The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

C2C – the Emerging Energy Technologies Summit – day 1

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So there I was, hiding out in the midst of some 500 entrepreneurs and business leaders (including the odd student and faculty member) who we were told would wander in and out as the Conference looked to create a pathway to "The Next Industrial Revolution," this time in Energy. The two-day meeting/Summit is being held on the campus at the University of California-Santa Barbara, and seemed to be a good place to see what some of the more creative thinkers (the speakers include two Nobel Laureates) see as the technology to get us out of our current mess.

The first thing we learned is that they are no better than the rest of us at getting things done on time, but that minor quibble aside, I gather I was not the only one who felt something of a split between the tone of the first two papers presented, and much that followed.

The first paper was given by Paul Roberts who brought a perception of public attitude to the issue to preface the debate. He pointed out that the recent drop in oil prices has given the public the feeling that they "got through the problem", and that many still have that "Faith Based Energy" belief, with solutions being "out there" and solutions being provided by divine intervention. In reality the situation has got worse over the past 5 years, demand is going up in many ways faster, but in a different form, than was anticipated. The result is that the American public, and that of most of the rest of the world do not see the problem. Car purchases are still at the heavier end of the spectrum.

He noted, as did some others I talked with, that the demands for oil in the future revolve less about "where will China get it's oil," than "where will America get it's oil." China has been very diligent in going around the world lining up long-term supplies. And with the available "float" between demand and available supply having dropped from 4 mbd to somewhere under 2 mbd, this intermediate term question is no longer a theoretical issue.

The supply of that oil is increasingly under geopolitical control, and politics control investment. And American policy has not really helped, he asked "If Saudi Arabia held free elections – that really were – tomorrow, who do you think they would elect?" And offered the hint that it would be unlikely to be Secretary Condoleeza Rice. He noted that even if the Iraq conflict were to be totally resolved tomorrow, our oil problems would not significantly change. And, further, we have reached a point that anything that disrupts supply threatens our future. Even with today's higher technical tools for the oil industry there is little cause for optimism, and this is not a problem that is amenable to a "patch." Outside that industry new technology is still struggling to get established. Given the incubation period to widespread application being a likely 20 – 30 years, we cannot afford to wait to make the necessary investments.

He was followed by Severin Borenstein who gave even more of a "downer" speech than Paul's. He divided energy into sources and storage, and pointed out that hydrogen qualifies under storage (as does gasoline). The sources are fossil fuels, nuclear power, solar, wind and the renewables. And increasingly those sources must address three criteria: cost efficient supply, environmental impact, and geopolitical ramifications. In the last case he noted that while oil is a world market, natural gas is still largely a continental market, electricity is more of a local market. And as an illustration he noted that "there is plenty of coal in the United States," is only true if we don't have to worry about politics and the environment.

While he was the first to raise the issue of global warming, it became a topic that was then referred to by virtually every speaker that followed – and there were comments later that one should expect the Senate to vote out a bill on this issue but that it would be unlikely to pass through the House, and would face an almost certain Presidential veto. Fossil fuels are, at present, the cheapest option around and the likelihood is that we will continue with this status quo, for this is a global issue that goes beyond local action.

We are at a point where the choice becomes mitigation or adaptation, and whether it is paying a higher price for gas, or moving to higher ground as the tides rise, we are more likely to adapt than to change.

The program was then switched from that planned to allow Amory Lovins to speak, and largely go over some of the ground covered in his book on "Winning the Oil End Game." He pointed out that, contrary to the earlier speech, the cheapest and most rewarding step is that of conservation and energy saving. He noted that companies such as IBM and DuPont have saved billions of dollars, by investing in energy saving approaches. And then he rhetorically asked if it would be possible to have the US save 3% of it's energy use by a change in attitude. He noted that the US has done this in the past (the oil shocks of the '70s). China has made energy efficiency a prime target, and has achieved levels of up to 8% increase in efficiency, and when one notes that the US wastes 50% of its oil and gas, and 75% of the energy used in creating and using electricity, there is lots of scope for improvement. The key investment should be made in transportation, and he worked through the calculation that showed that a car really only usefully applies 0.3% of the energy it consumes in doing useful work. In the midst of this discussion and in noting how we could save much of our energy consumption (he illustrated this by commenting on the number of banana crops he gets from the plants in his house) he did slip in that he has very high expectations for cellulosic ethanol – an opinion he did not really further discuss.

One of his themes has been the use of lighter materials to make vehicles, and the many advantages that this will bring, and he illustrated this by banging on a sample of a composite material, and having it ring like a bell. Times have changed, and he noted that Boeing have switched to making composite aircraft, and looked to the time when automobiles might be made the same way. Some changes are not so dramatic. Consider pumping systems, he noted that he has achieved savings of up to 75% of energy costs in a plant by having them use fat short, straight pipes in their plumbing, and replacing the elbows with Y-joints to reduce turbulence. Simple, but effective steps when one changes one's orientation to the needed answer to a problem. He was not that impressed with the chances for improving the size of the nuclear industry. His comment was along the lines of "you can electro-stimulate the heart of a corpse, and it may jump around, but it will still be dead."

In the question session that followed he and Paul Roberts answered questions from the floor, that elucidated the following opinions.
There is not enough natural gas to refine oil from tar sands, but LNG has some value as a bridge

fuel, though it will be very sensitive to the availability of regasification plants. Shell's oil shale venture is unlikely to work, but good for them, for trying.
The best use for coal is with steam to generate hydrogen.
When asked if wind farms change local weather he got a chuckle by just saying "no!"
And he noted that while the first two speakers were grim, because they were looking back, he was more optimistic, because he was looking forward.

And that proved to be the distinction between the speakers. For after the first two, the immediacy of the fossil energy supply issue was not a great concern in the short term, but instead global warming, and the longer term view of the problem became more the focus of the speakers. There was less a sense of urgency in the answers, and there was the clear implication that we had all the time needed to develop and implement these answers.

A somewhat different view was given by Stephen Golden of Catalytic Solutions who divided ideas into technology, as something that produced commercial value, and science, those that did not. His view was toward the immediate use of ideas to improve car, with his answer reverting to the work of Otto and Diesel, who gave us the answers. He recognized the problems of diesel exhaust, but the 2-year payback on change, and the presence of diesel hybrids in Europe suggest that this is the way to go.

Joe Powell from Shell pointed out that it is economics that control the oil business, and that while it is a very price competitive business, it is also one that has had to learn some hard lessons. In 1984 the company was approaching an answer to improving the absolute amount of oil they could get from a reservoir, by following the initial water flood with a soap or micellar flood or wash which could increase recovery. However, just as they were getting a handle on the problem the price of oil dropped and the program died. So now oil prices are back up, and the question becomes one of selecting which of the alternatives that face the company will provide the right investment in the face of a changing political climate. He came back to the problems of supply by adding the potential fossil energy resources, including oil, coal, oil shale, oil sands and natural gas, and compared them to current usage, to project a peak in all fossil energy supply within the next 30 years.

He sees enzymatic hydrolysis as being the path forward on cellulosic fuels, and the generation of syngas from biofuels as also being an answer. He felt that the GTL program for natural gas from Qatar was the way to go, and that hydrogen generation would ultimately go through the syngas production route since this would allow the carbon to be captured. And, down the road, gas hydrates – despite a very significant current technical set of problems - would yield the greatest new supply. He anticipated an EROI for the oil shale program as probably being around 3:1. He also noted that CO2 sequestration in an oil reservoir increases overall return, and "dry-cleans" the reservoir quite well. Shell has some 416 MW of wind turbines operating, with the greatest complaint being about noise, and the solar advances are likely to come from the copper-indium-diselenide approach. However, in reviewing all these options, the final choice will be made on the basis of energy profit, and he did not see any major breakthrough technologies on the horizon.

Mark Jones , of Dow Chemical, noted that it is a daunting task to face a change in the underlying foundation of one's industry. He noted that the increase in the cost of the oil and natural gas drove the US from being a chemical exporter to a net importer after 2001, and that his industry, that makes many things from hydrocarbons, must now look for alternate sources from which to get that supply. He reviewed the costs and benefits of some of the choices that face his industry.

Alan Heeger was the first Laureate to address the meeting, and he talked about the work that was being done, by his group and the associated company Konarka , in developing solar cells that

are printed onto plastic sheet (and brought a roll along). Current efficiencies are about 5.6%, but he pointed out a route forward that has the potential to increase efficiency above 15%, which is the current critical threshold.

Joan Ogden then talked about the Hydrogen Pathways program at UC-Davis, and quoted a National Academy report that, in time, it is likely that hydrogen will become as cheap as natural gas. Hydrogen is already reaching the point that enough for a 300 mile trip can be stored in a car, and some of the cars are very attractive not only to look at, but also to drive. But, to move forward, and to convince the manufacturers to invest, one must define who will be the first to drive these cars, who will buy them, and why, and how many stations should be installed to adequately supply those customers. The task becomes one of finding ways of making the car a "niftier" buy than the current hybrid. She expects that the source of hydrogen will be natural gas, with a target of supplying 10 million cars by 2025. (This will increase supply needs by 10%). Yet while this is a long-term goal, in order to get there, there remains a need to define an attractive short-term strategy to ensure that we make the progress we need to get there.

Michal Moore brought politics into the debate, pointing out that the pressure points that control the efficacy of electric grids, and their sources of power, flow through the chambers that host the hearings run by local state and federal legislators. From his perspective technological innovation must be something that works now, and which can replace existing technology with clear benefit, and which can be sold to the legislators, a difficult task. It requires long-term champions to understand the issues and shepherd the project, yet legislators will only fund items that provide benefit within their current term of office. Consumers want energy whenever they flip a switch, and are not really concerned about where power will come from in the future. But what most folk fail to realize is the role of capital in all this debate. Without a long-term assured return the capital will not be there. (This point was made again later by a venture capitalist, and also brought up in a discussion I had with another speaker at the reception). Those who change, or imply change to the rules for the future, make that future uncertain, and make it very difficult to ensure the availability of the necessary capital. Bear in mind that time matters, both in terms of being ready when the supply is needed, and in terms of getting the supply available so that the legislator can get credit within their term of office. And don't forget that a reliably supply of energy is not an optional choice.

The final speaker was Bengt Kasemo from Sweden,who talked about some of the Swedish initiatives, and their hope to be free of nuclear power, while concurrently reducing dependence on oil and natural gas. That choice is made easier by the availability of rivers that can provide hydro-power, and the forests that cover much of the country. He mentioned their plan to provide a book on energy that was written in the chamber where Nobel Laureates are chosen, but which is aimed at children. He thinks they may have succeeding in creating one, but is not yet sure. The reainder of his talk dealt with the more futuristic applications of nano-technology, and he mentioned the interesting ability of shaped particles to control light through resonating at different frequencies as a function of size, and how this gets more interesting when the particles are elongated and can thus resonate in different modes, that generate different lights.

The podium was then turned over to the final panel, chaired by our second Laureate, Walter Kohn who led a panel that reviewed some of the day's discussions. It was led off by Paul Davis of Titan Oil, who have a microbial process for enhanced oil recovery. He pointed out that 80% of the worlds oilfields are depleting but that 65% of the original oil in place (OOIP) cannot be recovered - some 6.2 trillion barrels. If only 10% of that were recoverable then the world would gain an additional 20 years worth of supply. Unfortunately we have passed beyond the years of cheap oil supply and production now is challenged to keep up with supply. Hal La Flash who also spoke last

year, noted that algae gave a better ROI than most other biofuels and also that California is already ahead of most states in addressing the concerns about legislators that Michal Moore had discussed. The third panelist was Chuck McDermott a venture capitalist, who pointed out some of the issues that draw capital. He saw solar as leading, biofuels second, and clean coal (if it can overcome the environmental issues) as third.

In the discussion Walter Kohn pointed out that the developing world is at a critical point in regard to fuel supply, but feel that they are being robbed of their fair share, and are thus owed for the lost opportunity. He also said that we are bad at conservation. The sum of $35 a ton was quoted as the cost for carbon sequestration, and, in the final theme of the evening it was agreed that the politics of climate change had undergone a complete make-over within the past 12 months. Since this will impact the economics of coal power plants it makes them less attractive to banks and funding institutions, who do not like uncertainty in their investments. Thus the financing may not be there for many plants that are now planned.

And so to bed, before another full day tomorrow.