shrunken gas pump here because our supplies are down. He has a huge SUV beside him. He asks, ``Just why is gas so expensive?'' Gas is expensive because the demand is exceeding the supply. As a matter of fact, the world production of oil has now held constant for about 30 months, but the world's demand for oil has been steadily going up. So if you look back over the last 30 months, the price of oil has been doing exactly what you would suspect the price of oil has been doing. It's been going up because the supply has been constant and the demand has been going up.

Mr. Speaker, it was absolutely inevitable that today or some day like today near this date in history that we would be here talking about $95 oil.

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If you listen to the experts out there, they are telling you that they expect, in the next few days, that it will go through $100 per barrel.

The next chart is one that kind of puts this in perspective. Let's just refer to the upper chart. The upper chart looks back through only about a little less than 400 years. But if we extended this on to the left here about another 7,000 years, we would have gone through all of the recorded history of man, and it would look just like it looks here. In this scale, the amount of energy that we were using in 1630 and 1650 is hardly wider than a line, so it's hard to distinguish the baseline here from the energy that we were producing.

Then the Industrial Revolution started, and it started with the steam engine and that sort of thing and wood, of course. That's the brown line there. Then you see that we found coal and, boy, we produced a lot more energy with coal, so the Industrial Revolution roared on. It was stuttering when we discovered oil. Boy, then did it take off. Just look at that curve and how sharp that curve is.

If we had another curve here on population increase in the world, it would mirror this, follow this pretty exactly. For thousands of years, through 8,000 years of recorded history up until fairly recent history, the population of the world was somewhere between half a billion and 1 billion people. Now that population has exploded until there are nearly 7 billion people in the world. By the way, nearly 2.5 billion of them are in India and China.

Notice one other thing about this curve. Look what happened back in the 1970s. The oil price spike hikes of the 1970s, where oil was less, even with inflation correction oil was less than it is today, it still resulted in a world-wide recession with sufficient demand destruction that the production of energy decreased for several years. Now we are back on a big upswing slope again.

The next chart has some data that was used by 30 of our prominent Americans, Boyden Gray and Woolsey and McFarland and 27 others, among them a number of Four-Star Admirals and Generals, retired, and they wrote a letter to the President, and this was several years ago. They said, now, Mr. President, the fact that we have only 2 percent of the known reserves of oil in the world and we consume 25 percent of the world's oil and import just about two-thirds of what we use is a totally unacceptable national security risk. We really have to do something about that.

Two other data points here which are of interest, one is that although we have only 2 percent of the world's oil reserves, we produce 8 percent of the world's oil. Now, you don't have to be very far along in arithmetic in grade school to understand that if that's what's happening that we are now exploiting our oil reserves four times faster than the rest of the world.

So if there comes a time when the well will run dry, you would expect that our wells would run dry before the average well in the rest of the world, because we are pumping our oil four times faster.

Note, also, this says 5 percent of the world's population, we are a bit less than that. We are one person out of 22 in the world, and we have a fourth of all the good things in the world. The subject for another discussion is why. What's so special about the United States that this one person out of 22 is so fortunate that we have a fourth of all the good things in the world?

The next chart is a really interesting one. This chart shows what the world will look like if the size of the country was relative to the amount of oil that it had. Now, the colors here indicate how much energy you are using and the size indicates how much energy you have.

What this shows is that the countries which have the least energy are using the most energy.

But notice that Saudi Arabia here totally dominates the world. About 22 percent, almost a fourth of all the known reserves of oil in the world are in Saudi Arabia. There is Iraq and little Kuwait. Saddam Hussein thought that looked like a corner province in Iraq, and, indeed, if you look in the map, it is tiny compared to Iraq, but it has just about as much oil as Iraq.

Iran, notice how big Iran is there.

Look over here at the United States. We are dwarfed. We have only 2 percent of the world's supply of oil. The people we get most of our oil from are Canada and Mexico. Gee, they aren't very big either. Look at Venezuela, Hugo Chavez, huge, would swallow up the United States several times with its oil reserves.

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Something I would really like you to note is the size of China and India. Between the two of them, they don't have as much oil as the United States, and they have about 2.5 billion people between the two of them.

Now, as a result of this disparity between how much oil they have and how big their population is, the next chart will show us what China has been led to do. This is a map of the world which shows where a number of people have staked their claim, that is, own oil reserves. Notice in how many parts of the world the symbol for China appears.

This chart is a little old, and at the time we started using this chart, China was dickering to buy Unocal, an oil company in our country. Well, a lot of people thought that was just awful. I didn't think the sky would fall if they did that, because the reality is in today's world it doesn't really matter who owns the oil. We own an absolute trifling amount of oil in the world.

The fellow who owns the oil and the fellow who comes with the dollars, and if, by the way, if the currency ever changes from dollars to Euros, that will be a tough day for our country, but the person who has the dollars gets the oil. So you might ask why is China buying up all this oil.

I asked the State Department that question, and they told me it's because they don't understand the economic realities. They don't really understand that it doesn't matter who owns the oil, that the person who has the dollars buys the oil. My response was, gee, it's a little hard for me to believe that a country of 1.3 billion people, which is growing for the last quarter, I saw data, 11.4 percent, we never grew at anything like that. Japan in its heyday didn't grow anything like that. A country growing 11.4 percent that doesn't understand economics is hard for me to believe.

You may note at the same time they are buying up this oil they are aggressively building a blue water navy. They don't have one. Blue water navy is one that goes out in the deepest waters. We are the only one in the world the Chinese are competing with.

Could it be that they envision a time when there won't be enough oil to go around, and since they own it, they are going to say to the rest of the world, gee, guys, I am sorry, there is not enough oil to go around, and we have 1.3 billion people and so we are going to use it. To make that stick, they are going to need a really big navy to protect their sea lanes. Only the future will tell.

I led a codel of nine people to China talking about energy. It was over last New Year's. I spent last New Year's Eve, as a matter of fact, in Shanghai. They began their discussion of energy there by talking about post oil. Wow. They get it, and I wonder why very few people in our country get it.

They have a five-point program. The first step in their program is the first step in any rational program to address the challenge we face, and that is conservation. The second and third points in their program was get as much of it as you can from your own country and diversify as much as you can.

The fourth one may surprise you, because they pled for protection of the environment. They are the biggest polluters in the world, and they know that. They are kind of pleading for help, because, gee, we have got 1.3 billion people, 900 million of those in rural areas that are clamoring for the benefits that accrued through industrialization. We have got to really do something about that, and help us to be more efficient.

But the fifth point in their five-point program was a really interesting one. They are pleading for international cooperation.

As they plead for international cooperation, which they hope they get, I doubt that they will, but they have a backup, they are going to buy the oil so that if we don't get international cooperation, at least they have a go-it-alone reasonable probability of doing well in the

future.

The next chart shows how we got here, and this tells you why I mentioned the 25 years. It's actually 27 years.

In 1956, a Shell Oil geologist by the name of M. King Hubbert, and if you haven't heard his name before, you will hear it, and I think that the speech he gave 50 years ago last year, I think it was the 8th day of March, to a group of oil executives and engineers and scientists and so forth in San Antonio, Texas. When the United States was king of oil, producing more oil, exporting more oil, I think, than any other country, M. King Hubbert told that group that in just 14 years, by 1970, we were going to reach our maximum oil production. No matter what we did after that time, it was going to go down.

Shell Oil Company asked him, please don't give that speech. You are going to make a fool of yourself and us. He became something of a pariah for a number of years and was relegated to the near-lunatic fringe.

But right on schedule, as this chart shows, in 1970 we peaked in oil production. He predicted that here in 1956, and in 1970 we peaked in oil production.

His prediction was only for the lower 48. We got a bunch of oil in Prudhoe Bay in Alaska and a lot of oil in the Gulf of Mexico, where, by the way, we have drilled more oil wells than in all of Saudi Arabia, four times as many as in all of Saudi Arabia.

It has been downhill ever since 1970 except for a little blip produced by the enormous amount of oil that we got from Prudhoe Bay. I have been there. I have seen that pipeline where it begins, a 4-foot pipeline.

For a number of years a fourth of our total domestic production went through that. Despite that enormous find, it's still down, down, down, and today we are producing half the oil that we produced in 1970.

Remember several years ago those fabled oil discoveries in the Gulf of Mexico which were supposed to secure our future? There it is. That's what it did. Pretty trivial, wasn't it.

The next chart shows an attempt of one of the major think tanks in our country on energy to debunk M. King Hubbert. This us the Cambridge Energy Research Associates, and they present this data, which they say proves that M. King Hubbert didn't know what he was talking about.

Now, if you were a person who dealt with numbers, a statistician, you might see some relevance in that argument. But for the average citizen, this is what you see in the chart.

The yellow symbols here are the predictions of M. King Hubbert. The green is the actual lower 48 production.

Now, he said that it would follow this curve, but it actually followed that curve. Cambridge Energy Research Associates said, gee, isn't that awful, he really missed it, didn't he. I think for the average person looking at that, I am a kind of a layman here in this area, but I am a scientist and I have had courses in statistics, that looks pretty darn close to me. I think he kind of got it, didn't he.

The actual total production, when you add the Gulf of Mexico and Alaska, these red symbols here, and if you add the next chart, if you only had one chart to talk about energy, this would be the one, because this tells you so much.

If ever a picture is worth 1,000 words, this one is. This shows the discoveries of oil. We were discovering lots of it very early, the 1940s, 1950s, huge, huge amounts in the 1960s and 1970s. At just the time when M. King Hubbert predicted we would reach our maximum oil production, 1970, here, we just previously had found enormous amounts of oil.

During those 14 years, 1956 here to 1970, we had found more oil than we ever found before and ever found after that. No wonder, gee, they thought this guy must be an idiot.

But right on schedule we peaked in 1970. By the way, just a little explanation of how he was able to do that. He had observed that each oil field followed a pretty constant kind of curve. The oil was easier and easier to pump until you pumped about half of the oil.

Then you reach the maximum production, it's reasonable. The last half would be harder to get, so it came out slower and slower. It kind of followed a bell curve. He rationalized if he knew how many oil fields there were and what was in there, he could have all the little bell curves, and you would get a big bell curve that would tell us when we were going to reach the peak. He said that was going to be 1970. Right on schedule it happened. He also said that we were going to reach peak oil, the maximum production of oil in the world about now.

[Time: 17:00]

Now, the question I've been asking for 30-some times I've been on the floor

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here talking about this, over the last couple of years is, if M. King Hubbert was right about the United States, why shouldn't he be right about the world? And why shouldn't we have been paying some attention to this?

I was interested in this subject probably 40 years ago. I knew that oil couldn't be forever. I mean, you know, the Earth isn't made out of oil; it's not going to last forever. At that time I had no idea how long it would be before we had to start being concerned about oil. Was it next year, 10 years, 100 years, 1,000 years? But I knew at some time we would need to be concerned about oil. Apparently, that time has come.

Well, the solid black line here indicates our consumption of oil. It also represents our production of oil, because there's no big stockpile of oil somewhere unused, so what we produce is what we use. So it's either the consumption curve or the production curve.

If we were to put a smooth curve over these discoveries, and there we have little bars for each year, it's obvious that what you've done is to add up all of the discoveries year by year. So the area under that curve, for the person who doesn't understand what integration is, the area under that curve represents the total amount of oil we've found; so much this year and this year and this year. And the area under the curve adds them all up.

Now, the area under this black curve here is going to indicate how much oil we use. Now, it's really obvious that you can't use oil that you haven't found. So the area under the consumption curve is going to have to be the same thing as the area under the discovery curve.

But look at what's been happening to discovery since, what, before 1970. It's been down, down, down, down, down, down. The lightly shaded part of this graph to the right is just a guess as to what's going to happen in the future, but an absolute certainty is that you're not going to pump oil that you haven't found.

Now, ever since the 1980s here, we have been pumping more oil than we've found, so this area here now has consumed reserves that we found in the past. So we have all this amount of reserves that we can use in the future. That represents the area under this curve.

They're predicting here that we will have ever less and less discovery. It won't be that nice smooth curve. It will be up and down. But on the average, that's what it should be because that's what it's been.

And by the way, for the past 20 years or so we have had incredibly improved techniques for finding oil. So for those of who tell you not to worry, it's out there, where? We've been scouring the world for the last 20 years with computer modeling and 3-D seismic, and our discovery has been down, down, down. And these people are wisely projecting that's probably what it's going to do for the future.

There's another chart here, and this is another chart from CERA, Cambridge Energy Research Associates. And they are predicting that we're going to find two and three times as much more oil as all the recoverable reserves that we now know are there. And even if that is true, it moves the peak out only a relatively few years. This is the curve, if we don't find any more than that previous chart showed.

Most of the experts in the world believe that the total amount of oil that we have pumped and will pump is somewhere in the category of 2 trillion barrels. We've pumped about a trillion, we have about another trillion to pump, more or less. So the peak, if that is so, is imminent, isn't it?

If we find 2.93 total, wow, that's another trillion barrels of oil. It pushes out only that far. And they say we're going to add some unconventional oil. That we will. And so they, and this was in an article that was debunking peak oil, and this was a major chart in that article and, by golly, it shows a peak. They say it will be an undulating plateau. I agree. I don't agree that it's going to be out there another 50 years, but I agree that it's going to be an undulating plateau.

The next chart is an interesting little exercise. And this is from EIA, our Energy Information Agency, which, by the way, does a really good job of tracking the use of energy. And it has done a pretty poor job of projecting how much energy we're going to find, because this was their projection. These are the discoveries of oil.

Remember that previous bar chart? These are the big spikes, the discoveries of oil. And they, really misinterpreting some data from USGS, predicted three different possible paths here. There was an F for frequency in the USGS data, and somehow that got translated to P for probability when it came to this chart. I have no idea how you'd do that, and I have had a course in statistics, so I understand a little about that.

But they said that the 50 percent probability was the mean and that that is the most probable thing that would happen. Therefore, the discoveries of oil were going to go up.

This is the 95 percent probability. If it's truly a probability, obviously, if you're 95 percent more certain than 50 percent, and this is the 5 percent; by the way, there should be another green line here and another blue line here because it's a little bit like the path of the hurricane. It's pretty tight today, but where it's going to be a week from now you're less certain, so it kind of fans out. So that's what these 50 percent and 5 percent represent.

But notice where the actual data points have been. The actual data point have, as one might suspect, followed the 95 percent probability because 95 percent probable is more probable than 50 percent probable.

The next chart is a chart from a report and I'm going to mention in just a moment four major studies that have been done, and I have a number of quotes from those. Because what I'm saying today is based on not just my perception of what's going on, but the reality as indicated in these four different studies.

This is EIA projections. And if we found as much more oil as all the known reserves of oil today, that is going from roughly the 2 trillion to 3 trillion barrels of oil. That will push the peak out only from here to 2016.

And this shows another interesting thing. If we get really good at enhanced oil recovery, and we drill a lot of wells and we suck it out faster, we might move the peak over to 2037. Then you fall off a cliff; because you can't pump what's not there.

Now, enhanced oil recovery will get a little more, but it may get it a lot faster. There will be some additional oil pumped from enhanced oil recovery, but it will not be a huge amount.

Now, I want to go through a number of quotes from five different sources actually. One of those is a very famous speech given by Hyman Rickover, the father of our nuclear submarine. He gave this speech 50 years ago, the 14th day of this May, in St. Paul, Minnesota, to a group of physicians. He was incredibly prophetic in that speech. There's a link on our Web site to that that you can simple do a Google search for Rickover and energy, and this speech will pop up. I will tell you, it is the most interesting speech that I have ever read. You'll be fascinated by it.

Just a quote from this speech: ``Whether this golden age,'' and boy is this a golden age, and he notes in this speech, by the way, that the amount of energy that we have available to us represents a huge amount of people working for us. The energy in a single barrel of oil represents the work of 12 people working all year.

When I first saw that, I said, it can't be. But then I thought of how far that gallon of gasoline or diesel, by the way, still cheaper than water in the grocery store, how far that takes my Prius, I drive a Prius, takes my Prius nearly 50 miles. How long would it take me to pull my Prius 5 miles? I could do it. If it was on the level, I might strain and do it very slowly. If it was uphill, I'd have to have you come along to do it. But how long would it take me to pull my Prius 50 miles? An incredible amount of energy. This is indeed a golden age, this age of oil.

He noted that every housewife 50 years ago had available to her the work equivalent of 34, I think he said, faithful household servants. I think it was 700 manpower efforts push your airplane through the sky, and 100,000 the train down the track and so forth.

``Whether this golden age will continue depends entirely upon our ability to keep energy supplies in balance with the needs of our growing population.

Possession of surplus energy is, of course, a requisite for any kind of civilization, for man possesses merely the energy of his own muscles. He must expend all his strength, mental and physical, to obtain the bare necessities of life. A reduction of per capita energy consumption has always in the past led to a decline in civilization and a reversion to a more primitive way of life.''

The next quote is another one from Hyman Rickover: ``High energy consumption has always been a requisite of political power. The tendency is for political power to be concentrated in an ever smaller number of countries. Ultimately, the nation which controls the largest energy resource will become dominant. That control today is represented by having the necessary dollars to purchase it. Tomorrow it may be indicated by who, in fact, owns the oil fields. If we give thought to the problem of energy resources, we act wisely and in time to conserve what we have and prepare well for necessary future changes. We will ensure this dominant position for our own country."

I would submit that we have done none of this. We have not acted wisely. We have not anticipated today. And it was absolutely inevitable that there would come a day when the supply of energy would be inadequate to meet the demands for energy, which is why it's roughly now 93, $95 a barrel.

There have been four studies paid for by our government. And much to my chagrin, they have pretty much ignored what all four of these studies have said. One of those was a study done for the Army by the Corps of Engineers.

Now, these were published just September of 2005, just a couple of years ago. There's another quote from him in just a minute. It's really interesting. Jean La Harerre made an assessment of the USGS report, that's the report we were looking at just previously that said we were going to find as much more oil as all the oil that we now knew existed which is recoverable in the world. And this was what Jean La Harrere, he's a French expert in this area, said: The USGS estimate implies a fivefold increase in discovery rate and reserve addition, for which no evidence is presented. Such an improvement in performance is, in fact, utterly implausible, given the great technological achievements of the industry over the past 20 years, I mentioned those, computer modeling and 3-D seismic, the worldwide search and the deliberate effort to find the largest remaining prospects.

The next chart is another quote from the Corps of Engineers: Oil is the most important form of energy in the world today.

By the way, all four of these reports said the same thing in slightly different words, that peaking of oil is either present or imminent. By peaking, we mean we've reached the maximum of production to produce it. Try as hard as we will, it will not increase after that, but just go down, down, down. It's being doing that in our country since 1970; that's in spite of the fact that we have drilled more oil wells in our country than all the rest of the world put together.

Putting a dozen straws in the soda will not result in more soda, will it? It's a limited amount. There is a limited amount.

Historically, no energy resource equals oil's intrinsic qualities of extractability, transportability, versatility, and cost. The qualities that enabled oil to take over from coal as the front line energy source for the industrialized world in the middle of the 20th century are as relevant today as they were then.

The next chart is from the first report that came out. This is the ``Hirsch Report'' that came out a few months earlier than the Corps of Engineers report. And they made some really startling statements there. World production to conventional oil will reach a maximum and decline thereafter. That maximum is called the peak. A number of competent forecasters project peaking within a decade.

[Time: 17:15]

I have a chart in a few moments which will show you those and when they predicted it.

``Prediction of the peaking is extremely difficult.'' It is indeed. And you will only know that it's peaked historically looking back to see that, in fact, it peaked. And the production of oil, as I mentioned, has been constant for the last 30 months. As a matter of fact, conventional oil production has fallen off, but the total production is constant because we've been producing some unconventional oil. Heavy sours, sour oil is oil that has a lot of sulfur in it and you need to get rid of that. And the Alberta, Canada tar sands that we will talk about in a few moments.

``Oil peaking presents a unique challenge,'' they say. ``The world has never faced a problem like this. There is no precedent in history to prepare us for what will happen. Without massive mitigation more than a decade before the fact, if oil has now peaked,'' which it looks like it has, they said, we should have started a decade ago, and if we didn't, there are going to be meaningful consequences is what they are saying.

The next chart is a really interesting statement by our Secretary of State, Condoleezza Rice: ``We do have to do something about the energy problem.'' Thank you. We should have been doing something about it for the last 27 years. I say 27 years because by 1980, we knew absolutely that M. King Hubbert was right that the United States had peaked in 1970. It takes about that long to be really certain that peaking has occurred, but I think we knew it, absolutely knew it.

``We do have to do something about the energy problem. I can tell you that nothing has really taken me aback more as Secretary of State than the way that the politics of energy is--I will use the word `warping'--diplomacy around the world. We have simply got to do something about the warping now of diplomatic effort by the all-out rush for energy supply.''

It was bad then. In April of last year, oil was nowhere near $95 a barrel then.

The next quote is another quote from the Hirsch Report. This is a big report done by SAIC, Science Applications International Corporation, a very prestigious international engineering scientific organization. They say that the economic, social, and political costs will be unprecedented. ``There is nothing in history to prepare us for the economic, social, and political cost of the peaking of oil.'' And that is not me saying that. This is a report from a major study done by a very reputable scientific engineering organization paid for by our government, by our Department of Energy. Have you heard the Department of Energy talking about this? You might ask them why not?

The next chart, this was 50 years ago: ``I suggest that this is a good time to think soberly about our responsibilities to our descendants, those who will ring out the fossil fuel age. We might give a break to these youngsters by cutting fuel and metal consumption so as to provide a safer margin for the necessary adjustments which eventually must be made in a world without fossil fuels.''

I think I noted earlier that when you talk to the Chinese about energy, they talk about post-oil. The age of oil is now about 150 years old. That's out of 8,000 years of recorded history. In another 150 years, we will be through the age of oil. There will, for all practical purposes, be no more gas, oil, or coal. What will our world look like? By the way, this is exhilarating for me. There is no exhilaration like the exhilaration of meeting and overcoming a big challenge, and this is a huge challenge. So this will be very invigorating.

The next chart is another one from the Corps of Engineers: ``In general, all nonrenewable resources follow a natural supply curve. Production increases rapidly, slows, reaches a peak, and then declines.'' They are just validating what M. King Hubbert said more than 50 years ago.

``The major question for petroleum is not whether production will peak but when.'' Of course it will peak. It is inevitable.

You know, our descendents will look back on us and ask themselves how could they have done that. What we really should have done when we found this incredible wealth under the ground was to stop to ask ourselves what can we do with this to provide the most good for the most people for the longest time. That obviously is not what we did, with no more responsibility than the kid who found the cookie jar or the hog who found the feed room

door open. We have just been pigging out. And, incredibly, with all the evidence that we are probably at or nearly at peak oil, we want to continue doing that.

They keep asking me will I vote to drill in ANWR. No, I will not. I have 10 kids, 16 grandkids, 2 great-grandkids. We, without my votes, are going to leave them the largest intergenerational debt transfer in the history of the world. Wouldn't it be nice if I left them a little energy?

By the way, I will vote to drill there when they convince me they are going to use all the energy they get from ANWR and offshore to invest in renewables, because we have a huge challenge in developing enough renewables.

The next chart, this is an interesting one. In September 2005, ``The current price of oil is in the $45 to $57 per barrel range and is expected to stay in that range for several years.'' It is now twice that, more than twice of $45. Now, this is a very thoughtful group of people that did this study, but they missed it, didn't they?

``The supply of oil is increasingly inadequate to meet the demand. Oil prices may go significantly higher.'' Indeed they have. ``And some have predicted prices ranging up to $180 a barrel in a few years. Who knows?'' We assume we will be at $100 a barrel. How long will it take to get to this $180 a barrel?

The next chart is an interesting chart. And what this shows is a number of authorities, and we can get you this list, all these A to U, nearly an alphabet of them, and when they have predicted peaking will occur. Now, some of them are really uncertain. It could be now or any time in the next hundred years. But most of them believe that it will occur very soon or there is a probability it will occur very soon. So there is wide, wide concurrence in the scientific world out there that the peaking of oil is either present or imminent. And these four major government studies, I don't have quotes here from a study done by the National Petroleum Council. They have reached essentially the same conclusions. And another one was done by the Government Accountability Office. And all four of these said essentially the same thing: Peaking is either present or imminent with potentially devastating consequences.

The next chart is just a little schematic that shows the peaking curve. By the way, you can obviously compress the abscissa and expand the ordinate and make that a very sharp curve, or you can spread it out, as we've done here, and make it a gradual curve. The significant thing is that yellow area there represents 35 years. You see, at only a 2 percent increase in use, it doubles in 35 years. It is four times bigger in 70 years. It is eight times bigger in 105 years, and it is 16 times bigger in 140 years. Well, no wonder a namesake of mine, and I wish I was his relative, who really is a bright guy, Albert Bartlett, says that the biggest failure of industrialized society is to understand the exponential

function. Albert Einstein in responding to what will we find after nuclear energy, he said that the most powerful force in the universe is the power of compound interest. And that's what we see.

The next chart, and this is a really interesting one, shows on the ordinate here how happy you are with your state in life, your sense of well-being. What it shows on the abscissa here is how much energy we use. Guess where we are. We use more energy than anybody else in the world, and we're pretty happy about things. But notice that, I think, 20-some countries who use less energy than we, some of them less than half as much, feel better about their quality of life than we feel about ours. I put this slide up here to show you that we can use a whole lot less energy and still live well, still be very satisfied with our life.

The next one, and we need to come and start one of these 60 minutes we have together and just focus on this chart, because this is the future and this is where we are going. We will, of necessity, ultimately transition from fossil fuels to renewables. When the fossil fuels are gone, and one day they will be, the only argument is not whether but when. And when they are gone, we will have transitioned either smoothly because we chose the route or a really bumpy ride because we didn't plan ahead.

There are some finite resources that we can use. The finite resources include the tar sands, and previously you heard some discussion of the tar sands. They are now producing a million barrels a day. That's a lot, isn't it? But the world consumes 84 million barrels a day. We consume 21 million barrels a day. So they are producing a little bit more than 1 percent of the oil that the world uses, and they know that what they are doing is not sustainable. They will run out of water. They will run out of energy because they are now using stranded natural gas. Stranded gas is gas that is somewhere where there aren't very many people, and since it is hard to ship, they say it's stranded, and it's cheaper. So they are using stranded natural gas there in this process. What they do is have a big shovel that lifts 100 tons at a time. They dump it in a truck that hauls 400 tons, and they haul it to a big cooker where they cook it so that it is really stiff. All the volatiles will come out of that because it's near the surface, and they cook that until the oil flows, and then they add some solvents to it so it will flow at normal temperatures. And if you think of the thing they are now mining as a vein, that vein shortly ducks under an overlay so that they are going to have to develop it in situ, and they have no idea how they are going to develop it in situ. So the Canadians will tell you that what they are doing is not sustainable. They might for a bit ramp up and produce a little more, but ultimately it is certainly not sustainable.

By the way, there is a huge, huge amount of potential energy in the tar sands. One and a half times as much energy there as all the known reserves of oil in the world. It is incredibly large. But let me note to you that there is an incredible amount of energy in the tides. So just because it is there doesn't mean it is in your gas tank, and just like the tides, which are very difficult to harness, this has proved difficult to harness.

What's even more difficult to harness are the oil shales. And we have more in our West, roughly 1 1/2 trillion barrels of oil. The world has only about 1 trillion recoverable barrels of oil in all the world. So we have one and a half times as much as all recoverable oil in the world. Then why not rest easy? Because it is enormously difficult to exploit. The Shell Oil Company was the last company that conducted a major experiment there, and they aren't certain that it is economically supportable to develop this. We put a lot of money in that in the 1970s after the Arab oil embargo, and we still are a little closer to exploitation of these shales than we were then.

Then there's coal. You've heard that we have 500 years of coal. That is just flat out not true. A more correct statement until we knew better was that we had 250 years of coal.

But that's at current use rates. The National Academy of Sciences has reevaluated the data. This is not me saying it. This is the National Academy of Sciences, the most prestigious scientific organization perhaps in the world. And they have said that they have not looked at this data since 1970. That's a long time ago. In relooking at the data, they say there is probably 100 years there. But let's look at what happens if there are 250 years there. At a 2 percent growth rate, remember we talked about the 35 years it doubles, at 70 it is four times, 16 times bigger in 140 years? That now shrinks to 85 years. And if you convert some of this, if you use some of the energy to convert it to a gas or a liquid, it now shrinks to 50 years. And it is inevitable that you will share it with the world. Let me explain. If we are using liquids produced from coal, we are not buying oil; so that means that oil is available to India and China, isn't it? Energy liquid fuels are fungible. So it is inevitable we will have to share it with the world because if we are not buying the oil, someone else will. That 50 years then shrinks to 12 1/2 years. And, by the way, if the real amount, as the National Academy says, is 100 years, then that shrinks to about 5 years. So we have 5 years of coal at 2 percent growth to be converted to a gas or a liquid and share it, as we must, with the world.

So for those who tell you rest easy, we have got this huge amount of coal, not to worry, 250 years, that's at current use rates, and they just do not understand what happens with exponential growth.

Now, back to the chart we were looking at.

[Time: 17:30]

This really should be a separate category because nuclear is, if it's the right kind of nuclear, totally sustainable.

There are three ways we can get nuclear energy. One is from the light water reactor. All of the electrical energy in the world, I think, is produced from light water reactors. France produces about 75 percent of their energy; we, 19 or 20 percent of our electricity.

But fissure uranium is limited in the world. There is not enough to meet all future demands. But then we can go to breeder reactors. The breeder reactors do as the name implies, they produce more fuel than they use. So that is kind of a forever thing. With that, you buy some huge problems in transporting and enrichment. And you are hauling around weapons grade material, and then you're having to store away the end product for maybe a quarter of a million years. So although we have the potential for a lot of energy from breeder reactors, that comes with some big problems that we need to address.

Then there is nuclear fusion. We have a great fusion reactor; it's called the sun. And it, by the way, is the source of almost all of our present energy and past energy. All of the fossil fuels are there because the sun was shining a long time ago to make the plants and microbes and so forth grow. Well, we put about $250 million a year into nuclear fusion. I suspect we are a little closer now than we were 15 years ago when I came to the

Congress. By the way, I happily vote for that $250 million because it's the only thing that gets us home free, if we can find fusion.

If you think you're going to solve your personal economic problems by winning the lottery, you're probably content that we're going to solve our energy problems by developing fusion. I think the odds are roughly the same. But because it is so incredibly important, because it gets us home free, I happily vote for the roughly $250 million we spend there.

Then the renewables, solar and wind. I want to spend some time talking about these.

I'm pretty sanguine about our future for electricity. We can produce a lot of electricity by nuclear; France produces about 75 percent of theirs. There are huge potentials from solar and wind. More solar energy falls on the Earth each day than we use all year long. It may be in less time than that that it falls on the Earth; it's an incredible amount of energy. The big problem, of course, is harnessing that energy. It is, by the way, the sun that makes the wind blow. The wind blows because there is differential heating, and so it makes the wind to blow. So all of this is kind of solar energy; wind, kind of secondhand solar energy.

The problem with solar and wind is the sun doesn't shine all the time, and the wind doesn't blow all the time. But we have a pretty constant demand for energy, so you've got to store it. And this is a huge challenge. And if you're talking about running your car on batteries, then you have to think, but, do we have the raw materials necessary for making enough batteries to run all the millions of cars in the world with batteries? I think we could produce enough electricity to do that. I'm not at all sure that there is enough raw materials out there to make the batteries necessary for these cars.

Then there is geothermal. I'm not talking about the heat pump that you tie to groundwater or ground temperature, which really, by the way, is what you ought to do. If you think about your heat pump, in the summer it's an air conditioner. It has to warm the outside air. It may be 100 outside, no matter. The heat pump has to increase the air, that temperature, in order to decrease the temperature in your house.

And in the winter time, what is it trying to do? When it's 10 degrees outside, the heat pump has to make it even colder outside so it can make you warmer inside. The 56 degrees, which is what it is here, looks awfully cool in the summer time, doesn't it? And awfully warm in the winter time. As a little boy, I was confused about how the spring house we had on our farm could be so warm in the winter time and so cool in the summer time. Of course when I went to school, I kind of figured that thing out.

Ocean energy. I mentioned an incredible amount of energy in the ocean, but harnessing that energy is a difficult thing. The waves and the tides represent, by the way, the tides are produced by the movement of the Moon, of course. That's an exception to energy produced in the past or now from the sun.

But the challenge there is that because this is so spread out, it's so difficult to harness. A good axiom is that energy, to be effective, must be concentrated. And, boy, is it concentrated in gas and oil and coal, just an incredible amount of energy there. Both the quantity and the quality of that energy is superior to anything that we can produce to take its place.

Now, agricultural resources, and this is an area, let me flip to the next chart. Let's look at corn.

Earlier this evening you heard quite a discussion of ethanol and its potential. And I don't want to quote **ROSCOE BARTLETT** here; I want to quote the National Academy of Sciences here. They did a study, and they concluded, and this was an article that appeared, I think, was it The Washington Post, and they said that if we took all of our corn for ethanol and discounted it for the fossil fuel input, which they said was 80 percent, by the way, some people think that we use more energy producing corn than we get out of the ethanol from corn; but even if it's 80 percent, and that's a realistic number, I think, if we used all of our corn for ethanol, no tortillas, no fattening of pigs and chickens from corn, used it all for ethanol, it would displace only 2.4 percent of our gasoline.

Now, if you just start with the corn and ignore the energy it took to produce the corn, then you get a whole different figure. So you need to be careful when people are talking to you about energy from ethanol. You know, the sun gratuitously produced that energy that put the oil in the ground; it doesn't gratuitously grow our corn.

We put huge amounts of fertilizer, this lower pie chart shows that nearly half the energy that goes into producing corn, and not one person in 50 outside of the farmer knows this, almost half the energy that goes into producing corn comes from the natural gas from which we make the nitrogen fertilizer. Nature does this, by the way. You may notice that your lawn is never as green watering it as it is after a thunderstorm; we used to call it ``poor man's fertilizer.'' The nitrogen in the air is converted by the lightning into a forum which is carried down into the ground. That's fertilizer by the rain.

This is their data. The National Academy of Science said if we use all of our corn for ethanol and discount it for fossil fuel, a little silly, something to burn the fossil fuels in another forum, which is corrosive, you can't put it in our pipes. You have to add it pretty much at the last minute because we don't have the infrastructure to move ethanol around. They wisely noted that if you tuned up your car and put air in the tires, you would save as much oil as using all of our corn to produce ethanol.

They then noted if we use all of our soybeans for diesel fuel, soy diesel, all of it, no soybeans exported to China, which was, a few years ago, our largest dollar export, by the way, because tofu, bean curd, as they call it, is the energy staple of the Orient, none of that, if we used all of our soybeans for soy diesel, it would displace 2.9 percent of our diesel.

Now, there are, I think, 70 million acres of corn, 60 million acres of soybeans planted on our best soil, pampered with fertilizers and pesticides and insecticides. And we would get, if we used it all for energy, 2.4 percent of gasoline and 2.9 percent of our diesel would be displaced.

Now, how much energy should we expect to get from weeds and switch grass and trees? I don't know. But I suspect that it's going to be difficult, sustainably, to get huge amounts of energy there because today's weeds and so forth are growing in large measure because last year's weeds died and are rotting and fertilizing them.

When you take the growth away from the rain forest, which looks like an incredibly wealthy environment in terms of nutrients, you leave laterite soils that will hardly grow anything because most all of the nutrients were in the plants that were growing.

The Department of Agriculture came to me and they were hyping cellulosic

ethanol. And I asked them, Are our topsoils increasing in quantity and quality? And the answer is no. Then I said, Pray tell, how are we going to get these enormous amounts of energy? Because topsoil is topsoil. Because of humus, humus is the material from plants that grew yesterday and are rotting today. It holds nutrients; it holds water. For every bushel of corn we grow in Iowa, three bushels of topsoil go down the Mississippi River. In spite of our best practices, it used to be many bushels, by the way. In spite of our best practices, three bushels still go down the river.

We will certainly get something. What if we got four times as much, which is unlikely, from our wasteland and woods and so forth, as we can get from all of our corn and all of our soybeans? That would be roughly 20 percent. Exploiting. Now, this would not be sustainable. You might, for a few years, mine the topsoil and take off this biomass, but by and by you will pay for that because you will no longer have the same quality or quantity of topsoil.

The next chart has a little pie chart on it, which is really interesting. We're a little bit like the couple whose grandparents have died and left them a big inheritance and they have now established a lifestyle where 85 percent of the money they spend comes from their grandparents' inheritance and only 15 percent from their paycheck. And, by golly, the grandparents' inheritance is going to run out before they retire. So obviously they've got to restructure their lives; they have to make more or spend less, or some combination of that. That's where we are as far as energy is concerned. Eighty-five percent of our energy comes from natural gas, petroleum and coal. A bit more than half of the remainder comes from nuclear power.

And here are the true renewables over here. This is an old chart, several years old.

I appreciate the opportunity to address the House. And we will return shortly to talk more about these very important subjects.

END.