PEAK OIL
January 27, 2010

Coordinator: Welcome and thank you for standing by for today's conference call.

At this time I need to remind all participants that today's conference is being recorded. If you have any objections to this recording, now would be the time to disconnect.

I also need to remind parties today's conference is listen only but we will be doing a question and answer session today, at which time you will be asked to press star 1 to ask a question or make a comment.

We're going to go ahead and get today's conference call started. I'm going to turn it over to Mr. Larry Flowers. Sir, you can begin.

Larry Flowers: Good afternoon and thank you for joining us for this important topical Webinar in a series of Wind Powering America information Webinars.

We're really pleased today to have Randy Udall who many of you know and have actually met personally at Wind Powering America annual summit meetings.

Randy has, as you all know, a great background in energy and the environment and has recently dedicated himself to really digging in to this issue of peak oil which has big impacts for renewable energy and for energy security.

And as you can see, he's a co-founder of the Association for the Study of Peak Oil. And with that I'm going to let Randy fire away. And we're going to have

about - oh, 45 to 50 minutes of Randy presenting this issue and then we'll have a question and answer period.

So for that - with that, fire away, Randy.

Randy Udall: Each year we do an annual conference. This one - last year's was in Denver. We had about 400 people come from all over the world to discuss this question of peak oil and the future of liquid fuels.

So today I'd like to share a few of the lessons and take homes from the conference we had in October.

I think to start with it's helpful to have a little context - a little historical context. This is global oil production in the last century - the 20th Century, from 1900 to the year 2000.

When the GIs came home from World War II, the whole world was running on about 10 million barrels a day. And 2/3 of it was produced in the United States. So we were the world's largest producer and also the world's largest consumer at that time.

Between 1950 and the year 2000, we had an eight-fold expansion - 800% growth in global oil production. This was an amazing half century. It was a once-in-a-planet event. And it was the half century in which you and I were born and which we were raised, and in which many spectacular things happened all across the planet due to this blossoming of global oil production.

In that half century, we were drowning in oil. And it wasn't just abundant, it was incredibly inexpensive - $2 oil, $3 oil in the '70s. It jumped up to $8 or

$9 or $10 oil. And then by the end of the half century, in the year 2000 it was trading for about $30.

Cheap, abundant, ever present and it revolutionized the landscape and the industrial civilizations that we have on the planet.

It also created a cast of mind. I sometimes argue that this abundant, lavish supply of oil was sort of like a software infusion, a cultural infusion. It gave us an idea about the planet and the planet's abundance. It created certain ideas and expectations about growth, that growth was the natural order of things.

Between 1950 and the year 2000, we built Levittown. We built the Sunbelt. We built suburbia. We built the interstate highway system. We even went to the moon and drove on the moon.

It was a remarkable five decades and we're living inside a civilization that was created during that time period.

Oil fields deplete or decline as they age in the same way that human beings lose their hair and get gray and wrinkles. As they age, oil fields deplete. This is a perfectly normal process. It occurs in all oil fields. Petroleum geologists expect it to happen.

This is a graph of the largest oil field we ever found in North America, Prudhoe Bay on the North Slope of Alaska. And when I first did this graph in the year 2000, everything to the left of that vertical line - small vertical line here had already been consumed.

I replotted this yesterday and we're down now to here. Where the yellow star is, in terms of annual production at Prudhoe Bay, is now about 1/7 of what it

was when Prudhoe Bay was at its peak in the 1980s. At that time, one in every 10 gallons of gasoline you purchased in the United States was coming from the North Slope of Alaska.

If you think of individual fields peaking, then you can think of a larger region, a state. Here we have Texas, and you combine all the fields in the State of Texas, and you get a production graph like this one where the oil production started around 1900 and peaked in 1972 at 3.5 billion barrels a day.

Texas remains a very large oil producer. But you can see that its production has fallen about 70% since its peak. And current production is about 1 million barrels a day, which would actually put Texas all by itself in the top 25 oil provinces today - active on the planet today.

So Texas is not running out of oil. Texas is not out of oil. Texas will continue to produce oil for the next half century. But there is a decline in Texas. It's irrevocable essentially.

This is a graph - now we're combining all the American states that produce oil. There are about 30 of them. And you get a graph of U.S. oil production. And this is a graph that shows that the U.S. peaked in 1970. The little bump to the right of that peak in 1970 - this bump here - that is Prudhoe Bay coming on line in the early - in the late '70s, early 1980s.

And roughly 2/3 of all the oil that - conventional oil that the U.S. will produce has already been used.

Peak oil is not about running out. Peak oil tends to be a somewhat controversial topic. Many critics of the notion of peak oil say, "Well, we're

not running out of oil." They always try to say that, "Peak oil people are saying we're running out of oil."

This is not the case. Texas is not out of oil. The United States is not out of oil. Certainly the world is not out of oil. We'll be producing oil on the planet for the next full century at least.

What peak oil is about is about maximum flows. And again, we saw how Prudhoe Bay reached its maximum flow in the mid '80s, Texas in the early '70s, the U.S. as a whole in the - in 1970.

And it's only normal to ask, "Well, if America has peaked and some 50 other countries have also peaked, when will global oil production peak?"

Peak oil matters because the flows matter. Consumers need flows of liquid fuels. Petroleum powers about 95% of anything moving on the surface of the planet. So every snowmobile, every tractor, every jet airplane - anytime you see something moving across the surface of the planet, it's more than likely being powered by petroleum.

Petroleum reserves are only useful when they can be converted to flows. Peak oil is when the flows can't meet demand.

Now this next point is actually quite important. Petroleum flows can be geologically, politically, physically or capital constrained. It's not just a geologic phenomenon. And I'll give you a couple of examples of that momentarily.

Many experts think - most experts - kind of the consensus at our conference in Denver last fall was that peak oil flows will occur around 2015. Some people

think they already have. Some people think it might be a year or two after 2015. The global economic downturn has bought us a year or two - pushed back peak arguably a year or two.

This is the official Chinese view of the future of global oil production and it explains why they are moving so aggressively to secure new oil supplies all over the world -- in Iran, Venezuela, Canada, Iraq, Sudan, everywhere.

The Chinese - nothing inscrutable about what they're doing. They're recycling our Walmart dollars and buying hard, physical assets including petroleum, rare earth elements, minerals that are important in many renewable energy technologies and other strategic assets that they think they will need to continue growing their economy.

Now there are some people -- Exxon and a group called Cambridge Energy Research Associates are the two most prominent -- who say a peak is some distance still out in the future. This is an Exxon ad at the right saying there's nothing to worry about. A peak will not occur this year, next year or for decades to come.

It is interesting, however, to look at the production of the ten largest oil companies on the planet. So these are the ten largest companies in the world. Exxon is at the bottom.

Larry, I assume you can see all of the number - all of the names there. Is that correct?

Larry Flowers: Yes, correct.

Randy Udall: So Exxon's at the bottom. You can see that Exxon's own production has been flat since the year 2002 is on the left. Going up we have BP. PetroChina Shell's production has actually been going down quite dramatically.

Petrobras is the Brazilian oil company and they have found some exciting deep water fields. Their production is increasing.

But the total of all of the ten largest companies are actually - they are going down from where - they're back to 2003 levels. They peaked as a group in about 2006.

The president of Total, which is a French oil company - he says the world will peak soon if not already. In October 2007, he said production of 100 million barrels a day would be difficult. By February 2009, he thought it might be difficult indeed to get production up above 90 million barrels a day.

Right now this year - last year we used about 85 million barrels a day. The forecast will be that for the coming year, we'll use about 86 million barrels a day.

Many other oil companies also share this belief that a peak in global oil production is on the horizon if it hasn't already occurred.

This is the official Saudi outlook. And I would strongly encourage you to spend six minutes at You Tube at this link on the bottom and listen to this man, Dr. Sadad al Husseini, speak about his concerns about peak oil.

He's the former chief petroleum geologist for Saudi Aramco - a very senior Saudi. And now - fundamentally he's retired now but I think his role in the

universe of oil now is to do - truth - is to speak truth to power and explain kind of where the Saudis think we're going.

In this graph - I won't get into the details of this but they show a long peak beginning along - a peak and a plateau beginning around 2012.

Just a few words on petroleum supply fundamentals. How do we forecast a future peak in oil production and why are so many people convinced that they have good evidence that this is likely to occur?

Sixty-five countries produce oil. But 20 countries produce 85% of it. And so simply by concentrating on these 20 countries -- seeing what their past production has been, seeing what their petroleum reserves are, seeing how much money they're investing in developing new fields -- one can begin getting a sense - a fairly accurate sense of what the future global oil production is going to be.

The orange band at the top here, just below the dot here, is the former Soviet Union. Anytime you see FSU, we're talking about all the countries that used to be in the Soviet Union. Saudi Arabia is the yellow and the U.S. is the bottom nation here.

Of those top 20 countries -- these are the countries that produce 85% of the world's oil -- about six or seven of them are clearly in what you might call irrevocable decline. And it's hard to see these graphs but from the upper left we've got the U.S. In the lower left we have Norway. In the middle on the bottom is the United Kingdom. And then above the United Kingdom is Mexico.

Mexico's oil production peaked in 2004. And they've now lost more than a million barrels a day out of their production.

But remember that I said that certain countries can peak for reasons that don't have anything to do with geology. And this country here in the upper right is Venezuela. And Venezuela oil production is going down now not because the Venezuelans don't have a lot of petroleum reserves -- they have a staggering amount, probably the third most on the plant. But because the country and its investment situation has been so mishandled by Hugo Chavez is the primary reason Venezuela production is headed down.

There are some good news. You'll often read about - reporters are often more eager to report good news than bad news. So you'll read exciting stories about a well called the Jack 2 well, which is a discovery in the deep water Gulf of Mexico. This is a single well that cost $100 million to drill.

We've built a number of these deep water drilling ships now and we've gone offshore.

Onshore production of oil, if you look at the world as a whole, has already peaked. But offshore production is growing and there've been exciting offshore discoveries in Brazil, Angola and the Gulf of Mexico.

In fact, increased production of oil in the Gulf of Mexico last year actually reversed that decline in U.S. oil production that we've seen over the last 40 years. U.S. production actually rose last year for the first time in many years by 300,000 barrels a day, which is roughly a 7% increase in U.S. production.

Now the problem with these offshore oil fields - many of them are being drilled in 8,000 feet of water. The wells themselves might be 20,000 feet deep.

It typically takes five to ten years to bring on new fields that are discovered in the deep water offshore.

The Brazilians have found a really wonderful field called Tupi. But first oil from this field may not actually begin hitting the market until 2017, about - nearly a decade after they discovered it.

In the meantime you have that depletion dynamic that I explained earlier, working away, eroding global oil production. You can think of depletion as a rust. You can think of it as the hole in the bucket. We lose about 4 million barrels a day each year to just normal depletion. So in a three-year period of time, you're losing as much oil as Saudi Arabia produces today.

So this is the dilemma that petroleum geologists see - that they see themselves on a treadmill whose inclination, whose steepness increases every year. And they have to run harder and harder simply to stay in the same place. That's why it's become so difficult now to increase global oil production.

This is the Brazilian president. He was so excited about this new field that they - he now claims that God is Brazilian. I'm not sure whether that's an accurate representation or not.

There are other positive developments. You'll often hear people say when you mention peak oil, "But what about the Bakken Shale in North Dakota?" And this has been a quite exciting province that's been developed over the last decade.

North Dakota is now producing about 250,000 barrels a day. That's about 1% of U.S. oil consumption. And it's an increase from less than 100,000 barrels a day.

And these Bakken wells are drilled almost 2 miles deep and then they go horizontally for 2 miles. And they've begun - developing these individual wells here in that province cost about $10 million.

The Canadian tar sands are slowly growing, although that growth in the tar sands has slowed due to the economic downturn over the last 18 months.

So if we look at the countries on the left - these again would be in those top 20 performers. And these are the increasers, the countries that are growing their production. And then on the right we have the countries whose production is declining.

And you can see that if you look at - if you look at the increase here on the left - the total increase - and then you look at the total decrease here on the right, they essentially balance each other off.

Now this was the change between 2005 and 2008 when we have that dramatic run up in oil prices from about $40 a barrel in '04 to $145 a barrel in the summer of 2008. And it was that rapid run up in oil prices in conjunction with sub prime and a whole lot of other things happening on the economic side that some people argue led to the economic - steep economic downturn we've had over the last 18 months.

A word just on geopolitics. The Mideast has 60% of the remaining conventional oil on the planet. There are five countries depicted here. They're all in OPEC. They're all Muslim nations.

Each of these green splotches is a large, giant oil field. It's no accident that we've fought two wars in this region in the last 20 years and that we still have

100,000 troops on the ground in Iraq. Iraq is up here in the upper left of this map.

This large green splotch at the lower part of the map, just to the left of the dot, that is Ghawar, the world's single largest oil field. The red blotch over to the right is the world's largest natural gas field.

Now there are 40 large, giant oil fields on this map. It's an accident of history. It's a global dilemma not just for America but for Japan, Taiwan, South and North Korea, for France and Germany, Sweden and Norway. It is a - just a global dilemma is really the only way you can think about it.

We found two giant oil fields in North America -- one in Prudhoe Bay, one in Texas. The Mexico's have one at Cantarell.

But there are 40 of them on this map. And so this region is going to determine and have an enormous impact over the future course of global oil production and also over global oil prices.

This is a busy graph and I only put it up - you can see it sort of shows you annual flows. Biofuels are running about 1.5 million barrels a day. This is the OPEC reserves - how much reserves OPEC has, this big blue box here. And you can see of those reserves, OPEC is pulling out of their reserves - they're sucking on their reserves at a slower rate than the non-OPEC countries are, which is this orange block here.

The non-OPEC, non-former Soviet Union countries are using their oil reserves much more rapidly than OPEC is up here.

Canadian tar sands are a large supply of oil, about 174 billion barrels which is enough to run the world for about six years. But it's hard to get much flow out of the oil sands so you see a tiny flow coming out here.

The total - I think that's the key point is that OPEC's hand is getting stronger and stronger as time goes on.

So here are two possible scenarios for future oil production. This is sort of a steady state scenario that OPEC - there are 12 nations in OPEC. Half of them are in the Middle East. Nigeria is a member. Venezuela is a member. Angola is a member and a few other smaller producers like Algeria.

But if OPEC stays at about 35 million barrels a day, world oil production would peak at 86 million barrels a day a year or two from now.

Here is another scenario. It's a more bullish scenario. I think it's a less - personally, I think it's a less likely scenario.

This is a world in which OPEC invests literally trillions of dollars to try to lift their oil production - lift it enough that they can overcome.

Now notice here we have these other nations where actually oil production in these other nations is going down. This is a forecast that non-OPEC and non-former Soviet Union oil production will actually start going down in the next year or two.

So for - actually to have an increase in global oil production then, OPEC not only has to increase its own production, it has to offset this decline that we're showing here.

That seems unlikely to me. I think that they can make all the money they would ever want to make - they would probably make more money if they don't try to do this heavy lift and simply let global oil production be rationed or allocated by price.

Now this is an intriguing new development in this whole peak oil story. And there's a link here that you can go and read more about it later on if you want.

Before the Iraq War, before we went into Iraq, it was quite clear that everyone in the White House knew what petroleum geologists knew, which is that Iraq is the least depleted of all the large oil provinces on the face of the planet.

While Saddam Hussein was in power, he kept oil production at about - in the range of 2 to 3 million barrels a day. The War in Iraq starts about here and you can see global oil production just collapse in the early part of this century. And then it's back now to about 2-1/2, pushing 3 million barrels a day now.

The Iraqis have announced a very aggressive, very ambitious leasing program to try to take their oil production from where it is now, which is under 3 million barrels a day, all the way up to 12. Now if they were able to do that - and many people think that this is a daydream - if they were able to do that, then they would be producing as much oil as either Saudi Arabia or Russia. You would actually probably for a few years have a glut in global oil production.

Most of the people - and cheap prices to boot.

Most of the people that I talk with say there's no way the Saudis can do this in a five or six-year period of time even though they have the reserves - they have the underlying reserves that might enable them to do it.

Most people think that it's more likely that the Saudis might get to, say 5 million barrels a day by 2017, 2020. But this...

Larry Flowers: Randy, you say - you're saying the Saudis. You mean Iraqis, don't you?

Randy Udall: I'm sorry. The Iraqis. Let me correct myself.

Most people think that Iraq would be doing really well to get to 5 million barrels a day by 2020, 2017 - in that time period.

But this is one of the wild cards - and I should stress there are lots of wild cards in this peak oil discussion. There are wild cards both on the supply side, in the supply area, as we're seeing here. But there are also wild cards on the demand area.

Is the Chinese economy a bubble, for example, if you had a collapse or a reduction in economic growth in China? You might have a softening in demand for oil and the softening in oil prices, avian flu. What about if the Israelis attacked Iranian nuclear facilities.

There are lots of things that could happen to change the future course of this.

Let me take just a brief break and let's do a little digression. This woman is named Melanie Moses and she's a biologist at the University of New Mexico. I find her work quite intriguing.

She originally studied ants. And then she began thinking about cities and whether there were correlations between the energy use you might have in an ant hive and the energy use you had in a city.

One of her observation is that all organisms evolve networks to distribute energy. This, in the lower left, is the vascular system of a leaf - that you would see in a leaf. This is a standard subdivision layout in the upper left.

The lower right, we have a cross section of a tree - how a tree distributes nutrients up and down through it. And then here in the upper right, this is the Worldwide Web. And you can see there are some physical similarities to all of these patterns.

This is the pattern that we have for distributing a kind of energy, coal, throughout the United States. And even though what we're showing here is coal being distributed, petroleum is driving this. So petroleum drives the distribution of not only petroleum but all other energy sources on the surface of the planet.

This is the distribution system for U.S. aviation. Hawaii's off here to the left. You can see L.A. here. This is how we move people and goods around. When you FedEx something to someone or you select second day shipping, you're making use of this energy distribution network.

This is the rapidly burgeoning expressway system in China. Within about five or ten years - certainly within ten years - the Chinese will have as many expressways shown in blue here as we have interstate highways in the United States.

And so much of this peak oil story has to do with China - China's rapidly growing demand for oil. It's now the world's largest car market. But the Chinese are still only using about 1/10 as much oil per person as we do in the United States.

So it's clear to me - I have not had the chance to visit China, but it's clear to me you really could not understand global energy issues, whether it's climate change or peak oil, without having visited China and really seeing the rapidity with which they are developing.

This is a map of the United States. Everything in blue here - to show how heavily roaded the United States is, everything in blue here is within 1000 yards of a road.

So here's Iowa, the State of Iowa, for example. There's nowhere in Iowa - almost nowhere in Iowa that you can get further than 1000 miles from some sort of road.

In upper Maine you can find places that are a day's walk from a road as you can over here in Yellowstone. There's actually one place over here that's about 20 miles from a road. But that's the most distant place from a road in the entire United States.

Here is the distance from you to the nearest McDonald's. This is the distribution network for Ronald McDonald.

Let's come back now to the peak oil story and talk just briefly about oil and the economy.

Oil is a lubricant in the economy. It makes things happen. It's actually the original currency which is why when people are worried about the fate of the dollar, they tend to invest in hard assets like oil, for example, gold and silver -- things that they think may have value in the long run.

This is - we had a lot of discussion at our conference in October. There is an oil price that breaks the machine. By machine, I mean the growth machine.

And we had some discussion about what that oil price was. Will we see these kinds of gasoline and diesel prices again within the next five years? I certainly think that's possible, although if there was any lesson from '09, the summer of 2008 going into '09, is than an oil price much above $100 a barrel, $120 a barrel breaks the machine.

In effect, an oil price that high is a tax on consumption. And it becomes an energy policy all by itself -- a policy that restrains economic activity.

It prices people out of the market. It doesn't price everybody out of the market, but it drives the airlines bankrupt. It drives business travel down. It drives the cost of importing goods and services through the roof. And it really puts a dent on globalization, on the dynamics that we have in globalization.

A few words on alternatives to petroleum. Petroleum has a dominance, a monopoly on transportation. About 95% of all transportation is driven by oil.

Liquid alternatives tend to be very carbon intense, whether they're oil sands or oil shale here in Colorado or even corn ethanol is not great on the carbon scale.

The more important thing about them, however, is that they have lower net energy. The U.S. oil industry today - for every barrel that you put in looking for oil, you get about 10 or 12 or 15 back depending upon where you're producing it.

Now this ratio was even higher in the 1930s when we first started looking for oil. We put a barrel in over here on the left and we get 100 barrels back over here on the right. And that's - that - it was that period in our time in which the United States went through a process similar to the one that China's going through right now.

Oil sands - if you think about Canadian oil sands, they put a barrel of energy in here on the left and they get 2-1/2, 3, 3-1/2 barrels of energy back.

Now it's the surplus - it's these gray barrels - that power the civilization. And when you have low energy return like this, you're going to have a different kind of civilization than the one you would have up here with conventional oil or certainly the one you would have with corn ethanol.

So the liquid alternatives are not going to arrive in sufficient volume rapidly enough to do anything but to slow the decline on the far side of the peak in global oil production. That's my belief.

How about gaseous alternatives? Hydrogen is a nonstarter for reasons I won't go into here. But compressed natural gas is - illustrates the difficulty it is for any fuel to get an edge - to get into the market, into the petroleum transportation market.

In 1990 the U.S. set a target of having 10 million natural gas vehicles on the road by 2000. That target was revised steeply downward to 600,000 by '94. And today, 20 years later we have about 110,000 CNG vehicles - Honda is the only manufacturer that makes one - on our roads.

So we have 250 million motor vehicles in the U.S. and only 110,000 of them are being driven by natural gas.

The leaders in the natural gas vehicle thing are these countries here. And you can see that they have a total of about a million out of nearly 1 billion motor vehicles on the planet.

We will see much more efficient cars. That has already been set in motion. New federal standards - fuel efficiency standards will - are in the mid 30s now. Most cars sold in the United States will - the fleet average will have to be in the low to mid 30s by 2016, 2017.

The Chinese have stiffer standards than we do. And the Europeans also have stiffer standards than we do.

So I do think that we'll see an infusion of plug-in hybrids, hybrids. Diesel engines tend to be about 30% more efficient than gasoline engines. So we're likely to see more diesel-powered cars on U.S. highways also.

Just a quick word about wind power. I think when it becomes clear that global oil production has peaked and both Democrats and Republicans recognize this, this will give a huge boost to renewable energy even though most forms of renewable energy, with the exception of biofuels, are electricity, not liquid fuels. So they're not direct replacements for the petroleum that will be more costly unless available after a peak in global oil production.

Nonetheless, I think that a peak in global oil production is likely to make climate change more easily - easy to address and it's also likely to make renewable energy even more bipartisan and even more of a national priority than it is today.

I think it's quite clear now that this wonderful thing I saw on a bumper sticker is going to become really a dominant paradigm here in the United States, that all forms of renewable energy really represent, above all, homeland security.

It's interesting to reflect on the future of the oil tribe. There are about 300 million Americans who are consuming our body weight in petroleum every eight days. So about 140 pounds of petroleum plastic products per person per day - per person each week - each eight days in the U.S. right now, that's your share of the domestic consumption here in the United States and also your - it includes your share of military use and industrial use.

It's really quite remarkable. I sometimes reflect that the most common - absolutely the most common ritual in the United States is getting a tankful of gasoline. We use about nearly 10 million barrels each day of gasoline in this country. And that means that an American is filling up about - there are about 20 million fill ups that occur in the United States each day -- every 24 hours.

Over the last half century we've built this remarkable civilization and we have been driving the distance to the moon. Typical American motorist will drive the distance to the moon every 20 years. But that has already begun changing.

This is a graph of - 1984 is over here on the left and 2009 is over here on the right. This is a graph of our cumulative vehicle travel. So these are all the miles that we drive as the oil tribe. And you can see here in the last 18 months we've had the steepest downturn in this graph in the last 60 years.

Really quite remarkable when you look - here is 9/11, for example - this little dip here. Here's the first Iraq War is way back over here, the 1991 war - a little downturn.

But you can see how dramatic this economic recession has been just simply looking at how much - how rapidly and dramatically this turned down over the last 18 months. It's flattened out now and that decline is no longer underway.

It - if global oil production actually peaked in 2008, it's not clear - that's certainly a possibility - then peak oil, peak American debt, peak American travel and peak U.S. Credit all occurred simultaneously. And this would actually make some sense because both oil and debt - or oil and credit - both of these things are lubricants and both of them are levers.

Oil levers - is a way to leverage the ancient past, sunlight falling on the earth 50 million years ago. And debt and credit leverage the future. They enable you to accelerate activities, but essentially you're putting a lien or a claim on the future.

This discussion can seem abstract. I think peak oil sometimes can seem abstract. But it's quite clear that we've already begun an energy transition in the United States. Indeed, we're using 2 million barrels less oil today than we were five years ago, even though there are 15 million more people living in this country than there were five years ago.

We're using nearly 10% less oil now than we were. U.S. Carbon emissions are actually 9% below where they were in 2005 also.

So this energy transition associated with a slowing in global oil production growth and an eventual decline has arguably already begun.

This is a prominent energy historian, a wonderful guy whose work I recommend. He's speaking a little bit tongue in cheek here, but he has not - he doesn't tend to lose sleep over a peak in global oil production.

He is much more concerned about how much energy Americans use - how much more we tend to use than Europeans. And he's convinced that there's plenty of energy that can be saved in this country if we simply used it more intelligently.

Finally, some additional resources that you might - if you're interested in this topic - I'll just quickly call out three of them.

If you want a free weekly compendium of peak oil related news with no editorial content, it's just an abstract, you can sign up for free at that long link there at the top.

There's some wonderful information at the next two Web sites. (AspoUSA.com) has some of the presentations from our conference last fall. And theoildrum.com is a way to follow both some of the economic developments and some of the energy developments.

There are lots of - dozens of books on peak oil. Here are three that I recommend.

Thanks so much for your time and attention. I appreciate it.

And I think Larry's going to moderate the questions now.

Larry Flowers: Yeah. What we're going to do is open it up for questions. If you have a question, the operator will give you some instructions.

And Randy, while people are going to be - ask their question, let me just ask you one.

You didn't - at least I don't recall you showing the increase in demand for oil as some of the developing countries, especially China and you have Brazil - some of those countries - continue to grow at a significant rate and this - what happens when growth continues to increase and yet oil flows peak. And that...

Randy Udall: Right.

Larry Flowers: ...is created that's creating economic strain on economies.

Talk a little bit about that.

Randy Udall: Well there - there's a saying that, you know, that civilization has been climbing a heat ladder.

Americans right now - we're using about 25 barrels of oil per person per year. Now that's 2 barrels a month essentially, averaged across the country.

In China the respective number is in the range of 2-1/2. In India it's 1-1/2. So you have 3 billion people in China and India who are just now getting their first automobile or thinking about getting an automobile.

So increasingly, when we pull in to fill up, we're going to be bidding against a first-time motorist in a country many thousands of miles away. And it actually turns out that oil is more valuable in a sense in India and China because it's those first few barrels a year that you use that lead to the rapid increases in what we would call living standards.

So 25 barrels per person per year gives you Las Vegas, gives you a Super Bowl. It gives you an extravaganza - gives you just unbelievable mobility like we've enjoyed in the United States.

But those first few barrels a year that the Chinese and the Indians have begun using and Brazilians and Russians and people throughout the OPEC nations, those barrels are actually more valuable and people are willing to pay more for them than we are for the last barrel that we would consume each year.

So the thinking is that global oil consumption - the balance of power, in a way, will shift from America and the European Union to countries that are now industrializing quite rapidly.

Larry Flowers: Okay. Operator, would you give the people instructions on how they can answer - ask questions?

Coordinator: Absolutely. Anyone wishing to ask a question, we're going to ask you to press star 1 now. Please state your name loudly and clearly when prompted. Your name is required to introduce your question into the conference.

Once again it is star 1 to ask a question. If for some reason you need to withdraw a request, it is star 2.

And after you press star 1 it will take just a moment for your question to come through.

Larry Flowers: And Randy, while we're waiting for those, another question.

Oil shale, of course, is a big story out here in the West. Talk a little bit about what the challenges are to make oil shale make sense in our economy.

Randy Udall: Yeah. Oil shale is another one of these unconventional resources we've been trying to develop for a century in Colorado. It has even lower energy return than tar sands. It's probably - energy return probably in the realm of corn ethanol.

Oil shale is actually a misnomer. What we're talking about is a trillion tons of immature source rock. This is rock that has some energy in it but never went through what the geologists call a petroleum kitchen. That is, it was never heated - buried deeply enough to be heated - deeply enough in the earth's crust to be heated and transformed from kerogen, which is a precursor of petroleum, to petroleum itself.

So it's unlikely, in my view, that global production of oil shale will ever much exceed a million barrels a day. That would be 50 times more than we're producing globally right now.

It's one of these - Americans are always looking for a magic solution - a pill to cure baldness. And oil shale sometimes comes up on that list as if we only did oil shale, we would have no problems at all.

Larry Flowers: Okay. Operator, are there any questions?

Coordinator: Yes sir. The first question comes from (Kevin Rackstraw). Sir, your line is open. Go ahead, sir.

(Kevin Rackstraw): Hi, Randy.

((Crosstalk))

Randy Udall: Hi.

(Kevin Rackstraw): I know you just - you're talking mainly about oil and you hit on natural gas a little bit. But one of the things that I see a lot of these days from the natural gas industry is discussion of these huge deposits of natural gas and shale, various shales and all. I mean basically sort of the two cheap to meter...

Randy Udall: Right.

(Kevin Rackstraw): ...message about natural gas forever into the future. And I just sort of wonder what you learned about that since they oftentimes tend to be associated sometimes with oil.

So what...

Randy Udall: Yeah.

((Crosstalk))

(Kevin Rackstraw): ...you have on that.

Randy Udall: That's an excellent question. I actually suggested to Larry that we have a Webinar on shale gas because wind energy and other forms of renewables actually compete more directly with natural gas than...

(Kevin Rackstraw): Right.

Randy Udall: ...they do with petroleum, as you know, Kevin.

And the shale gas story is quite an exciting one. It also is a controversial one with some people claiming you would need much higher prices for natural gas than currently obtained if shale gas is going to grow and become a larger portion of the gas supply.

Shale gas has been developed now over the last 20 years but there's been an explosion of it over the last five or six.

Half of the country's shale gas is coming from a single field in Texas which is sort of the granddaddy of the shale gas place, called the Barnett.

But one of the interesting things about shale gas is that much of it is found east of the Mississippi. So the kind of land use controversies that we've had over - as we've had a natural gas rush here in the Rockies over the last 15 years, those similar controversies are now occurring in upstate New York over potential impacts on water quality, the kind of roads and pipelines you have to install to get at the shale gas.

Shale gas, in my view - some people disagree with this - is by and large a good news story. Many people think that shale gas - the key role that shale gas will play will be to simply offset the decline or the depletion of conventional natural gas in the United States which is happening quite rapidly.

So shale gas, coal bed methane and tight sands gas, which are some other kinds of "unconventional" gas are now about half of American gas supply.

The gas industry is really looking for new markets. They'd like to displace coal in the power sector so they're becoming more outspoken about climate change and the opportunity to use natural gas to displace coal.

They're also worried. It's interesting - in Texas I had someone for Anadarko tell me that wind energy - Texas has done a lot with wind. I think, Larry, they've got about 4000 megawatts now maybe.

Larry Flowers: Five thousand.

Randy Udall: Five thousand.

((Crosstalk))

Randy Udall: Wind is actually cannibalizing or reducing natural gas consumption by electric utilities in Texas. So there's lots of tension between gas and wind. And it might be a good topic for a future Webinar.

(Kevin Rackstraw): Doesn't it also - you think it would have an impact on oil over time because it can substitute? I mean...

Randy Udall: It can...

(Kevin Rackstraw): ...I know you said it was difficult.

Randy Udall: ...substitute - it's actually kind of a hold card. We have in the U.S. - we're producing about twice as much energy in the form of natural gas as we do petroleum now.

That Honda Civic I showed you that runs on CNG, those are beautiful little cars. It's the chicken and egg problem of getting the service stations in.

And it wouldn't surprise me to see a - the nation move when peak oil occurs - it's clear that it has occurred - that we put another big effort into compressed natural gas both for long-haul semi trucks, where you can easily install the gas tanks, and possibly in the private automobile market, too.

Larry Flowers: Of course, that's T. Boone Pickens...

Randy Udall: And that's what Pickens proposes to do.

Larry Flowers: Another question?

Coordinator: Actually that was the last question, sir.

Larry Flowers: Okay. I'm going to ask one last question to Randy.

And I'll say - just to thank all the audience for joining us today on this important topic, because there are a number of very senior level diplomats that are talking about the need for hybrid electric vehicles and the need to run those and develop those in a very aggressive way from an energy and security standpoint.

Randy, you have said in past presentations that you see the move to renewables, energy efficiency and the reduction of dependence on foreign oil as a economic prosperity issue primarily.

Can you just sort of finish the whole Webinar on that topic?

Randy Udall: Yeah. It occurs to me that we can't forecast how this peak oil story plays out. But if it plays out in an ugly, rapid kind of shock, another oil shock, it

wouldn't surprise me that the country made a commitment to natural gas vehicles and also a commitment to electricity as a transportation substitute.

And it could be all electric drive. Batteries are improving. It could be battery-powered bicycles, scooters, automobiles.

We might begin to think about all of these challenges we face right now - the environmental challenge of climate change, the economic challenge of hey, we've got 15 million people out of work. We'd like to put them back to work. What do you want to have them do? What's useful work? What's a worthwhile investment in American infrastructure?

I think the President faces a really difficult challenge right now. I think the nation faces a very difficult challenge. It's quite clear to me from the reading I've done that the whole notion that we're on the verge of an incipient recovery in the U.S. is way oversold and that we face some very, very challenging decisions if we hope to reboot this economy and begin resuscitating, if you will, prosperity.

I think that energy is going to be pivotal to this. I think energy is going to be central to the discussion. And I think that renewable energy is going to be really central to the discussion.

And that's why these connections between the different forms of energy, economic wellbeing, prosperity and jobs - I think we've got to bring steel home.

When oil gets more expensive, globalization takes a real hurt or a real hit. We're not going to be importing everything from China. We've got to bring steel home. And I think we're going to bring energy home.

And I hope that this call that I've used sometimes - sort of a come home America - I think that there's a possibility that that will have bipartisan attraction.

Larry Flowers: Thank you, Randy. Very interesting topic and an important topic for our future.

For those folks who are still on the phone, this has been recorded so that you can refer to it as well as refer it to you friends and colleagues.

Coordinator: I do apologize, sir. I do have one more person standing by with a question.

Larry Flowers: Okay. This will be the last question.

Coordinator: Okay. Stand by.

(Steve Druet), your line's open. Go ahead, sir.

(Steve Drouilhet): Hi Randy, and thanks very much for the presentation.

I really thought it was interesting that you characterized this threshold of $4 to $5 a gallon gasoline as the level that breaks the machine. I'd sort of been thinking of it as the level at which real progress is made in terms of people starting to change behavior as to, you know, choosing a job near where they live or choosing to live near their job or not buying that second car or these sorts of major changes in lifestyle.

Do you think - but you've portrayed that as, you know, being very negative and very, you know, harmful to the economy.

I'm wondering if those sorts of levels can be actually instituted as a matter of energy policy like, for example, tax oil so that it never falls below $4 a gallon and in some sort of revenue neutral way that it wouldn't break the economy.

I'm wondering if you think that's even possible to do that in such a way that we wouldn't, you know, strangle ourselves economically?

Randy Udall: Yeah. Well that's a great observation and it's the flip side of breaking the machine, I think.

Note that in Europe people are paying $7 and have been for 20 years.

(Steve Drouilhet): Sure.

Randy Udall: And the Europeans use that money - that's - most of that is tax that goes into federal coffers and they use it to support all kinds of social programs.

And the Europeans, you know, they do a lot less driving. They do 1/3 of their trips on bicycle or on foot, 1/3 in a car and 1/3 in mass transit. And here in the U.S. it's more like 95% of all trips are taken in a car.

So you could argue that, you know, looking back 20/20 hindsight that if we had put a - gradually put a dollar or even a $2 tax on - a gallon tax on gasoline starting in the mid 1980s that we would be in a much, much, much better place today, that our automakers wouldn't have gone bankrupt 18 months ago, that we wouldn't - you know, that our balance with payments problem would be much better, that we would have invested in high speed rail like they have.

I mean when the Chinese have a better high speed rail system than we do in America, it's really telling to me of kind of a imperial decline that we've gone through over the last 20 years.

My general sense of the politics of this is that a gasoline tax is probably still off the table even though the nation is desperate for additional tax revenue. I just - it's never gotten any traction in America. I think it goes back to the software thing that I reflected on because we always had so much oil in this country and we were always one of the world's largest oil producers.

This notion that we were - that oil was our life blood, that it was our birth right, that inexpensive energy was something this was - that we were owed, unfortunately has had a very powerful hold on our cultural software.

I do agree with you that a software upgrade is underway and it's late. It's regrettably late. It is underway and higher oil prices will accelerate it.

So there are - certainly there are some good outcomes here as oil prices tend higher over time.

Larry Flowers: Thank you, Randy. Thank you, (Steve), for that question.

And with that, we're going to conclude today's Webinar.

And again, please look at those references. And this has been recorded.

Thank you, Randy.

Randy Udall: Yeah. Thank you. The Sadad video is really useful, I think. It's just a seven minute thing at You Tube, about 15 slides into the talk.

Larry Flowers: Okay. Good afternoon, everybody.

Coordinator: And at this time all parties may disconnect from today's conference. At this time all parties may disconnect.

We thank you so much for joining, and have a great day.

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