PEAK OIL -- (House of Representatives - May 02, 2006)
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The SPEAKER pro tempore (Ms. *Foxx*). Under the Speaker's announced policy of January 4, 2005, the gentleman from Maryland (Mr. *Bartlett*) is recognized for half of the time remaining before midnight.

Mr. BARTLETT of Maryland. Madam Speaker, I have here in my hands two pretty big reports that were paid for by our government and have for reasons that it is difficult for me to understand been pretty much ignored apparently by the organizations that paid for them.

The first of these is a big report paid for by the Department of Energy called The Peaking of World Oil Production: Impacts, Mitigation and Risk Management. This is generally known as the Hirsch Report, because the project leader was Dr. Robert Hirsch from SAIC, a very prestigious scientific and engineering organization. This report is dated February, 2005.

For reasons that we are trying to find, this was bottled up, apparently, inside the Department of Energy, because it didn't become publicly available until several months after that.

The second report I have here is the report by the U.S. Army Corps of Engineers. This obviously is paid for by the Army. It is dated September of 2005, and it was just about 2 months ago that it finally got out of the Pentagon into the public. This one is called Energy Trends and Their Implications For U.S. Army Installations. I would submit that wherever they mention ``Army,'' you could substitute ``the United States'' and it would be completely appropriate.

What I would like to do for the first few minutes is to look at some of the comments and recommendations in these two reports; and I would like to keep asking the question, why have these two government agencies which paid for these reports done essentially nothing to promulgate this information across the country? Rather, it would seem that there was an intent to keep this information from the public, because the Hirsch Report was bottled up inside the Department of Energy for several months, and the Army Corps of Engineers report is dated September of 2005, and it says on the cover here, ``Approved for public release. Distribution is unlimited.'' But there was essentially no distribution of that until just about 2 months ago.

As you will see, Madam Speaker, if the content of these two reports is correct, if their observations and recommendations are correct, you would have expected these two government agencies to be using every vehicle at their disposal to get this information out to the public.

Let's look first at a few quotes from the Hirsch Report. The first here says, ``The peaking of world oil production presents the United States and the world with an unprecedented risk management problem. As peaking is approached, liquid fuel prices and price volatility will increase dramatically," oil was almost $75 a barrel today, ``and without timely mitigation, the economic, social and political costs will be unprecedented.

``Viable mitigation options exist on both the supply and demand sides, but to have substantial impact they must be initiated more than a decade in advance of peaking."

A little later we will talk more about this. I am not sure that this is exactly the way that I would have articulated our challenge. We will talk about that a little later.

``Dealing with world oil production peaking will be extremely complex, involve literally trillions of dollars and require many years of intense effort."

Now another quote from this Hirsch Report. ``We cannot conceive of any affordable government-sponsored crash program to accelerate normal replacement schedules so as to incorporate higher energy efficiency technologies into the privately owned transportation sector. Significant improvements in energy efficiency will thus be inherently time-consuming, of the order of a decade or more."

If we are talking about transportation, Madam Speaker, that is indeed true. Because the average automobile and small truck is in the fleet about 17-18 years and the average 18-wheeler about 28 years. So any improvements that we ever make, we are making in energy efficiency in automobiles and trucks, is going to take quite some time to show any meaningful effect because of how long they are in the fleet.

Now a third quote from the Hirsch Report. Madam Speaker, I would like us to keep in our mind the question, if this is true and we have two reports, as you will see, that have reached essentially the same conclusion, we have no reason to believe there was any collusion between them. Indeed, their dates of publication are quite different, February to September. And if these observations and recommendations in these reports are in fact correct, then one might wonder why haven't these agencies been using every vehicle at their disposal to get this information out to the American public and to initiate programs to deal with these problems?

``World oil peaking is going to happen. World production of 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. Others contend it will occur later. Prediction of the peaking is extremely difficult because of geological complexities,

measurement problems, pricing variations, demand elasticity and political influences. Peaking will happen, but the timing is uncertain."

Then this, Madam Speaker, a very significant statement. ``Oil peaking presents a unique challenge,'' they say, and then this statement. ``The world has never faced a problem like this. Without massive mitigation more than a decade before the fact, the problem will be pervasive and will not be temporary. Previous energy transitions, wood to coal and coal to oil, were gradual and evolutionary. Oil peaking will be abrupt and revolutionary."

Now I would like to read a few of the quotes and recommendations from the Corps of Engineers study just out about 2 months ago, although the date was September of last year.

``Historically, no other energy source equals oil's intrinsic qualities of extractability, transportability, versatility and cost. The qualities that enabled oil to take over from coal as the frontline energy source for the industrialized world in the middle of the 20th century are as relevant today as they were then. Oil's many advantages provide 1- 1/3 to 2 1/2 times more economic value per million BTUs than coal. Currently, there is no viable substitute for petroleum."

Madam Speaker, that is a startling statement. If in fact the world is peaking in oil production and there is no viable substitute for petroleum, wouldn't you think that the agencies paying for these studies would have used every vehicle available to them to get this word out to the American public and to articulate a rational program for dealing with this emergency?

``Oil prices may go significantly higher,'' they say, ``and some have predicted prices ranging up to $180 a barrel in a few years." Just under $75 today, $180 a barrel in a few years.

``In general, all non-renewable resources follow a natural supply curve: Production increases rapidly, slows, reaches a peak and then declines at a rapid pace, similar to its initial increase. The major question for petroleum is not whether production will peak, but when. There are many estimates of recoverable petroleum reserves, giving rise to many estimates of when peak oil will occur and how high the peak will be. A careful review of all of the estimates leads to the conclusion that world oil production may peak within a few short years, after which it will decline." Campbell and Deffeyes, several references here.

Let me digress for just a moment. One of these, Dr. Deffeyes, predicted that the peak did occur a couple of months ago, and he says he is no longer a prognosticator, he is now a historian, because the peak, he believes, is behind us.

``Once peak oil occurs, then the historic patterns of world oil demand and price cycles will cease. Unfortunately, Saudi Arabia has not been able to increase supply above its monthly production peak of April 2003."

And I am reminded here of a recent book by Matt Simmons called Twilight in the Desert. He has done a very scholarly and exhaustive study of all of the open literature and believes that Saudi Arabia has peaked in oil production.

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Iraq may also have significant excess capacity if it can be brought into production. Under Saddam Hussein, we got about 2 1/2 million barrels a day from Iraq; now we are lucky to get 1 1/2 million barrels a day.

Meanwhile, domestic oil production in both the lower 48 States and Alaska continues to decline. Many non-OPEC oil producers have also passed or are currently reaching their peaks of production. Indeed, Madam Speaker, of the 48 largest oil-producing countries in the world, 33 have already peaked.

And now their recommendations. And excuse me for reading, but to paraphrase this would not have quite the impact of reading exactly their words. The coming years will see significant increases in energy costs across the spectrum. Not only are energy costs an issue, but also reliability, availability, and security.

It is time to think strategically about energy and how the Army, and please substitute here the United States, should respond to the global and national energy picture. A path of enlightened self-interest is encouraged. The 21st century is not the 20th century.

Issues will play out differently and geopolitics will impact the energy posture of the Nation. Technology will change more rapidly and flexibility will be a crucial part of installation operations. This must also extend to the energy infrastructure and its operational concepts.

And then this very interesting statement: the days of inexpensive, convenient, abundant energy sources are quickly drawing to a close. When I read that, Madam Speaker, I was reminded of the short paragraph that Matt Savinar uses in introducing his discussion of peak oil.

He says: ``Dear reader. Civilization as we know it is coming to an end soon." I hope that he is overly pessimistic. We will see. Domestic natural gas production peaked in 1973. Now, note this statistic, Madam Speaker: the proved domestic reserve lifetime for natural gas at current consumption rates is about 8.4 years.

What this says is, if we can get all of our gas from our resources, it would last 8.4 years. Of course, we cannot get it out that fast. So we are importing gas. But that is all we have remaining is 8.4 years. This is the Corps of Engineers.

The proved world reserve lifetime for natural gas is about 40 years, but will follow a traditional rise to a peak, then a rapid decline. Domestic oil production peaked in 1970 and continues to decline. This is a really startling statistic. Proved domestic reserve lifetime for oil is about 3.4 years.

That means if we could pump oil as fast as we are using it, our 2 percent of the world's reserve would last us, at the rate at which we are using oil, 3.4 years.

World oil production is at or near its peak; and current world demand exceeds the supply, which is why oil is about $75 a barrel. Saudi Arabia is considered to be the bellwether nation for oil production and has not increased production since April of 2003. After peak production, supply no longer meets demand; prices and competition increase.

World proved reserves lifetime for oil is about 41 years, most of this at a declining availability. Our current throwaway nuclear cycle uses up the world reserve of low-cost uranium in about 20 years. We will see significant depletion of Earth's finite fossil resources in this century. We must act now to develop the technology and infrastructure necessary to transition to other sources.

This is dated September of last year, Madam Speaker. Have you seen anybody in authority in our country telling the American people this? We must act now to develop the technology and infrastructure necessary to transition to other energy sources.

Policy changes leap ahead of technology breakthroughs, cultural changes and significant investment is requisite for this new energy future. Time is essential to enact these changes. The process should begin now.

Indeed, if they had written this 20 years ago, they would use exactly that same language. Because we really should have started some 20 years ago.

Madam Speaker, what is all of this about? What are they talking about? To understand that, we need to go back about six decades and to the life of a very, now very famous oil geologist, Dr. M. King Hubbert, who worked for the Shell Oil Company.

In 1956, as a result of his studies, he published a paper that the 50th-year anniversary of that was March 8, in which he predicted that the United States would peak in oil production about 1970.

Now this was revolutionary. Because at that time I believe we were the largest producer of oil in the world, and probably the largest exporter of oil in the world. Shell Oil Company pleaded with him not to publish a paper, that we would make him and them look really silly.

He published the paper anyhow. And 14 years later when right on target we peaked, he became kind of a celebrity. What we have here, Madam Speaker, is his predicted curve, the smooth green curve. And then the more ragged curve, green curve with the largest symbols represents the actual data points.

And you see that right on schedule in 1970, oil production peaked. Now, this is the lower 48. He did not know about Alaska at that time, and in just a moment we will look at another chart which includes Alaska.

The red there, by the way, is the Soviet Union. More oil than we, peaked just a bit after us. They kind of fell apart when the Soviet Union fell apart, and they are now having a second small peak. But after that it will be continually downhill.

The next chart shows where we have been getting our oil from. Not just in the lower 48. And that is this blue curve and the dark blue one under it, Texas and the rest of the United States. But then you see the natural gas liquids and the Alaska oil, and the Gulf of Mexico oil.

And you see that in 1970 we peaked, and just a little blip in the downhill side of what is called Hubbert's peak here. I remember particularly, Madam Speaker, the fabled Gulf of Mexico oil discoveries which were supposed to get us home free. That is the yellow on this chart. Notice the relatively trifling contribution that the Gulf of Mexico oil discoveries made, about 4,000 wells out there. We were reminded of that last fall with these hurricanes, when a number of them were damaged.

The next chart is from the Hirsch report, and that shows you what we do with this oil. It is really kind of interesting. The light blue here represents transportation. That is about 70 percent of all of the energy from the oil that we use is used in transportation. Then there is industrial and a little bit of electric power and a little bit commercially. But the major part of our oil is used in transportation.

That is a liquid fuel. And, you know, the challenge is to find something to replace that. The next chart is a really interesting one, and we could spend a long time on this chart, because it has so much information on it.

But I want to look at it just in gross form here. The bar graphs here represent the discovery of oil, and you see that way back in 1940 we were discovering some big fields of oil. And then a little later in the 1950s, the 1960s, the 1970s, we were discovering a lot of oil.

And our use of oil was very small then. The heavy black line here represents our use of oil, and notice that we were finding enormously more oil than we were using.

So there was every reason to believe that for the foreseeable future and beyond everything was going to be just fine, because we were finding enormous amounts of oil and we were not using very much oil. But then that all turned around about 1980.

Because at about that time, the discoveries of oil reached a maximum, and

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then they trailed off. And you can see it here on the downslope here. And in spite of improved techniques, in spite of intense drilling, year by year, we have found on the average less and less oil.

For those who are familiar with curves like this, it is quite obvious that the area under this curve, if we were to draw a smooth line through this discovery curve, the area under that curve represents the total volume of oil which has been discovered.

And the area under the consumption curve represents the total amount of oil that we have consumed. Now, it is very obvious that you cannot consume oil that you have not discovered, and so to find out how much consumption we can have in the future, all one needs to do is to look at the area under this discovery curve, and then to project where you think the consumption curve is going.

Now, this chart has peaking occurring, what, in 5 years or so, about 2010. There are a number of people who believe that peaking has occurred about now or will occur very shortly.

The lightly shaded part of this graph, of course, is to the future; and, Madam Speaker, you can make that future within limits look about any way you want to make it look. For instance, if we use enhanced oil recovery, and we drill a lot more wells, the United States has drilled 530,000 wells. I believe there are about 400 wells in Saudi Arabia and maybe 300 in Iraq, both of which have enormously more reserves than we have.

But if you vigorously go after this oil, you might get it sooner. But if you get it sooner, there will be less later, unless you are really good at enhanced oil recovery and you are able to get significantly more out of the ground. The next chart kind of puts this in long-range perspective, and this is a really interesting chart.

Looking at the top chart here, we are looking back about 400 years through history; and we see that the quadrillion Btus, it is so near the zero line here that you probably cannot see the difference. And then we began the Industrial Revolution in the late 1700s. And we began that with wood, of course. We denuded the hills of New England, the mountains of New England, carrying charcoal to England to make steel. We have a little furnace up here in Frederick County, and we denuded the hills of northern Frederick County to provide charcoal for that little furnace there.

The Industrial Revolution was stuttering with wood when we found coal and were able to utilize that. And then look what happened, Madam Speaker, when we discovered gas and oil. It just took off. This is an exponential curve at about a 2 percent growth rate.

In a moment we will show this same curve with different units on the ordinate abscissa, and it will appear to be a much less dramatic curve there because it really spread out the abscissa here.

But I would like to note that the world population has reasonably followed this energy cycle. So that we went from about one-half a billion to about 1 billion people here. Steady state for quite a long time until we now have between 6 and 7 billion people.

And that dramatic increase in the world's population was largely due to the incredible quantity and quality of energy from oil and natural gas. I would like to reflect for just a moment on the quality of this energy, the energy density of these fossil fuels.

One barrel of oil, and you will now pay a bit more than $100 for the refined product at the pump, 42 gallons, will buy you the work output of 12 people working all year for you.

If you worked really hard in your yard this weekend for a full day, I will get more work, more mechanical work out of an electric motor for less than 25 cents' worth of electricity. And that may be kind of humbling to recognize that we are worth less than 25 cents a day in terms of the energy available in these fossil fuels.

Madam Speaker, our children and certainly our grandchildren will look back at our generation and the generation of our parents, and I say that because my father lived almost half way through the age of oil, and they will wonder how we could have behaved the way we have behaved.

[Time: 22:30]

When we found this incredible resource, this wealth, we should have stopped and asked ourselves, what do we need to do so we can provide the most good for the most people for the longest time with this incredible wealth. It should have been obvious to everybody that this was not infinite. The earth is not made of oil. It is a finite resource.

We are now, as this chart shows in 5,000 years of recorded history, about 100, 150 years into the age of oil. In another 100, 150 years, we will be through the age of oil. What, then, when we have had to transition to the renewables?

Notice here, Madam Speaker, what happened in the 1970s. That was really quite dramatic. There was a worldwide recession, demand for oil fell, the price collapsed, and we reduced our energy consumption. It is now with China and India and the developing world demanding more and more oil increasing again at the same kind of a rate that it did up till 1970.

Madam Speaker, I would like to give one statistic that is just startling. Up until the Carter years, in every decade we used as much oil as had been used in all of previous history. What that means is, had we continued on that course, and fortunately we did not as this chart shows, but had we continued on that course when we had used up half of the world's supply of oil, only one decade of oil would have remained. In 5,000 years of

recorded history, the age of oil would be just a blip, about 300 years long is all, out of 5,000 years of recorded history.

The next chart shows the predictions of some of the experts about when peaking should occur, and this is from the Hirsch report, and this was about a year ago, and they could not have known that Dr. Deffeyes was going to conclude that the peaking has already occurred. He gave a specific date for that, and he rather humorously said he is no longer a prognosticator, he is a historian.

Well, all these people believe the peak is going to occur in the next 5 years; and then there are a few that believe it will occur about 5 years after that. Then there are Serum, Shell Oil Company, a few who believe it will be sometime in the future. Nobody, Madam Speaker, will contend that we will not have peaking. It is not if. It is when.

The next chart is a simple depiction. It shows the same curve, that really dramatic one you saw a couple of charts ago, when we had this dramatic increase in the production of energy, same curve. You can make it short and very high or spread out, depending upon the units you use in the ordinate and the abscissa.

This is a 2 percent exponential growth rate, and notice that starts out rather slow, but 2 percent, leave the interest in the bank, it grows and grows till it is now getting quite steep, even on this expanded abscissa scale.

As you saw from the previous chart, most of the experts believe that oil peaking is either now or very shortly in the future. If, as we have indicated here, we are at this point, then the peaking will indeed occur a couple of years or so hence.

But notice that the discrepancy between the oil we would like to use, the demand curve and the oil which is available to use, begins before the curve. It will not be as smooth as this. It will be ups and downs, and oil may again fall down to $50 a barrel. That will be nice. Do not count on it.

What we have produced here is what is called a gap. That is a difference between what is available to use and what we would like to use; and, as the next chart shows, the Hirsch Report focused on the problems of filling that gap. What they did is look at the consequences of filling the gap, dependent upon when you start to fill the gap, and if you wait until peaking has occurred, you see zero here, that is when it has occurred. Then there will be significant shortfall. You will be able to do some mitigation.

In a few minutes, we will talk more about that mitigation; and I wonder if, in fact, we should try to mitigate or whether we need to effect a steady state where we can live happily and productively at the current energy level and thus leave a little more for our kids and our grandkids and a little more for the next few years just ahead of us.

What it shows here is that if you are going to have no supply shortfall, that you need to begin the mitigation 20 years before peaking occurs. Now, from all of the experts' predictions that we saw, that is going to be manifestly impossible because almost nobody believes that peaking is two decades from now. So what one would conclude from this is that there are going to be consequences.

The next chart shows what we would be using to peak. We would be using enhanced oil recovery, coal liquids; and, by the way, South Africa and Hitler's Germany demonstrated you can indeed do that; heavy oil, that is the oil shales, tar sands and so forth, gas-to-liquids and then vehicle efficiency.

I mentioned previously how long these vehicles stay in the fleet. If you start here, there will be several years before you notice any effect, and then slowly over 50 years. That is a little less than the average lifetime of the average car and pickup in the fleet and about half the average lifetime of an 18-wheeler in the fleet.

Madam Speaker, I would like to wonder if, in fact, we ought to be trying to fill the peak, that is, to fill this gap till there is no shortfalls so that the world can continue to use all the oil that it would like to use. Notice that, except for vehicle efficiency, we are dealing here with finite resources. They are not forever, and the more we use now, the less we will have to use in the future.

Today, we are amassing the largest intergenerational debt transfer in the history of the world. I would like not to include with that an enormous energy deficit that we are going to pass on to our kids and our grandkids. We are already burdening them with an enormous responsibility to not only run their government on current revenue but to pay back all of the money that we borrowed from their generations to run our government today. In good conscience, Madam Speaker, can we also borrow from their generations the fossil fuel energies which will be essential for establishing any reasonable quality of life in their generations?

I would submit that the challenge should not be to fill the gap. The challenge should rather be to establish an infrastructure and economy, lifestyles that can be interesting and productive and sustaining while we make the inevitable transition to renewables. These are all finite. You cannot fill that gap forever with these. As a matter of fact, for some of them, you cannot fill it very long.

The next chart shows us something about the consequences of excessive consumption. This is a really interesting chart. I would like to start here with this little insert where I think we are, and this is from our Energy Information Agency, and they get the data from the USGS. We talked to the Energy Information Agency, and they just use the information from USGS, and I think this is a rather meaningful misrepresentation of what the world will look like.

Madam Speaker, for any statisticians out there, it will be quite obvious that the 50 percent probability is

not the mean. The most rightly thing to happen is the 95 percent probability. That is a high probability. It is the lesser, the lower amount of oil.

By the way, the 50 percent probability means that there could be a whole lot more oil. It also means there could be a whole lot less oil. You just do not know. What the Energy Information Agency does and the USGS is to assume that 50 percent probability is the mean. This is an unusual, and one might say bizarre, use of statistics, but using these statistics, you end up with almost twice the recoverable oil left in the world.

You see, they said that the ultimate recovery would be about 2 trillion barrels of oil with a 95 percent probability. We have already used about half of that, about 1 trillion barrels. So there is about 1 trillion left.

With the mean, which they say is expected, now that is not the expected value. The expected value is the 95 percent probability. That is the most probable. That is what it means. It is the most probable.

But with this assumption that that is the mean, which is a bizarre use of statistics, that pushes the peak out only from here at about 2000 to about 2016. So even if there is that much more oil there, and, by the way, only half of that yet to be pumped 2 trillion barrels have been found, you remember that earlier chart that showed the steep decline in discoveries, one must project something phenomenal in the future, that it will look just vastly different than the last few years. It would discover enormous basins of oil, and there is no expert out there that I know who believes that anything like that is going to happen. Notice that you push the peak out only about 10 years if you have that much more oil.

Now there is another interesting assumption that is made here, and that is if you can produce it with enhanced oil recovery and then you have a 10 percent decline, look what happens. You are really falling off a cliff.

The next chart kind of puts this in perspective; and it is these numbers, Madam Speaker, which prompted Boyden Gray and Frank Gafney and Jim Woolsey and 27 other prominent Americans, four-star admirals and generals, to write to the President some months ago, a number of months ago, saying, Madam Speaker, the fact that we have only 2 percent of the world oil reserves and we use 25 percent of the world's oil, importing almost two-thirds of what we use, is an unacceptable national security risk. Mr. President, we have got to do something about that.

Even if you think that the only problem with oil is a national security risk, we ought to be about freeing ourselves from the dependence on foreign oil. Even if there was no such thing as peaking, our behavior today needs to be vastly different than it is.

We are less than 5 percent of the world's population, about one person out of 22, and we use a fourth of the world's energy.

Madam Speaker, when we found all of that oil, and we more than others fit this characterization, rather than a responsible response to that discovery, which would ask the question how can we get the most good for the most people for the longest time, we acted like kids that found the cookie jar. We just pigged out, and here in the United States we are now using 25 percent of all the world's oil, and we represent a bit less than 5 percent of the world's population.

These top two numbers are significant. With only 2 percent of the oil reserves, we are pumping 8 percent of the world's oil. That means we are pumping our wells four times faster than the average in the world, which means that we are going to be increasingly dependent on foreign oil as we pump down our reserves.

The next chart kind of puts this in a global perspective. Because what this shows, and many people now recognize this, that for the last several years China has been scouring the world for oil. We have symbols here which show who has access to the major sources of oil in the world, and notice the symbol for China is all over this map. They have bought all of the increased capacity of the Canadian oil sands. They have major commitments from South American countries. They almost bought Unocal in our country. They have really major commitments from the Middle East.

Madam Speaker, not only this, but they recognize that we have the only blue water Navy, that is the Navy that sails the seven seas of the world and can control all of the access lanes. They see that we could, if we wish, cut off their source of oil.

[Time: 22:45]

So they are very aggressively building a blue water Navy.

Last year, we launched one submarine; they launched 14 submarines. Now theirs are not the quality of ours, certainly, but they are improving.

Well, what do we do? And the next chart kind of presents this challenge and this picture. Obviously, if what these two big reports say is true, that we are just about reached peaking, then we need to be about transitioning. In fact, we should have been about transitioning from fossil fuels to the renewables.

Madam Speaker, we knew of a certainty 26 years ago in 1980 we had already slid 10 years down the other side of Hubbard's Peak. Now, M.P. Hubbard was right about the United States. He predicted that the world would be peaking about now. Madam Speaker, he was right about the United States.

Would you not think that our leaders have wondered maybe, just maybe, he might be right about the world, and maybe we ought to be doing something about that? There has been a deafening silence on this subject for the last 26 years.

Any rational person, get a bright fifth grader and he will tell you what we need to be doing: We need to call upon all of our finite resources to help us through this transition period, and those finite resources are the tars and the oil shales and coal. And then there is nuclear as kind of a separate class, light water reactors, breeder reactors.

And note the quote from the Corps of Engineers study that the high-quality cheap, that is fissionable, uranium, will be exhausted in about 20 years, so we will need to move to breeder reactors which, as the name implies, makes more fuel than they use and so they are kind of self-sustaining. But, with that, you buy some problems of transportation and enriching and products that could be used by bad guys for making nuclear weapons.

I have a number of colleagues who have been stoutly opposed to nuclear, but when they are now rationally considering the alternative of shivering in the dark, nuclear is looking better and better.

Nuclear fusion, if we ever got there, Madam Speaker, we are home free. There is nothing else on this chart that gets us home free. Fusion does. I support happily the roughly $250 million a year that we put into this technology. But I think that counting on solving our energy future challenges with fusion is a bit like me or you, Madam Speaker, planning to solve our personal economic problems by winning the lottery, and I think the odds are probably somewhere near the same.

Once we have gone through these finite resources and have developed all the nuclear that we wish to develop, then we will ultimately, and the geology will assure it, because coal, gas and oil are not forever, we will transition to the renewables, and these are what they are, solar and wind and geothermal. That is true geothermal, where you are tapping into the molten core of the earth. There is not a chimney in all of Iceland because all of their energy is geothermal there, ocean energy, the tides and thermal gradients and so forth.

Agriculture resources, a lot of talk today about ethanol and methanol and soy diesel and biodiesel and biomass. Waste energy, a great idea. Instead of putting it in a landfill, burn it. There is lots of energy there. A very productive plant, state-of-the-art plant up in Montgomery County who would be happy, Madam Speaker, to have you come visit them there.

And then hydrogen from renewables. That is significant. Today, we are getting all of our hydrogen from natural gas. That is not renewable. That, by and by, will be gone, and then we will have to get hydrogen from renewables or from nuclear.

Just a word of caution. Hydrogen is not an energy source. We will always use more energy to produce hydrogen than we get out of it, or else we will have to suspend the

second law of thermodynamics. And, Mr. Speaker, if we can do that, we can suspend the law of gravity and we are really home free, are we not?

Why even talk about hydrogen then? Well, because of the two characteristics of hydrogen. One is when you finally burn it, you get water that is not polluted. And if you have used a nonpolluting energy source to produce it like nuclear, for instance, or wind or solar, then you are totally nonpolluting.

The second advantage of hydrogen is that it is quite ideal for fuel cells if in fact we are ever able to make fuel cells that are economic. With the fuel cell, you get about twice the efficiency or at least twice the efficiency that you get out of reciprocating engine.

The next chart looks at coal. And some will tell you do not worry about energy because we have got an incredible supply of coal, they will tell you, in 500 years. That is not true. At current use rates, we do have 250 years of energy, of coal.

Albert Einstein said that compound interest was the most powerful force in the universe. If you increase its use only 2 percent, that 250 years shrinks to about 85 years. And, now, if you have to use some of the energy from the coal to convert to a gas or a liquid, and we will have to do that because we have limited uses for coal itself, then you reduce it to 50 years. That is meaningful. But it is a finite resource. It is not forever. It is dirty. You are either going to pay a big environmental penalty or an economic penalty for cleaning it up.

The next chart is an interesting one, and that looks at the opportunities and limitations from the agricultural world. On the top here, we have two little sequences which indicate the energy transformation from petroleum, and notice that you start out with maybe 5 equivalents of energy and end up with 4, so it is 5:4. And with corn to ethanol, you ought to do better, because you are getting some energy from the sun here. There are lots of challenges. It is or it can be energy positive. It certainly is in South America, where Brazil is converting sugar cane, which is a bit better than corn, to ethanol, and they are now freeing themselves from dependence on imported oil and soon all of their cars will be ethanol cars.

The bottom pie chart here is something I wanted to spend just a moment on because it is so startling. This shows you the energy input into producing a bushel of corn. Notice the purple area there, almost half of it, it says nitrogen, that is nitrogen fertilizer made from natural gas. When natural gas is gone, that source of nitrogen fertilizer is gone.

Madam Speaker, before we learned how to do that, the only source of nitrogen fertilizer was barnyard manure and guano. The guano is gone. It took tens of thousands of years to produce it, we believe, and now it is harvested, and it is gone. That is the droppings from birds and bats on tropical islands and caves and so forth.

All those other segments of the pie here are other fossil fuel energy inputs into growing corn. I would just like to emphasize in very large measure the food we eat is just

transformed gas and oil, and without gas and oil it would be very difficult to produce the amounts of food that we are producing today.

The next chart is a really interesting one. The little analogy that I use here is that we are very much like a young couple whose grandparents have died and left them a big inheritance, and they have established a lifestyle where 85 percent of all the money they spend comes from their grandparents' inheritance and only 15 percent from their income. They look at the inheritance and how old they are and project a reasonable life span, and, gee, the grandparents' inheritance is going to give out long before we retire. So, obviously, Madam Speaker, they have got to do one or both of two things: Either they have got to make more money, or they have got to spend less money.

I use that 85/15, and others will use 86/14. The 85/15 shows what our energy dependence is now. About 85 percent of all the energy we use comes from fossil fuels. That is like the inheritance from our grandparents: It will not last forever. And only about 15 percent of it comes from other sources. A bit more than half of it that comes from nuclear power, 8 percent of our total energy, 20 percent of our electricity.

As you drive home tonight, note that every fifth business and every fifth house would be dark if it weren't for nuclear power.

Then we look at that 7 percent which is renewable energy, and the biggest chunk of that is conventional hydro that will not grow in our country. We may get some micro-hydro, but the big rivers have all been dammed and probably more than we should have dammed.

The next biggest chunk of that comes from wood, and that is the paper industry and the timber industry wisely burning a waste product that would otherwise end up in the landfill.

And then waste energy, that 8 percent. By the way, this 1 percent is 0.07 percent, because that is 1 percent of 7 percent from solar. That is a tiny, tiny amount of energy. But this was in 2000. That has been growing at 30 percent a year, so now it is about four times bigger. It is now 0.28 percent. Big deal, Madam Speaker. 0.28 percent? And that is about the same thing for wind, maybe a bit more from agriculture.

Those are the energy sources we are going to have to increasingly rely on in the future. So we have got a big challenge ahead of us.

The next chart depicts what we ought to be doing. The first thing we

need to do is to buy some time. You see, it takes three things to develop these renewables: It takes money, and it takes energy, and it takes time. Mr. Speaker, we will not worry about the money, although we should. Because when it comes to money we just borrow it from our kids and our grandkids by running up a big debt. So let us not worry about the money here.

But we cannot borrow time from our kids, and we cannot borrow energy from our kids. The only way to buy some time and free up some energy is with a pretty massive conservation program which frees up some energy.

Today, Madam Speaker, there is no surplus energy to invest in alternatives. All of it is needed by the economies of the world, or oil would not be roughly $75 a barrel.

Madam Speaker, what this chart denotes is a program that I think needs three qualities if we are going to make this transition in any acceptable way. First, we must have everybody involved, a total commitment like World War II. I lived through that. Everybody had a victory garden, everybody saved their household grease and took it to a central repository. It was the last war, the last time that everybody in our country was involved. We need a program, Madam Speaker, that has the total commitment of our population in World War II. It needs to have the technology focus of putting a man on the moon, because we are going to have to have a lot of technology breakthroughs and applications here if we are going to make it.

Thirdly, it needs to have the intensity of the Manhattan Project. Minus that, I think we are going to have a very rough ride. We should have begun 26 years ago.

Once we have freed up some time and freed up some energy, we need to use it wisely. And what has the biggest potential? What will have the biggest payoff? I think there are enormous benefits to this. I can see the American people going to bed every night thinking to themselves, gee, I really contributed today. I used less energy, I lived very comfortably, and I am really working on that new project which is going to help my kids and my grandkids to live as well as I live or maybe even better.

I think that we can be a role model for the world. I think that we can develop a lot of technology that we can export, but, Mr. Speaker, we will never get there unless we start.

I am wondering again, unless we close in the way we started, these two big studies paid for by our government noting the problems that we face in the future, why have not those parts of the government that paid for these reports claimed ownership? Why are they not using the resources available to them to make this information available to the American people? Why are they not coming to us with a program that says we have a big challenge, we have big opportunities, we really need to get going?

Madam Speaker, I think that we have a great bright future if we challenge the American people and marshal the resource. I think we have a very bumpy ride if we do not.

I look forward, Madam Speaker, to our leadership showing the way. I think Americans will follow. I think that we can be a role model to the world, and I think that we can get through this with less problems than many are depicting, but we won't get there unless we start.

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