



## Day 3 at the ASPO-USA meeting

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Day three of the ASPO-USA Conference in Sacramento was focused on where we go from here with fuels other than oil. It began with a session on coal and natural gas reserves and the potential of biofuels. There was considerable information on each of the slides that each of the presenters provided, and so I encourage you to go and look at the presentations which should be up soon on the ASPO site.

[David Hughes](#) had the first slot, and talked of the issues that are raised by coal consumption. David began by contrasting a quote by [Emerson](#) that

Coal is a portable climate. It carries the heat of the tropics to Labrador and the polar circle; and it is the means of transporting itself whithersoever it is wanted. Watt and Stephenson whispered in the ear of mankind their secret, that a half-ounce of coal will draw two tons a mile, and coal carries coal, by rail and by boat, to make Canada as warm as Calcutta, and with its comfort brings its industrial power.

with the more recent pronouncements of James Hansen that [coal is the enemy of the human race](#).

So much has changed in the past two decades and the fuel that was the kickoff fuel for the Industrial Revolution has become something that folk just wish would “go away.” This contrast, and the relative view of nations as to where they stand is epitomized by the examples of China and India, who are building coal plants as fast as they can, with the United States, where some 59 of 151 planned coal power plants are on hold, or cancelled, while only 28 are in construction and 66 are still in planning. As this doubt about future conditions has grown, so the price has doubled.

There has been a strong correlation between the amount of fossil fuel that is used and the size of the world population. Coal was the fuel that helped initiate the Industrial Revolution and is, at present the fastest growing fuel source, with natural gas second and oil third. There has been some misperception about the use of fuels in that when the dominant fuel changed from wood to coal, mankind did not stop using wood, rather while the amount of coal used grew, the amount of wood held steady. Similarly when oil began to be used as a source of fuel this built on the amount of coal being used, and that level was almost sustained so that with significant coal and wood being burned, the fuel use grew larger.

A turkey can sit in relative comfort anticipating based on history, a long, happy life, not being able to forecast Thanksgiving. So at present we look backwards, rather than looking at what the future is likely to bring for us, and think that all is well. Coal is about two-thirds of the fossil fuel that is

left to us, but as the population increases, and the amount of energy used per capita also rises, we are burning through it at an increasing rate. The amount remaining is in question. A National Academy Report in 2007 noted that it is questionable that the United States has enough coal to last more than a hundred years. There have been two studies, one by the [Energy Watch Group](#) and one from [Uppsala \(pdf\)](#), both of which show that the peak will, however, more likely be sooner.

Dave Rutledge's work at Caltech suggests that this earlier decline, and the drop in coal use, will mean that the amounts of carbon dioxide in the atmosphere will fall below the lowest prediction of the IPCC on GHG generation.

Looking at the power that would be required to sequester that gas, it would cost 27% of the energy generated by a coal powered station to gather and sequester these gases and if the technique was based on the [IGCC model](#) then the construction costs would be 32% higher. Ultra super critical combustion in current plants can run at 43% efficiency, and when this is combined with district heating ("cogeneration") can raise the overall energy recovery to 70%, in contrast with the 51% figure for the IGCC.

His opinion is that it is best to concentrate more on conservation, since coal would be around for a long time. The Chinese will peak in population in 2030 at 1.3 billion people, but then India will pass them, and both nations want not just to sustain the energy use per capita but to increase it. Demand will thus continue to grow. But this is an exponential growth that is not sustainable. (The only folk that think otherwise are either mad or economists.) It is a problem we cannot win, we can only try not to lose. And the question becomes do we adapt and change, or do we reach a point of societal collapse.

The next talk was on Biofuels, and was given by [Robert Rapier](#). In the talk he mentioned a number of the points that he has written about on TOD as well as on [his own site](#). His message was not that we should abandon hope, but that there were both weak and strong contenders for success.

If there was a common thread to the speakers of the morning it was in their attempt to address the scale of the problem that we face. Robert pointed out that all the corn ethanol produced at present does not equate to more than the production of a single large oil refinery. Ethanol production from corn is subsidized, and without that subsidy, and a mandated market, would not survive. It is purported to be a bridge, but a bridge to nowhere (cellulosic ethanol), and so we should say "Thanks, but No."

Were cellulosic ethanol to work it would require a forest of material feed stock a year per plant. The only viable way to make the process work economically, since the ethanol content is initially so low in the beer produced, is to go the gasification (syngas) route. Sugar cane to ethanol is, however, another story. The reason that it is effective comes from the use of the plant waste, the bagasse, as a fuel for the processing plant. (The ash is then mixed with a compost of other parts of the waste and then returned to the soil.)

Biodiesel is significantly different from petro-diesel. He feels that there are two possible contenders that may lead to a future solution. The first is the process being developed by the [LS9 Company](#) which is after the "Holy Grail" of biofuels, and which may reach it though there are many challenges technically, a major one being in the separation of water from the fuel.

This holds equally true for the other alternative, butanol, for which he has a soft spot, given his earlier work in the field. Not only is it difficult to remove the water from the product, but it is also

very difficult to scale up to the volumes required to make a difference.

In a reality check, he noted that the main reason that Brazil is independent in Energy is because of their off-shore oil, and that ethanol plays a small part in that overall success. This cannot be compared with the needs of the United States. He pointed out a couple of cases where initial enthusiasm has led to diminishing hopes as the process was scrutinized. He is cautious about biodiesel from algae, since there have been some “Photoshop technology” presented to the public as well as some other shenanigans, and it has a long way to go. At the moment it is “an interesting R&D project.”

He suggested that, in the short term it does not help anyone for politicians to wage war on the oil companies, and we really need them to encourage behavior to reduce consumption.

[Andy Weissman](#) then returned to the podium, to give a talk on Natural Gas (NG) supplies and the risks associated with its use in generating electricity. The most risk is that the increased reliance on the fuel, in a time of shrinking supply, will lead to a cost that is at a premium relative to oil. The marginal supply for NG is liquefied NG (LNG) which is imported. While there is, at present, more than enough to go around, this will change by 2011. At that point demand will continue to rise against an inadequate supply and this will lead to as dangerous a situation as one might imagine. It could very well double or triple electricity costs.

The current price softening is transient, but will not discourage the building demand which can be expected to explode, just as supply tightens in the 2011 to 2012 period. In this regard he pointed out that the EIA had not even been close in their predictions of demand growth. Increased coal use in the short term will not happen, since the utilities are all installing NG plants, and this is not recognized. Thus we are flying blind on what the real demand will be. We paid a huge price the last time that we got this wrong, but have not learned the lesson.

We need to stress Energy Efficiency, since this has the most potential, but our record on this in the past has not been good. Providing the motivation has been difficult and we need targets to be set, and these should be aggressive. Attempts to date have been long ongoing but with little significant success.

In regard to the recent growth in gas, this is not sustainable. It came about through a combination of circumstances, particularly the technical breakthroughs in getting gas from the large shale deposits around the country. He fears that the production from the Barnett shale may peak next year. This is due to the ability of the industry to find the “sweet spots” early, but even there the individual wells decline at a very fast rate. At the same time imports from Canada could well drop rapidly. The supply of gas down the MacKenzie Pipeline requires that it first be built, and that is still not certain, given the resistance of some of the local Indian tribes along the route. It is troubling that there exist such a number of questions, even in the short-term future since an increasing percentage of the world is starting to rely on LNG as a supply source. And sadly there is no Plan B.

When one then considers what the future power source will be for electricity, nuclear is not likely to increase greatly in overall volume, wind though currently popular has no storage capacity, and is intermittent and does not often blow when it is most needed. And this leaves coal. But in his opinion we would be unlikely to increase coal use without a program of sequestration.

After a short break, the second session of the morning dealt with coal, carbon capture and Climate Change issues. [Michael Webber](#) led off the session by discussing the pro’s and con’s of coal-to-liquids plants. Coal-to-Liquid (CTL) plants are not new, and have provided fuel for over half a

century, and so there is a considerable background of information on their use. Further since the USA has an abundant amount of coal and the US Air Force is concerned about the security of future supply, this is something that they have tested, and found to provide a product that is much to their liking. It is, however, expensive (oil price + \$10) and he is not sure that it could be sustained without significant subsidy. Further there are the environmental costs of surface mining, and questions as to how long the supply will really last, since at present major coal production has switched to the lower energy, but lower sulfur, coal from the strip mines of Wyoming. There are 4.3 million acres under permit application for mining use.

Scale was again brought forward as an issue. If 1 Btu is the amount of energy in a single match head, consider that we use around 100 Quads (10 to the power 12) Btu's of energy each year. Further, because it is difficult to put carbon capture devices on tailpipes, if we are to reduce carbon it must be done at the stationary sources, such as power plants. However not only is the greenhouse gas (GHG) generation of concern, but so also is the water use, and the processes required to scrub other gases from the flue gas emitted by the plants. Power plants are the greatest users of water.

And the ugly part of the situation is that the actual installation of CTL plants is politically and policy driven and so, at this time it is hard to predict whether we will see a 70% increase in production, or a 50% decrease, and so planning is somewhat haphazard. Yet, because of the scale of production one has to ask what might one replace it with? Further, in terms of growth, there is the concern as to how the coal is to be moved, since in many cases rail lines and mine car supply is maxed out. The hope at one time was that 50% of the Air Force need could be met from CTL by 2016. However Representative Henry Waxman has introduced legislation that effectively bans purchase of any CTL fuel except in that the wording is subject to some interpretation. And so the debate continues.

While it does, the problems do not go away, and we are faced with issues that relate to Resource Depletion, the Economics of supply, and the impact on the Environment. We need to either replace coal or fix its problems.

The second talk in the session was by [Pamela Tomski](#) of Entech Strategies LLC, who talked about carbon sequestration. In terms of scale she began by noting that to have any effect we need to remove about 1 gigaton of carbon per year from the atmosphere. She went through the history of carbon capture and sequestration (CCS) development. It is now a major topic for discussion in terms of climate change, and the impact that CCS might have. One such is the new acronym NUMBY (not UNDER my back yard). She reviewed the various strategies for capture that might be used, and stressed the high costs, both financial and in energy, to be successful. It will take between 20% and 40% of the power output from a plant to be diverted into CCS, and such integration, even when undertaken, will not be easy. And we only have two IGCC plants in the country.

To move carbon dioxide around may need a network of pipelines similar in size to that of existing oil supply lines. From Europe, there has been some suggestion that liquid CO<sub>2</sub> could be shipped back to Saudi Arabia for enhanced oil recovery (EOR). Liquid carbon dioxide has been used in enhanced oil recovery for about 20 years, successfully. It has also been stored successfully (there are places where it is found trapped naturally and in these places it has been pumped out for use). EOR could thus see an increase in production, over time, of up to 48 billion bbl of oil. There are three major current projects, [Sleipnir](#) in Norway, [Salah](#) in Algeria, and at [Weyburn](#) in Canada.

On a reality check, there is really no concept of scale as yet in terms of the size of the problem that needs to be addressed. One should trust no cost estimates at this point. It could well lead to a

40% to 80% increase in the price of electricity. It is something that Greenpeace is opposed to. And while there are few regulations in place, this is being addressed at the State level. The problem in part comes in that there is not enough human capital available to work on the program. And when all is said and done the GHG produced by China and India will make the effort almost irrelevant.

The final speaker of the morning was [Randy Udall](#) who talked about the conflicts between peak oil and global warming. He began by noting that four million Chinese miners will go underground to work this week, and by the end of the week about a hundred will have died. We are mining and burning coal at an ever increasing rate, so that half of the world's entire consumption has occurred since 1980. It is possible that fossil fuel energy production will peak in 2017, and this is not recognized by the IPCC. They plan as though there is a never ending supply of oil and coal, and this is reflected in their models. They are not amenable to correction, and there is only a small group within the IPCC that addresses the energy aspects of the situation. They assume that energy scarcity is a myth, that fuels are superabundant, there will always be free global trading of supplies, that coal can be made into almost anything, and that it will remain cheap for all of the next century. This attitude and fixation is dangerous, since the debate between those who press these opinions and those concerned about oil production pass each other by. But in both cases they foresee an increase in cost. But the actual increment is likely to be higher because of peak oil, rather than that incurred through CCS. In some ways he thinks that Peak Oil is a gift.

At the lunch that followed [Rep. Terry Backer](#) of Connecticut and [Debbie Cook](#), Mayor of Huntington Beach, and [candidate for California's 46th congressional district](#) were both given awards for "Speaking Truth to Power."

Sadly I had to leave at that point, and I may post on where I went later, and, as usual I will have a post on my conclusions as well. But for those who stayed, or heard different things, or who have other comments please help those who couldn't be there by adding comments to this.

Thanks!

The one thing that those of you who haven't been to one of these should realize is that the information density of any one of the talks we are give is immense. Thus any of the summaries that I present are just a shadow of the reality of the information that the talks contain, Please, therefore, after looking at these very brief summaries do visit the [web site](#) and download the presentations themselves, or perhaps better wait a short while and buy the DVDs.



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