PEAK OIL -- (House of Representatives - March 06, 2007)
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The SPEAKER pro tempore (Mr. Arcuri). 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, I believe this is the 24th time since the 14th day of last March that I have come to this floor to talk about a subject which is growing in importance. That subject is energy.

I had the privilege of leading a codel to China. We left just after Christmas and we spent New Year's in Shanghai. There were nine of us who went there, and the primary purpose of that congressional delegation was to talk to the Chinese primarily about energy.

I was both surprised, shocked, and really pleasantly surprised that they began their conversation about energy by talking about post oil. This just wasn't the energy people in China, it was high officials in other parts of the government. Everywhere we went and spoke with them, they talked about post-oil, a recognition that oil cannot be forever, and they talked about a five-point program.

The first point of this program was conservation, a recognition that the world has no surplus energy to invest in developing alternatives. If there was any surplus energy, we wouldn't be paying $60 a barrel for oil.

Conservation not only frees up oil, but it buys some time because if we in

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fact are producing oil at the rate at which it is consumed and we cannot easily increase that production, then we have not only run out of surplus energy, we have also run out of time. So an aggressive conservation program will buy some time and free up some energy that we can invest in alternatives.

So the first part of their five-point plan was conservation. The second and third points was diversify, get energy from as many other nonfossil fuel sources as you can, and get as much of it as you can from your own country. From a national security perspective, that makes good sense.

The fourth point in their five-point program, and again, it wasn't just the energy people in China talking about this, it was leaders in government in several other parts of the government, the fourth part of their five-point plan was be kind to the environment. You think, gee, that is strange they would say that since they are the world's biggest polluter. They are the world's biggest country. Their economy grew at 11.4 percent for the last quarter. And they know they are a big polluter. They are apologetic. They have 1.3 billion people, and they don't know how to

use energy wisely, and they are asking for cooperation so they might use their energy as efficiently as we use ours.

The fifth point was that we need international cooperation because this planet is a little spaceship, not all that big. It once seemed absolutely enormous when we sailed the ocean in sailing ships, but now with airplanes it seems much smaller. We are here together, so we have a global responsibility.

I thought of this attitude on the part of the Chinese when I read an article that appeared in the New York Times on page 1 on March 5. It says, ``Oil innovations pump new life into old fields.''

Bakersfield, California. That is out in the desert. I used to teach medical school out there and drove through Bakersfield coming east. This states the Kern River oil field, discovered in 1899, revived when Chevron engineers here started injecting high-pressure steam to pump out more oil. The field, whose production had slumped to 10,000 barrels a day in the 1960s now has a daily output of 85,000 barrels. In Indonesia, Chevron has applied the same technology to the giant Duri oil field discovered in 1941, increasing production there to more than 200,000 barrels a day, up from 65,000 barrels a day in the mid-1980s. And in Texas, ExxonMobil, the world's largest oil company, expects to double the amount of oil it extracts in its Means field which dates back to the 1930s. Exxon, like Chevron, will use three-dimensional imaging of the underground field and the injection of gas, in this case carbon dioxide, to flush out the oil.

I might pause to interject here that this is a very appropriate use of carbon dioxide. It is a greenhouse gas. Its concentration in the atmosphere has about doubled in the last couple hundred years, and most of the world's scientists who study weather believe that the Earth's temperature is increasing and that the greenhouse gases, chief among them carbon dioxide, are responsible. So sequestering the carbon dioxide and pumping it down into these wells to force the oil out is a doubly good thing. It keeps it from going into the atmosphere, and it gets some additional oil.

This article continues, within the last decade, technology advances have made it possible to unlock more oil from old fields, and at the same time higher oil prices have made it economical for companies to go after reserves that are harder to reach. With plenty of oil still left in familiar locations, forecasts that the world's reserves are drying out have given way to predictions that more oil will be found than ever before.

Well, I have a chart here which looks at the oil discoveries back through the last number of years, last 70 years, and we see here in the bar graph the discoveries of oil and we see there were some big discoveries in the 1940s and 1950s and 1970s and down in the 1980s. And ever since that time, it has been down, down, down. That is in spite of ever-better technology for discovering oil.

They mention the 3-D seismic computer modeling they are using. We now have a pretty good idea of the Earth's geology, and so we know where we might find gas and oil. Some very unique geological conditions are necessary in order to have gas and oil. We don't really know how the oil and gas got there, but there are some reasonable conjectures, and if you understand these conjectures and if they are correct, it gives you some clue as to how much more gas and oil we are likely to find.

The most popular theory goes that a long time ago when the Earth was more uniformly warm than today, there did not appear to be the torrid equator or the frigid poles, and because there were subtropical seas at the North Slope and in ANWR and in Prudhoe Bay, and those subtropical seas had a seasonal growth and then death of algae-like organisms and maybe some small, animal organisms with them like the algae that grows on your pond today. I don't know that they had winters, but they had seasonal growth, and each season it would mature and die and then sink to the bottom, and Earth runoff would mix in and overlay it, and then the next year another layer of the organic material was deposited. This continued until there was big buildup, a lot like at the bottom of a lake.

Then the theory says that the tectonic plates of the Earth moved and surface seas with all of the organic material mixed with the inorganic, rock and sand, were now submerged down under considerable pressure and near enough to the molten core of the Earth there was just the right combination of pressure and temperature. And with time, this organic material was converted into what we know as gas and oil.

Now the products were some very short-chain products such as gases, methane, the shortest of the chains; and then very long chain ones which end up as Vasoline or waxes or something like that. If there was not a rock dome over this, kind of an umbrella of rock, then the gases would have escaped through the years and what would be left was some tarry stuff that you couldn't pump because you would have to heat it up. That is known as heavy oil where it exists today. You have to heat it up or mix it with volatiles to get it moving.

This dome keeps the gas from escaping. This was the explanation why for many oil wells when you finally pump down into the oil, it is not a pocket of oil that you are sucking out like a soda through a straw. It is all mixed with sand and rock, fractured rock and so forth, but it will flow. For wells that were gushers, this gas pressure that accumulated under the rock dome was now pushing down on this oil, and it pushed it up the well pipe. So we had these gushers.

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Well, this may not have been the way that oil and gas was produced, but it certainly sounds logical because that is where we find it, where we have these rock domes and so forth. What that means is, of course, that with these current techniques that we have of mapping the world, we can find those areas which have rock domes, which were likely to and with the location relative to the edges of the tectonic place, we can now identify where it is probable that you might find gas and oil production. And with ever-increased capabilities, computer modeling and 3-D seismic, we have found less and less oil through the years.

Now, this chart has another curve on it, and that is the consumption curve. Interesting curve. You will notice for a long time we were finding enormously more oil than we were using, because we were using this much, but we had found that much. But from about 1980 on, increasingly we have found less and less oil and used more and more oil.

I would like you to note the interesting change in the curve here in the 1970s. There was a stunning statistic up until the seventies, the Carter years, with this rate of increase and use. Every decade the world was using as much oil as it had used in all of previous history. Now that is a stunning statistic. What that means is that when you have used half the world's oil, there would then be 10 years left at current use rates. Well, we had a big shock in the 1970s at the Arab oil embargo, and we learned how to be much more efficient. For, what, 10 years or so here, there was essentially no increase in oil, and now it is slowly going

up again as the world's economies grow. In China, bicycles are banned on some of their streets. I was late getting to one of the appointments there because of traffic jams in Beijing. I was, a couple of years ago, in Moscow, and traffic jams in Moscow. I was there in 1973, and the streets were essentially deserted. The only cars I saw there were a few government cars. So all over the world there is a surge in interest in automobiles, and they are now being bought by the Indians. And not very long, the Indian middle class will be as big as our whole population. Information technology, which they excel, is increasing this middle class.

Now, this chart looks at what the future may hold. This article that I just read, ``Oil Innovations Pump New Life Into Old Wells'' says that we are going to have more oil than we have ever found. Now, we are not really finding new oil, most of this is oil that is in some of these fields, and these bars will go up higher here because now, with enhanced recovery, we are able to get more oil out. And they are making the projection that we are going to find as much more oil as we have remaining. And one projection is, and I will come to that in a few moments, that we are going to find as much more oil as we have ever found.

The next chart shows an interesting picture. This is the same consumption curve that you saw there with the same perturbations between the seventies and the eighties as a result of the Arab oil embargo.

Now, this chart, which is from our Energy Information Agency, is assuming something that I think is not rational to assume, and that is that we are going to find as much more oil as all of the reserves which we now know to exist.

A couple of congresses ago, I chaired the Energy Subcommittee on Science, and one of the first things I wanted to do was to determine the dimensions of the problem, and so we had oil experts from all over the world come in. How much oil did we find? How much of what we found is still there? And there was surprising unanimity from just under 2,000 giga barrels to just over 2,000 giga barrels. That is their figure here of 2.248,000 billion barrels.

Now, we use giga barrels. They said billion barrels here, that is because it is for an American audience. But if you were in England, a billion is a million million, in this country it is a thousand million. So you may confuse the audience when you are talking about billions. If you use giga, apparently gigs is a billion the world around. But what I want to point out in this chart is that even if they are correct, that the main amount, expected amount of oil that we will find, is 3,000 giga barrels, that moves the peak out from the present to only 2016. So even if they are right, and I think the probability that they are right is small, and I will give you several evidences of that as we go along, but even if they are right, even if we find as much more oil as all the reserves that we now know to exist out there, that will move the peak out only from about now, when most of those who work in this area believe that peaking has occurred or will shortly occur. If we find there is much more as that which remains, and by the way, of this 2,248,000 giga barrels, we have used about half of that, and about half of it remains. Now, with this enhanced oil recovery that this article is talking about from the New York Times, we will get a bit more of that. How much more remains to be seen. But if we find this extra roughly thousand giga barrels, that will only move the peak out to 2016. Now, one of the authorities in this area believes that we will find another thousand giga barrels, and we will be up around 4,000 giga barrels total. If that is true, since this is an exponential curve, and this was only, what, 16 years? The next may be only 12 years. So that moves the peak out only to about 2028. And that assumes that we are going to find as much more oil as all the oil that has ever been found.

The next chart shows an interesting prediction, and the data that was collected following the prediction. This shows the discovery curves. What this does here is to kind of round out those big bars that you saw in the previous one. And here they have done a very interesting thing. They have taken the F-5, F-50 and F-95, which was fractional, and I don't have the chart to how they got there, but I can tell you how they got there. What they did is run a lot of simulations. And they had the number of simulations on the ordinate, and they had the amount of oil that the simulation indicated would be found on the abscissa. So, they put these numbers into their computer simulation, and they got numbers out, and they graft all those numbers. And then they found the mean of those numbers, and they found that 95 percent, which meant that 95 percent of the predictions indicate

you would find more oil than that and so forth. And so they assumed that the most likely thing would be the mean. Now, it was a mean of their projections. But somehow that F got translated when it went from USGS to the Energy Information Agency, it got translated to P, which is the probability. Now, if this is really probability, this is a bizarre use of statistics.

So they show here three probabilities. They show the P-95 probability, the P-50 probability and the P-5 probability. Now, if these really are probabilities, there should be another green line coming down this way; because if you are only 50 percent certain, obviously that is a pretty broad funnel you create out there. If you are only 5 percent certain, it is really broad. It is like the path of the hurricane. For the next 24 hours, they know pretty well where it will be, so that is pretty narrow. But as you go out in time, 2, 3 and 4 days, why it gets wider and wider because you are less and less certain of where it is going. So there should have been another green line down here and another blue line down here because you have a broad uncertainty if

you are only 5 percent certain.

But notice what the actual data points have been doing. They have been following, as you might suspect, the 95 percent probability, if in fact it is probability. Obviously 95 percent probable is a lot more probable than 50 percent probable.

In a wide-ranging study published in 2000, a U.S. Geological Survey estimated that ultimately recoverable sources of conventional oil total about 3.3 trillion barrels, that was this little mean number in the previous chart right here, of which a third has already been produced. What has been produced is a half of what we have discovered. They are predicting that we will discover for that mean, as they call it, as much more oil as all of the reserves that we now know to exist.

More recently, Cambridge Energy Research Associates, an energy consultant, estimates the total base of recoverable oil, and here they have 4.8 trillion. The little chart I showed you before had that at just under 4 trillion, you will remember. But notice from the peaking chart that even if that is true, that will push peaking out to only a bit before 2030. That is not all that far into the future.

Then they say there is a minority view held largely by a small band of retired petroleum geologists and some Members of Congress, that would be me, that oil production has peaked, but the theory they say has been fading. Well, they should have told that to T. Boone Pickens, because an Associated Press article, March 1 of this year, just a few days ago, this is from Doha, Qatar, he is over there talking about oil. And by the way, I didn't know until I read this article that he started his professional life as a petroleum geologist. We know him as a very wise investor on Wall Street. Legendary Texas oil man T. Boone Pickens sees

today's stubbornly high price as evidence that daily global production capacity is at or very near its peak.

If demand for crude rises beyond the current global output of roughly 85 million barrels a day, Pickens told the Associated Press, prices will rise to compensate, and alternative sources of energy will begin to replace petroleum. If I am right, T. Boone Pickens says, we are already at the peak. If that is true, the price will have to go up.

And then he makes this statement: ``I think there are less reserves around the world than are being reported.'' Well, the two sources I mention are reporting greatly increased reserves. T. Boone Pickens says that he believes that they are over-reporting, said the 78-year-old former--by the way, young people can be very bright, but wisdom comes with age, and so T. Boone Pickens has 78 years of wisdom--who now

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heads the Dallas-based Hedge Fund BP Capital. There are no audited reserves in the Mid East. It makes me suspicious, he says. We really don't know how much oil is in the Mideast because they do not open their books for us to see.

Forbes publisher, Steve Forbes, challenged Pickens' assumptions during an exchange during the conference saying political, not technological or geological, road blocks stood in the way of increasing the world's oil production. Now, I know Steve Forbes, and I admire him very much, but I think that he gives far too much credit to the marketplace. Many people believe that the market is both omniscient, that is, all knowledgeable, and omnipotent, all powerful.

If we had unlimited resources, the market might do what Steve Forbes has confidence that it will do. With the right incentives in places, such as Mexico, more oil could be brought to market and prices could drop, Forbes said. Pickens responded by saying that Mexico is a declining producer of oil, as are most other countries, indeed. Thirty-five out of the top 43 oil-producing countries in the world have already reached peak.

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Pickens responded by saying that Mexico is a declining producer of oil, as are most other countries, naming the United States, Norway, Britain and soon Russia. By the way, Russia did peak once already, and then they kind of fell apart with the dissolution of the Soviet Union. They are reaching a second peak, which I believe will be less than the first peak.

``The world has been looked at,'' Pickens told Forbes. ``There is still oil to be found, but not in the quantities we have seen in the past. The big fields have been found and the smaller fields, well, there is just not enough of them to replenish the base. Global consumers, led by the United States, have already pumped 1.1 trillion barrels of oil, roughly half of the 2.2 trillion barrels that have been discovered,'' or what Pickens describes as nearly half of the world's estimate. He thinks we will find a little more, 2.5 trillion barrels of oil. Other experts put reserves at 3 trillion, Energy Information Agency; or 4 trillion barrels of oil, Cambridge Energy Research Associates.

``From now on,'' Pickens said, ``rising demand will be met by higher prices, rather than ever larger crude oil production. Alternative energy sources will begin to take a share of the energy market until the world evolves from a hydrocarbon-based economy to something that is a mix of hydrocarbons and something else. Everything from nuclear, coal, wind, solar, hydrogen and biofuels stands a chance to assuage growing demand for energy.''

I would just like to make a comment about hydrogen. All the others are truly energy sources. Nuclear, coal, wind, solar, biofuels are energy sources. Hydrogen is not an energy source. So why do we list it there? You can't mine hydrogen; you can't pump hydrogen. The only way you can get hydrogen is to make it from something else. Unless you are going to violate the second law of thermodynamics, it will always take more energy to make hydrogen than you will get out of hydrogen.

It is made today largely from natural gas. It can also be made by electromagnetizing water, splitting water into hydrogen and oxygen. Well, if you will always use more energy to make the hydrogen than you get out of the hydrogen, why would we be interested in hydrogen?

Well, for two reasons. One is that when you finally burn it, you get water. Water is the oxide of hydrogen. When you burn hydrogen, you get hydrogen oxide. We commonly call it water. That is pretty nonpolluting.

The second reason we are interested is that it is a great candidate for fuel cells if we ever get economically supportable fuel cells. We have been working on them for a long time, experts tell us, maybe 20 years. We will have economically supportable fuel cells, but that's the reason we talk about hydrogen.

A lot of people believe hydrogen is an energy source. Hydrogen, think of it as a battery, is something that carries energy from one place to another place. You can't put the falling water in your car and run it, nor can you put the electricity, unless you have a lot of batteries in your car to run the car, but you can take the electricity you get from the hydroelectric plant, split water, compress the hydrogen, put the hydrogen in your car. So you are really running your car on the energy from the waterfall.

But secondhand you produce hydrogen with it, and if you have a fuel cell in your car, now you will not only be running your car, polluting, just with water, which is pretty nonpolluting, but you will also get at least twice the efficiency out of that as you get out of the reciprocating engine.

The next chart is a very interesting one that shows us the sources to which one might turn to get energy other than the energy we get from fossil fuels. This chart reminds me very much of a young couple whose grandmother has died and left them a big inheritance, and they now have established a pretty lavish lifestyle. Eighty-five percent of all the money they spent came from their grandmother's inheritance and only 15 percent of the money they spend comes from what they earn.

They look at their grandmother's inheritance and how old they are, and, gee, this money is not going to last until we retire, so obviously we have got to do something, and that something is going to be either make more money or spend less money. That is pretty much exactly where we are relative to energy.

Eighty-five percent, some people will tell you 86 percent, but 85 percent of all the energy that we are expending today comes from natural gas, from petroleum, and from coal; and that leaves only 15 percent of the gas to come from other sources, of energy to come from other sources.

A bit more than half of that 15 is nuclear energy. That is 20 percent of our electricity, and in France, by the way, about 80 or 85 percent of their electricity comes from nuclear; and in our country, about 20 percent, but it is 8 percent of our total energy.

So when you look at the true renewables, only 7 percent now, it is a little different that this today, because this is a 2000 chart, and we have been really ramping up with solar cells, for instance, producing solar electricity. That market has been growing at about 30 percent a year. That is incredible growth.

But this started out as 1 percent of 7 percent, that is .07 percent. Suppose it is four times bigger today, that is .28 percent, less than a third of a percent, big deal. We have got a long way to go.

Thirty-eight percent of this renewable energy comes from wood, but that is not the person heating their house with wood so much as it is the timber industry and the paper industry wisely using what would otherwise be a waste product to produce energy. Waste to energy, 8 percent of this 7 percent.

There is a really state-of-the-art plant up here in Dickerson. They will be happy to have you come visit. It is really a showcase, and they are burning waste to produce electricity.

Now, one word of caution about waste: that huge stream of waste represents a big investment of fossil fuels, and don't count on having that big stream of waste in an energy-deficient world. We will live comfortably, we can live comfortably, but we will be producing far less waste in the future because all of that waste represents the use of fossil fuels.

If T. Boone Pickens is correct, and, by the way, he is not the only one, there are a number of experts out there who believe that we have peaked or are about to peak, there will be less and less of this waste. But at least for a moment it is a great use of this waste material, much better, I think, than putting it in a landfill. Recycle what you can; what you can't recycle, why, burn it to produce energy.

Wind. That is growing; it is really efficient. Our big wind machines today are producing electricity at about 2.5 cents a kilowatt hour. By the way, none of those big ones are made in our country. I hope we can change that, but Norway makes them, for instance.

These are huge machines with blades that turn very slowly. You have to be a really sick bird or bat that flew into those. These aren't the little ones they had first where the blades twirled around quickly and did kill some birds and bats. You may have seen them. They are really quite large, and, I think, quite handsome.

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That could and should grow. It is really growing in California. It is a totally renewable resource. By the way, the wind is simply secondhand sun. The wind blows

because the sun heats the Earth unequally and so it is differential temperatures on the surface that cause the winds to blow.

Then the big chunk of these renewables are conventional hydroelectric. Now, in our country we have pretty much tapped out on the conventional hydroelectric. We probably dammed every river that should have been dammed and maybe a few that shouldn't have been dammed. They are now building fish ladders, and we are blowing up some of those dams because we think that the environmental pressures are greater than the relatively small amount of electricity we get from some of those.

That probably can't grow much in our country, conventional, but microhydro produces far less environmental impact and some believe might be as big as conventional hydro. This is a little dam and small amounts of electricity, maybe only watts, but 100 watts, 24/7, that will produce a fair amount of light for your reading, for instance.

At this 2000 chart, alcohol fuel represented 1 percent of 7 percent, that is .07 percent. Today it represents more than that. We have a number of ethanol plants; it is growing very rapidly. There is a very interesting speech given by Hyman Rickover to an audience of physicians. The 50th anniversary of that will be in just a few days, few weeks, the 14th day of May. In that article he noted, that speech, really, we used to have a transcript of it, he noted that one day there would be competition between energy and food for our biological crops.

I thought of that when I spent some time on a couple of occasions recently with our dairymen; and what has happened is that with the relatively small amount of ethanol we have made from corn, the supply demand has been so changed that in September of last year corn was $2.11 a bushel, and in December it was $4.08 a bushel, nearly double. The price of tortillas in Mexico has gone up, which is hurting poor people there, and our dairymen are going bankrupt because of the high cost of feed. Now, this is a boon to the corn producer, but it is anything but that to the animal feeder, because with the relatively small amount of ethanol that we have made, we have doubled the price of corn.

Well, this pretty much is where we are going to have to find alternative energy sources, and it is quite obvious, if you stop and think about it. You may want to put this off into the future, but at some point we will reach peak oil. I think we are there or nearly there for conventional oil.

Then at some point in the future, oil and gas will be so hard to find, and so expensive, that other sources of energy will be more attractive. We will look back in the future at the age of oil, and what an incredible age it was.

If you do a Google search for Hyman Rickover and energy, you will pull up the transcript of this fascinating talk that he gave almost 50 years ago. He, in that talk, goes through a very interesting history of the development of civilization and the role that energy played in the development of that civilization.

All one has to do is kind of reverse the tape, as you may see, when somebody jumps into a swimming pool, and you reverse the tape and they jump back out of the swimming pool. So we can see the contributions energy made to the development of civilization, and you reverse that tape, you can get some idea as to what would happen to our civilization if we are not able to derive energy from other sources equivalent to that, which we are getting from fossil fuels.

The next chart is a very interesting one from CERA, Cambridge Energy Research Associates, and this has several projections of peaking on it.

Now, the title of this article is ``Undulating Plateau Versus Peaking,'' and what they are contending in the article is that those who believe in peaking probably also believe in the tooth fairy, that they are about as probable. But in that article

they have this graph which shows a peak. I agree with them that it will not be a smooth plateau, that it will be undulating.

I disagree that it will be that far in the future and it will be that broad. But let's look at this chart. They agree that if we find no additional large quantities of oil, that's the roughly 2 trillion barrels that will have been found, that's the current discovered oil in the previous charts, the peaking will be occurring fairly soon.

If we find another, roughly another trillion barrels by enhanced recovery and going under 7,000 feet of water and 30,000 feet of rock, as that last oil find in the Gulf of Mexico was, that we can get that much more conventional oil. So peaking will be pushed out to about this point.

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And then they are looking at unconventional oil. And just a word about some of that unconventional oil. There are incredibly large potential reserves of unconventional oil. For instance, the tar sands of Alberta, Canada, contain more potential oil than all the oil that has been discovered so far. The same thing is true of our oil shales out in Utah and Colorado.

So why aren't we resting easy then that there is no problem for the immediate future because there is this incredible reserve of oil? Now, they believe that we are going to tap a pretty large amount of that.

In Alberta, Canada, they are exploiting this field. They have a shovel which lifts 100 tons at a time. It dumps into a truck which hauls 400 tons, and they carry this 400 tons to a cooker. They have what is called stranded natural gas in Alberta, a lot of gas and not many people. And since gas is hard to transport, it is not worth much because there is not many people there to use it, so we call it stranded. So its value is low. And from a dollar and cents perspective, they are making a lot of money in Alberta. It is costing between $18 and $25 a barrel; that is bringing $60 a barrel. That is a very handsome profit, so they are aggressively exploiting this field. They are using natural gas to cook the oil. The natural gas will not last forever. They know that, so now they are looking at the possibility of building a nuclear power plant there.

I have asked: How long do you have to operate a nuclear power plant before you get back to the fossil fuel energy it took to build the nuclear power plant? I get wildly divergent estimates of how long that is, which makes the point that we really need for this dialogue, which we really need to have, we really need an honest broker to help us agree on the facts, because it is very difficult to have an enlightened discussion when you can't agree on the facts. That honest broker might very well be the National Academy of Sciences. They are very

knowledgeable. They are highly respected, and I think that they would assume this responsibility and I hope that we can find the resources so that they can do that.

Now, the Canadians know that this is not sustainable. The gas will run out. And, in addition to that, this vein, if you think of it as a vein which has now pretty much surfaced, it will shortly duck under a heavy underlay so there will be a lot of material to remove above it, so much so that they could not economically continue to mine it and carry it to the cooker. So then they will have to develop it in situ, in place. They really don't know yet how they would do that.

Now, the real profit that you need to look at in any of these things is what is called energy-profit ratio, how much energy you put in and how much energy you get out. In the big oil fields, and we have no giant oil fields in our country. We have never had one. The Ghawar War Field, perhaps the grand daddy of all oil fields in Saudi Arabia, has been producing oil for a very long time, and for much of its life, it was producing $100 worth of oil for $1 worth of investment, energy-profit ratio of 100.

Our oil was never that good. It started out maybe 10 or 20, and now it is down to 1 or 2 energy-profit ratio, how much energy you have to put in compared to how much energy you get out. And so although there are very large potential reserves in these unconventional oil fields, the net that you get out will be very much less. Even if it is feasible to get it out, the net will be very much less than the amount of oil which is there.

Now, they are working very hard in Canada. It is a huge enterprise. They are producing about 1 million barrels a

day. That is a lot. But that is less than 5 percent of what we use in this country, and just a bit more than 1 percent of the 85 million barrels a day that the world uses. So even though this is a tremendous effort and a lot of oil produced, it still is making a fairly small contribution to the total amount of oil in the world.

Now, I would ask the listener, Mr. Speaker, to draw their own conclusions: How much additional oil do you think we will get from current fields with enhanced oil recovery? Even if we get as much more as all of the present projected reserves, that will only push the peak by their own chart, which we saw a bit ago, out to 2016. And if we find double the amount of oil that we have ever found, it pushes it out only to about 2027 or 2028. That is not the distant future.

The next chart is really an interesting one, and I think graphically this kind of presents the dilemma that the world is in, and this is what the geography of world would look like if the size of a country was relative to the amount of oil reserves that it has. It is a really interesting map; isn't it? Saudi Arabia dwarfs everything

else. And notice little Kuwait, a tiny corner of Iraq. You can see now why Saddam Hussein was interested in Kuwait, a tiny province down there at the southeastern corner of Iraq, just a fraction of the geography of Iraq, but nearly as big as Iraq. It dwarfs the United States. Here we are; we would fit five times into Kuwait. They have five times the reserves that we have.

Notice the two largest countries in the world, China and India; 1,300,000,000 people in China; 1 billion in India and growing. They don't have the birth control, the population control they have in China, and it won't be very long until India's population is equal to that of China. I mentioned a bit ago that it won't be too long before the middle class in India is the size of our total population, 300 million people. They all want cars. They all want heated and air conditioned homes. All of this takes energy.

So the traditional roughly 2 percent increase per year in energy demand is going to pick up with the development of countries like China and like India. Russia, which is now a huge exporter of oil, notice, they are only four times the size of the United States, a fraction of the size of Saudi Arabia, probably a bit smaller than Kuwait.

Notice where most of the world's oil is. There is some in this hemisphere, in Venezuela, but the rest of it

is all northern Africa and the Middle East. Someone had noted that it is very strange that the world of Islam has most of the oil and the Christian world has most of the arable land. It seems to me there ought to be some opportunity for partnering. We can produce the food; they can produce the energy. But those kind of relationships in this confrontational world are hard to achieve.

The next chart is one that further develops this picture. And what this shows is the world, not as that would be proportioned by oil but as it is, and it shows what the symbols here, who is buying oil where. And these symbols for China, you notice one here, they almost bought Unocal in our country, and China is now buying up oil around the world very aggressively, not just buying oil, but in the process making friends. ``Would you like a hospital? How about a soccer field?'' And the Chinese are doing this all over the world. You can see their symbols where they are all over the world, and notice many of them in that oil rich crest of Africa and the Middle East.

Why are they doing this? The Chinese economy is growing at over 10 percent. The last quarter for which I saw data was 11.4 percent. They have to have observed that oil is fungible; that it really doesn't matter who owns the oil, which is why I didn't have any big problem with them buying Unocal. It doesn't really matter who owns the oil. The country, the company that gets the oil is the high bidder because oil moves in a global marketplace. Today, it was roughly $61 a

barrel. So it doesn't make one bit of difference who owns the oil. The person who has the money, who bids the highest, gets the oil.

So, if this is how oil moves on the world market, why would China be buying up all of this oil? We happen to have one of the largest reserves of coal. We have 250 years of coal at current use rates. But if you increase the use of coal only 2 percent; by the way, this exponential growth is poorly understood by most people. After the discovery of nuclear energy, Dr. Einstein was asked what the next great energy source in the world would be, and he kind of jokingly responded that there was nothing quite like the power of compound interest.

Let me tell you just a little story to help understand this. The story is told that chess was developed in an ancient small kingdom. And the king was very appreciative, and he told the inventor of chess that, ``You have made such a contribution to our culture that I will give you anything reasonable that you ask.''

And so the inventor said, ``Oh, king. I am a very simple man. I have simple needs. If you would just take my chess board with, what, 64 squares on it, and if you put a grain of wheat on the first square and two grains of wheat on the second square and four grains of wheat on the third square and eight on the fourth and so forth until you filled all of the squares of the chess board, that will be an adequate compensation.''

The king said to himself, ``Foolish fellow. I would have given him anything reasonable. All he is asked for is a little wheat on his chess board.''

The king of course could not do that, because the amount of wheat that would have been on that chess board I understand represents a decade of world harvest of wheat. That is what exponential increase does.

Well, the world has been increasing at about 2 percent a year. That rate of growth will increase. There is an easy formula that you can use. If you divide the percentage growth into 70, it will give you doubling time. So 2 percent growth doubles in 35 years; 10 percent growth doubles in 7 years. So you can now get doubling time if you divide the percent into 70.

This coal that would last us 250 years, if you have only 2 percent increase in growth, that exponential function decreases the duration of its use to just 85 years. And since coal will not be useful for many of the uses of energy that we have, we are going to have to convert it into a gas or a liquid. And the energy to do that if you take it from coal will now reduce the amount of time that that 250 years of coal will last to 50 years.

But since energy sources move on a world market, we might be expected to share that liquid from coal or gas from coal with the rest of the world. And since we use 1/4 of the world's energy, that 50 years divided by 4 comes down to 12

1/2 years. So this amazing 250 years of coal suddenly shrinks to just 12 1/2 years at only 2 percent growth if we are sharing it with the rest of the world.

Well, we may decide that, since the coal is ours, that we won't need to share it with the rest of the world if there is an acute energy shortage here.

[Time: 20:45]

That would be a logical decision that a country would make.

Now, if we, if there is a possibility we would not want to share our coal with the rest of the world, is there a possibility that China might not want to share their oil, which they have now bought in all of these countries around the world; that they would not want to share their oil with the rest of the world?

Mr. Speaker, with that thought in your mind, you might reflect on the fact that China today is aggressively building a blue water navy. Some I think 60 percent of their oil goes through the Straits of Moloch. We now could cut off that oil.

From a national security perspective, I can understand why they would have a meaningful interest in a blue water navy large enough to protect their supply lines for oil.

By the way, talking about choke points for oil, I think 40 percent of the world's oil moves through the Straits of Hormuz. And if that were mined, or if super tankers were sunk there to block that, 40 percent decrease in the amount of oil would bring all of the world's economies to their knees, essentially overnight. I hope that we are guarding well the Straits of Hormuz because that would, indeed, be the ultimate in asymmetric attack.

I have here a little article called, ``Corn Based Plastic Coming Soon.''

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Now, of course, we live in a plastic world. And all of these plastics are made from oil. If you will look at your car, if you look at your home, you look at your television set, you look at almost anything in your environment, and I suspect this rug was made out of oil. Our pesticides, our herbicides, our pharmaceuticals, our make up, this is all made out of oil or a great part of it is made out of oil. So there is an interest in getting the things we make out of oil, much of our clothing is made out of oil, interested in being able to get these fibers, this material from something else, and so this is an article, ``Corn Based Plastic Coming Soon.''

Every bushel of corn that we produce requires a lot of fossil fuel energy. And almost half that energy comes from natural gas, which currently is used to make

nitrogen fertilizer. Corn, as a plant, is a pig. It requires and uses incredible amounts of nutrients. And we have now engineered hybrid corn so that it can be planted close together. It grows rapidly. It uses the sunlight efficiently, and it uses enormous amounts of energy. And so, this corn based plastic that they are talking about, I don't know what the efficiency there is. But if it is no better than the efficiency of making ethanol, and ethanol, remember, every gallon of ethanol represents at least three-fourths of a gallon of fossil fuel to make it. Some, Dr. Pimenthal, for instance, believes that if you really cost-account all the energy that goes into producing corn, that you use more fossil fuel energy to produce the corn than you get out of the corn. I hope he is wrong. I believe he is wrong. Anyway, after you have produced the ethanol from the corn, you still have a pretty good feed left, and I don't think his calculation took that into effect.

So this corn based plastic really is, in large measure, just recycling fossil fuels. It may make you feel good to say that my shirt is made from corn. But when you recognize the incredible amounts of fossil fuel energy, if it is the same efficiency as using ethanol, at least three-fourths of the fiber of your shirt might just as well have been made from oil because that oil or some fossil fuel source was used in growing the corn from which the plastic was made.

Mr. Speaker, we will continue next week.

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