The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

Wednesday at Clean Tech 2007

Posted by Engineer-Poet on May 25, 2007 - 11:29am
Topic: Miscellaneous
Tags: brass, clean tech 2007, halley dickey, henry courtwright, live blogging, vinod khosla [list all tags]

In the middle of vacation, I'm taking some time to try to cover the Clean Tech 2007 conference in Santa Clara. I arrived Wednesday morning, missing most of the keynote speeches. When I got to the auditorium, Vinod Khosla was speaking. He was getting near the end of his presentation and toward the Q&A.

Vinod Khosla

Khosla's claims were a great deal more realistic than some here might have expected. Among the eminently sensible things he said during his talk and the Q&A were:

- (in response to a question including the statement that the power generation industry does not reward innovation):
  1. His goal is 80% replacement of fossil fuels
  2. The country needs an HVDC grid to move South Dakota wind power to New York or Arizona solar to Texas and LA
  3. One of the essential elements is a smart grid (this topic would be addressed in more detail by the next speaker)
- For biofuels incentives and subsidies, the definition needs to be nonfood inputs rather than a narrower specification.
- Grid capacity is a barrier to solar thermal technology (and presumably others).

Khosla made complete sense at the big-picture level. It may be that he only falls down when he's arguing for his own interests.

K. Brass, GE Ecomagination

K. Brass from GE (Ecomagination) followed Khosla, and began by going over the population of Asia and the technological trends going on there.

She went over a series of slides with the conclusion that it is completely unsustainable for Asia to follow the same path as the history of the West. I think we can heartily agree with this.

She said that GE's business was finding needs and meeting them. The new products will have two major performance criteria: operating performance and environmental performance.

GE has set some ambitious goals for 2010:

- $20 B revenue
- $1.5 B R&D
- Greenhouse footprint 1% reduction from 2004 baseline despite greater production.

This seems ambitious (it was the most ambitious of the 3 plans presented to the CEO) but GE seems to be trying to set an example.

Brass went over several things I remember poorly:

- "White space" ideas
- Re-lamping is an important measure. Modern high-efficiency lighting creates improvements in both cost/energy and appearance/feel.
- Ecomagination defines new ways to interact with customers. If this sounds reminiscent of the Clue Train Manifesto, it may not be a coincidence.
- GE is turning organic content of wastewater into energy. I didn't catch anything which indicated that this was more than the classic sewage-plant methane capture, but if it leads to more and better conversion of waste to resources it can only be a good thing.
- Municipal SOlid Waste. Brass went over the current practice and the potential:
  - Current practice is landfills, which are bulky and polluting.
  - Incineration/gasification reduces volume immensely and generates energy, albeit possibly with pollution issues.
  - Plasma gasification is the ne plus ultra, offering an 80:1 reduction in volume and greatly improved cleanliness. I don't know if this is practical in the near term, and I didn't catch much from Brass on that issue.

She offered up a number of points of consensus:

1. We are living in an increasingly carbon-constrained world.
2. Renewables will be a part of the solution, but only a part.
3. Nuclear power is needed and is becoming big.
4. Renewables require better grid technology (the smart grid and HVDC systems mentioned by Khosla).

She went on to some things GE is doing to make it happen. The LMS 100 gas turbine hits 44% simple-cycle efficiency. This is way above previous gas turbines, and changes a lot of the economics of power. These turbines can receive construction permits today.

GE acquired Enron's wind power unit in 2002. GE's technological expertise offers a number of synergies for wind:

- Rail supplies robust gearboxes and power converters
- Plastics supplies resins for blades
- Financial services double RE investment to $3B by 2008.

GE is into multifunction building components such as PV roofing.

I got a note on the cost of CO_2 scrubbing from post-combustion gases. The number I have is $42/ton, presumably with amine scrubbing. There are a lot of efficiency and other measures which will reduce carbon emissions for less than this, and carbon taxes or caps may shift the economics far enough to make air-fuel (as opposed to oxy-fuel) combustion uncompetitive. We'll see.

Henry Courtwright

Ms. Brass was followed by Henry Courtwright, who came to talk about EPRI and its efforts in this area. His intro went into CO2 emissions from the electric power sector. Currently ~2500 million metric tons/year, the Business As Usual projection has it rising to ~3.3 billion metric tons/year by 2030. This appears to have dire consequences (if it is possible; I did not get to ask about peak coal). His presentation of the EPRI program for 2030 covered 7 points:

1. Efficiency: Reduce electric demand growth by 30%.
2. Renewables: The standard projection is for 30 GW of RE generation by 2030. EPRI thinks this can be more than doubled, to 70 GW.
3. Nuclear: An increase of 64 GW (presumably an increase, because current capacity is about 90 GW) would further reduce CO_2 emissions.
4. Coal efficiency: Today's best plants get about 38% efficiency. Courtwright believes this can be increased to 49%, which reduces both fuel costs and CO_2 emissions [albeit not enough].
5. Carbon capture and storage. This is a post-2020 wedge [too late, more likely than not] and Courtwright did not get into the energy cost of this option. He described several technologies for both CO_2 scrubbing and oxygen separation for oxyfuel combustion, with nothing about timeframe, pilot projects or cost.
6. PHEVs: He touched on the aspects of liquid-fuel replacement (displacing carbon-containing liquid fuels with electricity from sequestered or carbon-free powerplants) and the V2G possibilities.
7. Distributed Energy Resources: This includes building-integrated PV and the like, and has the effect of removing the transmission and distribution costs and losses from the system.

It seemed to be a pretty comprehensive list.

He then went into a brief description of EPRI itself. It's a world-wide association of electric utilities, other industries and governments. It is a non-profit which supports research programs (this includes outfits like AC Propulsion).

After this, he went into the required technology for these improvements:

1. Effciency. He touched on several points:
   - The "natural" efficiency improvement would be about 13%. This is inadequate.
   - Utility and state efficiency initiatives would lead to roughly 5% improvement.
   - The total potential for improvement is 26-40%. This led into a listing of means to achieve it.
2. "Prices to devices". This involves smart devices and the information systems to get power price information to them. The devices would manage their power consumption to achieve the least cost to the consumer (which also minimizes the peak demands on generation and transmission assets).
3. Ocean power, wave and tide.
4. Improved hydropower and biomass systems.
5. Hydrogen. He didn't give much detail on this, and I doubt that he would have had any response to the criticisms of hydrogen systems from Ulf Bossel or others.

With this, the session went to Q&A. I was able to get two questions to him.

I asked about local solar-thermal generation, using the convention center itself as an example (it has several acres of surface over the parking structure). Courtwright stated that this would be

handled better by PV, because of the reduced maintenance requirements. He didn't mention, and I didn't have time to ask, if the thermal output of something like a Stirling dish system could run absorption chillers or other equipment to shift the balance in its favor.

My second question was about direct-carbon fuel cells and their potential to boost powerplant efficiency to nearly 80%. Courtwright said that this was in the early stages and wasn't sufficiently developed to put into a firm projection for 2030.

Another question dealt with carbon emission projections. Courtwright said that the improvements would include a shift from today's 40% share borne by electricity to some 70% in the future. With technologies like PHEV, this seems very practical.

In the one-on-one which followed, I also got a chance to ask him about ice-storage as a mature technology for DSM. He said it had once been popular, interest had dropped as energy became cheaper (in the 80's, I suppose), and it was a rising star once again. I mentioned the Ice Bear but he refused to talk specifics.

I kicked around a bit after that, but I didn't find any energy-technology talk of note until after the poster session.

Halley K. Dickey, UTC

Halley Dickey of UTC spoke on the subject of modular geothermal generation systems. The system he described is really quite clever, leveraging a great deal of equipment already in large-scale production for other purposes. The essence of the system is a vapor-cycle engine using common organic fluids as the working fluid. Carrier has made large-scale centrifugal vapor-compression water chillers for many years, and it happens that this centrifugal compressor is easily adapted to a vapor turbine. The size produces a machine of 225 kW capacity, and the existing production volumes allow a 16-week period from order to delivery. This machinery is currently produced in 3 plants world-wide, none of which are running more than 1 shift. Increasing the plant utilization could lead to rapid expansion of the geothermal resource.

Dickey touched on the nature of the geothermal resource. With the vapor-cycle engine, heat sources too cool for conventional systems become practical for electric production. Hot water is a byproduct of today's oil and gas production, but it is mostly ignored or even treated as a difficulty. If this hot water could produce electricity, it could both eliminate the local emissions from diesel generators to run the well apparatus and produce power for sale. This ability to use low-temperature resources could double the size of the geothermal market. How low? Dickey talked about a site in Alaska which exploits the availability of groundwater at 40°F as a heat sink to make productive use of a heat source at only 165°F. This is apparently the lowest temperature geothermal generation system in production.

Cost came next. Dickey cited a generator unit cost of $1350/kW, with installed cost in the region of $2500/kW. The details of wells and other plumbing might come to considerably more, but if they have already been drilled for oil or gas production they would not factor into the incremental cost of electricity. He claimed a cost in the region of 4¢/kWh from such a system.

B. Cinnamon, Akeena Solar

Last came B. (Barry? I didn't catch his name) Cinnamon for Akeena Solar. His company makes PV systems for installation at consumer sites. The economics are complicated, but he claims that

the various California and Federal RE credits make a household PV system pay off in as little as 9.9 years given current cost trends. The prospect of a much greater Federal tax credit could drop the payback to the region of 6 years.

I got most of the details of this in pictures which I can't get to right now, but he claimed that the state derived benefits which made such a high tax credit worthwhile. A large part of this was the reduction in the cost of the electric transmission and distribution network. Another element is grid reliability. During recent heat waves, 25 kW pole transformers were literally exploding because they were forced to transmit 30 kW or more for hours on end. Just one house on a block with a 5 kW PV system would reduce that net load to 25 kW, putting the transformer back within its design ratings and eliminating most of the failures.

I wanted to ask him about the economics of PV vs. solar thermal for the likes of the convention center, but time ran out first.

I had some other interesting one-on-one conversations afterward, but there was nothing else to report on. Well, perhaps one thing. Whoever supplied the Merlot for the open bar afterwards has a very smooth, tasty product.

And that ends my reporting from Day 1 of Clean Tech 2007. More tomorrow.

Footnotes:
1. The convention center's system is exorbitantly priced, and Santa Clara's MetroFi system is highly unreliable where I've been able to get a connection.
2. Tiger Direct seems to think that 25% of rated lifespan is sufficient for a laptop battery, and shipping a replacement to one's shipping address on the East coast when one is at a motel on the West is customer service. I take exception to both assertions.