Chris Nelder's Notes on the 2008 ASPO-USA Peak Oil Conference

September 21-23, 2008
Sacramento, California
Proceedings: http://www.aspo-usa.org/aspousa4/proceedings/

These are merely my notes, of the key points I picked up during the conference. I hope these notes will be useful to others as an index to the volumes of material that were covered. Any errors or omissions are undoubtedly mine. Please send any comments/corrections to me.

My coverage is no doubt incomplete because I can only type so fast and much of the material went by very quickly. Consider this document an index, and go back to the source presentations to double-check the data.

My personal comments are shown in [brackets]. (?) indicates information that I probably got wrong.

Since no one can be in two places at once, I could only cover part of the split sessions that occurred simultaneously. So coverage of these sessions is limited.

For bios on the speakers, see http://www.aspo-usa.org/aspousa4/ConfirmedSpeakers.cfm
For the presentations, see http://www.aspo-usa.org/aspousa4/proceedings/
(some presentations may not be posted yet; check back)

See also the list of others' notes from the conference at the end of this document.

Your humble scribe,
Chris Nelder
chris (at) getreallist (dot) com
Energy Analyst
http://www.getreallist.com
http://www.energyandcapital.com

DAY 1 – SUNDAY, SEPTEMBER 21, 2008

1:30 pm – 3:00 pm

***Reporting the Oil Story* – panel discussion**

Erica Etelson, San Francisco Chronicle
Bart Anderson, Energy Bulletin
Neil King, Wall Street Journal
John Theobald, University of California at Davis, Moderator

Started with a hilarious clip from *The Daily Show with Jon Stewart*.

Neil King

- A “sea change” this year in reportage on peak oil. A higher acceptance of the notion, primarily driven by price & public alarm.
- If the price remains below the pain threshold, we may see coverage diminish and a loss of momentum in more efficient vehicles etc.
- It’s been a very strange year for the oil business, with wicked volatility but no major geopolitical events. What lessons should we draw from this? What are the bigger concepts?
- Various factions…from techno-optimists to hardcore doomers. Analysts, journalists, traders…all focus on different aspects of the story, be it inventory levels, or official announcements, or trading patterns.
- The Oil Drum is one of the few domains where the conversation is factual and interesting and intelligent. But there is an element of willful blindness also that we are working against in the media; when gas prices fell below $4/gal, a lot of ears started to close.
- “Our problem is that the supply is old and the demand is young.” – quote he heard at an IEA meeting in Paris last week.
- Doomers vs. arch-optimists: the reality will lie somewhere in between, but where?
- He ran a couple of informal polls amongst his contacts to predict the price of oil 6 months in the future…and everybody was very wrong.

Erica Etelson

- Peak oil was one of the most censored stories of 2005, but we’re past that now. Still, many articles seem to studiously avoid the term.
- Google the term “peak oil” and you find yourself in a deep, dark realm where the collapse of society is a foregone conclusion.
- Media has short attention span and when the pain/price level falls, media coverage falls too. Most journalists would be happy to see the price fall and stay down so they don’t have to write about it anymore.
- The framing of the story is a problem. It’s currently framed as an industry problem, with no sense of government accountability, even though gov’t has known about this issue for decades and done nothing about it. The Hirsch Report in 2005 should have been greeted with screaming headlines, likewise the GAO report; in fact there were no headlines at all. Journalists have failed to hold politicians’ feet to the fire or ask them the hard questions about these glaringly serious issues.
- Industry isn’t going to somehow save the day with some new technology. Journalists really need to ensure that stepwise changes are made. E.g.,
  - Ask for meetings with the editorial boards of news organizations.
  - Contact ombudsman’s office for newspapers and ask for coverage.
  - Don’t forget about local media. Write your op-eds and letters to the editor. At the highest levels of government, they’re asleep at the wheel, but at the community level, there is much being done.
  - Try to reach sympathetic ears in your alumni networks & publications.
  - Minority journalists for communities of color need to get the word and get the word out faster, because they will be hit by the effects first and worst.

- There actually is quite a bit of good reporting out there, but we don't make adequate use of it. Every time you see a good article on peak oil, send it to everyone you know, including elected officials.

Bart Anderson

- The peak oil meme is more common now than it was, but the understanding is very shallow and driven by price pain.
- Oil isn't the only crucial thing at peak. Consider peak phosphorus!
- Presentation: "The Evolution of Peak Oil Coverage"
  - Problem at the beginning: little awareness; media & gov't uninterested; nowhere to publish; few ways to communicate
  - Around 2004, some new books (Simmons, Kunstler, Heinberg, Goodstein, Deffeyes); a few media mentions; new sites (peakoil.com, Energy Bulletin, LATOC, etc.)
  - Around 2005, new communities: ASPO-USA, TOD, PCI; personal blogs & new writers; documentaries ("The End of Suburbia"), Gov't reports (Hirsch Report, GAO Report); media interest (but little depth)
  - 2008: Mainstream now, with more books, web sites, documentaries, new writers, investors, regular coverage in the press esp. the financial press, and a spike in prices.
- There are now 4.3 million hits on Google for "peak oil". New interest from industry and governments, and local groups (PCI, Transition Towns)
- A continuing role in critiquing energy technologies, lobbying, monitoring, & working with media and allies (investors, planners, environmentalists)
- What we've done right: networked, non-hierarchical; non-partisan; more volunteers; welcoming; stimulating, constant stream of content ("like an ongoing graduate seminar")
- Limitations: It's all volunteers; limited to information and persuading – we can't actually *do* things; narrow demographics (mainly white technical professional males in English-speaking countries)
- Trends: climate, politics, economics, food & ag, urban design & transportation
- Other peaks: fossil fuels (nat gas, coal, uranium), other minerals (phosphorus), water, eco-systems (we have only a 13-year supply of indium at current rates(?))
- New voices: Third World, women, farmers, blue-collar workers, small business, artists

Q&A

- What about the "drill here, drill now" crowd? What about peak oil and invading Iraq?
- Kjell Aleklett: How do we reach non-English speakers? How do we share materials that originated in other languages to English-speaking audiences?
- Chris Nelder: How can we improve the factual reporting of peak oil? Etelson: Send the Peak Oil Media Guide to editorial boards. Anderson: Contact the writers directly, be nice, don't be accusatory. King: Try to establish a dialogue with journalists and editors.
- How do we get economists involved? Anderson: economists are not our friends, they are a hotbed of opposition! Try to find the sympathetic ones. Etelson and Anderson: Paul Krugman, and the editors of Freakonomics are sympathetic.
- Mike Ruppert: Optimistic stories are always above the fold; negative stories are always on p. 22. What's up with that? King: Disagree; new articles on difficulties

of oil sands, shales, offshore, etc. have regularly appeared on p. 1 of the *WSJ*. There is a greater sense of urgency about peak oil now than there once was.

- Ron Swenson: Desperation is driving us to oil shale, tar sands, extreme technology, etc. with greatly over-optimistic expectations, while at the same time solar and other renewables are regularly dissed. Can coverage become a little more balanced about renewables, or an improving trend? King: There are a lot more energy ads now than ever before. Energy stories of all kinds are certainly dominating the news.
- Etelson: I write about permaculture regularly but I don't call it permaculture because I want to get it published.
- How can we get more politicians to talk about it? King: Roscoe Barlett has been giving his talk many, many times to a mostly-empty chamber. It's a hard thing to get politicians to talk about a story that nobody wants to hear.
- Liz Warren (who covered peak oil as a "most censored story" in her thesis): We seem to expect media to be entertaining; how can peak oil be presented in a more entertaining way, and how can we reach youth? Etelson: Youth are particularly interested in community gardening, permaculture, etc. King: Props to Oily Cassandra and KrisCan! [Hear, hear!]
- Do IEA officials express privately a different sentiment than what is reported? King: Yes, absolutely, there are folks at EIA, IEA, Saudi officials, even President Bush who know that the options are limited going forward.

3:30 pm – 5:00 pm

***Analyses from** The Oil Drum* **– panel discussion**

Robert Rapier, Oil Drum Contributor, R-Squared Energy Blog, Accsys Technologies,
Jeff Vail, Oil Drum Contributor, Davids Graham & Stubs LLP
Brian Maschhoff, Oil Drum Contributor
Kyle Saunders, Oil Drum Editor, Moderator

Robert Rapier: "The Energy Information Providers"

- His first ASPO conference because his previous employer, ConocoPhillips, didn't want him to come!
- Review of the most common energy information agencies: EIA, IEA, CERA
- EIA is good for:
  - Current data on exports, consumption, optimistic forecasts, etc. Good statistics. Outlook reports, etc.
  - This Week In Petroleum (TWIP) – weekly – has the power to move markets because it has the inventory updates.
  - How I use the EIA: To debunk the claims made by confused politicians, etc. To get good shared information, e.g., import data. For current reporting, e.g., gasoline stocks during a hurricane.
- What I don't use the EIA for:
  - Price forecasting: over the past 12 years, have been consistently wrong, by as much as 127%. Average error was 53%.
  - Supply forecasting: consistently too optimistic. But the problem is that everyone uses their forecasts for policy planning!
  - Zoom in on 2008 Annual Outlook: expects oil imports to suddenly drop after a long period of constant growth!

- IEA (International Energy Agency): Energy policy advisor to 27 countries
- IEA Oil Market Report, World Energy Outlook, other good reports, special reports, statistics on oil, natural gas, coal, etc.
- How I use the IEA:
  - Monthly OMR (Oil Market Report) has the most current estimates of world oil supply. Excellent source of worldwide inventory data, world refining margins, etc.
  - Understanding supply/demand risks. Watch the charts, e.g., stock builds, days of forward cover.
  - IEA has adopted a more pessimistic tone than the EIA….downward revisions of OPEC spare capacity, impending supply crunch, "peak lite"
- CERA:
  - Clients are big oil companies, and CERA reports the story they like.
  - Forecasts have been terrible since 2002. E.g., prediction of $20s - $30s in 2005 for oil price, actual was $65/bbl
  - Forecasts of supply wildly overdone
  - In 2008, they reversed course and noted a "perception" of supply issues.
- Misc sources:
  - BP Statistical Review of World Energy
  - Drumbeat on TOD
  - Oil Price information Service (OPIS)
  - Platts
- The major agencies do a great job of reporting data, but a terrible job of forecasting. Government and business leaders who depend on this data for their decisions will be badly misled.

Jeff Vail: "The Geopolitics of Energy"

- "Rational extraction sets the stage for geopolitical problems." Geopolitical challenge rises as geological challenges increase (?)
- "Market-driven conservation & efficiency increase in elasticity." More extreme measures are needed to ensure supply.
- "Highly theoretical disputes drive very real conflict." Oil as a subset of the intersection of "nation" and "state." E.g., disputes between legal owners and moral owners of oil resources. How do you meet the needs of all stockholders together?
- "Actors seek to secure their slice of a shrinking pie." If we seek to maintain our current share of energy supply as others' shares shrink, who loses? Pipelines are a good example of this, predetermining who has access and who doesn't. "Military adventurism."
- "Tactical evolution increases geopolitical threat to energy."
- "These developments act as positive feedback loops"
- "Geopolitical feedback loops exacerbate peak oil" [interesting graph!]…Production under geopolitical reality (feedback loops) will make the reality considerably worse than the geologically *feasible* production curve.
- "This is a global feedback system." Mexico's events affect Iraq, affects Nigeria, etc.
- "'Solving' symptoms leads to alternative negative outcomes." A lesson in unintended consequences.
- "Addressing causes requires radical restructuring." Radically: Decentralized? Renewable? Vernacular modes of consumption? Realistic? What is a realistic

way to choose and then implement an approach to stopping geopolitical feedback loops? Really, geopolitics is a force of nature.
- Our energy future isn't solely determined by what is possible geologically, politically, or economically. Geopolitics can always trump those factors.

Brian Maschhoff ("JoulesBurn" on TOD): **"Saudi Aramco and the Art of Oilfield 'Maintenance'"**

- What does "maintenance" mean? It really means production…maintaining a certain level of production. But "production" isn't right either, because you're not making anything, you're extracting.
- Maintenance: Putting wells where no well has gone before (unswept zones). Reworking existing vertical wells (simulation, horizontal tracking)
- What about existing Saudi Aramco megaprojects? 2003-2011…delays are common. A lot of inflated numbers on the heavy oil side for KSA
- Madness: Monitor Saudi Aramco from the comfort of your own home. Classify and quantify oil field infrastructure from satellite photos. On a paltry budget. But we can't measure oil flowing from wells, nor make money from doing it.
- Methods: Google Earth, Digital Globe imagery (Quickbird Satellite), finding wells, counting, aligning and comparing imagery with dated maps (find what has changed)
- "Jeopardy!" slide…what fields are really being discussed in the press?
- Looking at satellite photos, it can be tough to distinguish what is what…e.g., gas wells vs. oil wells.
- North Ghawar shows major overhaul, after 40 years of operation. [Numerous slides showing progression of oil wells drilled in various parts of Saudi Arabia.]
- Diagnosis: Old production is being replaced daily. But they're running out of dry rock in Ghawar. Still a lot of oil, but they're out of giant fields. Expanded production will depend on a collection of a lot of smaller fields.

Q&A:

- How concerned is the US military and what are they doing? Vail: Studies are being conducted into the energy footprint of various options. Military is clearly concerned but they may not yet understand the long term implications of it.
- Why didn't Robert Rapier include USGS data? Because the data is pretty worthless.
- What about population? Vail: Third world is getting priced out, but there don't seem to be any good (implementable) and equitable solutions.
- How much oil is left in Saudi Arabia? Maschhoff: We can only go by the information they put out there.
- When will Russia's exports fall to zero? Vail: Russia is one of the few cases where population (decline) is actually working for them. But Russia is also exerting more control over the FSU countries that surround them.
- What about water? Vail: Used to work on water reclamation. Water is even less substitutable than oil.
- On a question about unconventional oil production, Rapier: "It's a fact that there is more than a trillion barrels of oil in shale; it's also a fact that it will take more than that to get it out."
- On the Pickens Plan: Maschhoff: Transportation fuel is a huge gaping mouth that you can throw anything into and it still won't be enough.

6:30 pm – 7:30 pm

Dr. Peter R. A. Wells: "OPEC Dilemmas, Issues, and Responses"

- Introduction by Steve Andrews; Toyota has known about peak oil since 1992, internalized it, and thus became the Prius.
- OPEC produces 42.8% of the world's crude, proportion will grow as time goes on
- When OPEC increases capacity, they get stuck with a loss in demand. How much spare capacity should they invest in? Spare capacity currently 1.5 million barrels per day (mbpd)
- OPEC is diverse; price hawks in Venezuela, Iran, Iraq; others like Qatar, KSA and Kuwait with higher per capita GDP are less keen on expanding capacity
- Decision making is very slow; national heritage, timing of investment, etc…save some for the grandchildren. When should they time the investment? How not to get stuck in the same situation they were in the in the 1980s? Why expand to reduce prices? Politics…Iran, Iraq, Venezuela, Nigeria, Kuwait
- Fields are old, and there is competition between the old & newer producers. Kuwait, Qatar, UAE, KSA: $1,5 trillion invested, mostly in the US. They don't want the price to go too high for demand destruction, and they don't want to hurt the US too much for the sake of their investments.
- New production capacity is also high risk.
- Exploration success in OPEC peaked 40 years ago
- The large OPEC fields are mature (fields >2 billion bbls reserves)…not much has been discovered to replace the older fields. Fields are being replaced at a very conservative rate.
- World liquids supply model: OPEC is expected to make up the loss for non-OPEC supply.
- Crude oil makes up 86% of the "crude oil" supply [the rest is natural gas liquids, etc.] (?)
- But it's not just geology; marginal cost of supply alters the mix and the size of reserves
- Balance & interaction between geology, money and politics. Balance affected by long lead times in supply projected 5-15 years forward, and ultimately the finite nature of supply. Insufficient spare capacity leads to high oil prices and demand destruction. Excess spare capacity weakens oil prices and can reduce supply at the margin.
- Most of the time, spare capacity doesn't matter to price. It mattered in the 1980s when there was too much spare capacity, but that floor was set by the needs of the KSA budget and it stuck for 20 years. Around 2002, KSA capacity started to fall, in part due to increasing demand from China, but there was also the declining production from non-OPEC. Then price started to rise dramatically. Now high prices will lead to some new capacity and a short period of lower prices.
- We have produced 864 billion (bn) barrels (bbls) to date; 1,111 bn remaining & TBD (HIS data)
- According to USGS/CERA, another trillion bbls remain to be discovered. But we have nowhere near that.
- Enhanced Oil Recovery (EOR): In US peaked around 2000 via miscible non-hydrocarbon gas injection (CO2, N2)

- US EOR: specific to field, reservoir, oil type, location…works best in poor reservoirs with light oil; not so much for deepwater. No gains for light-medium oils in good quality reservoirs
- Global EOR: potential 220-470 billion barrels (CERA: 592 billion barrels) and most of that is in OPEC, so we won't see it for a long time in the future.
- Total potential: ~ 3 trillion barrels
- Peak around 2012-2013 for conventional crude. (CERA estimate way, way higher, assumed to be filled by exploration success and EOR)
- Methodology: using simulation model approach to crude forecasting, using probabilities, time between discovery & first production, field-by-field specs
- EOR: good match to historical production for non-OPEC.
- Most non-OPEC, non-FSU EOR projects are offshore (80%!) (?)
- 625 bn bbls produced, 530 bn to go for non-OPEC; we're at the peak for non-OPEC.
- Most of OPEC is "above ground" risk; for non-OPEC, "below ground"
- OPEC: issue is not reserves but maximum sustainable rate and pace of getting there.
- KSA field-by-field assessment: total remaining: 278 bn bbls; production to end of 2007: 115 bn bbls
- Iran: produced to end of 2007: 61 bn bbls; Total remaining: 90 bn bbls
- Iraq: produced to 2007: 31 bn bbls; remaining: 177 bn bbls
- Venezuela: 58 bn bbls produced by end of 2007; remaining: 322 bn bbls…will mostly be produced after 2020 because it's undesirable heavy oil
- OPEC production forecast: Will reach 40 mbpd, no higher, mainly due to political decisions
- Challenges for OPEC
  - Balance creation of capacity to guesstimate future call on OPEC
  - Difference between non-OPEC liquids and demand
  - Excessive investment needed…
- Natural gas liquids (NGL): Peak around 2020; non-crude oil liquids (CTL, GTL, tar sands, etc) peak around 2025 (?)
- Peak liquids: ~98-105 mbpd around 2020 (2017-2030)…demand has surprisingly little impact
- World crude oil peaks around 2015; around 2015 will be a major crisis in price.
- Other liquids like biofuels, tar sands, etc. help to defter world liquid peak by 3-5 years, but cannot ramp up quickly. They take a long time & a lot of investment.
- Does not believe that north Ghawar is about to water out. They will have to start EOR in the region within the next few years because it will then begin to water out.
- Re: Kashagan, the problems are technical and environmental. Expensive gas extraction & processing & reinjection; also impacts on sturgeon. 2013-2015 is when oil production might begin, and will ramp up slowly, disposal of sulfur will be an issue.
- Estimating yet-to-be-discovered oil is "an opinion." About 300 bn bbls yet to be discovered; few oil geologists agree with USGS.

DAY 2 – MONDAY, SEPTEMBER 22, 2008

8:00 am – 8:30 am

Opening Remarks

Debbie Cook, Mayor of Huntington Beach, CA, ASPO-USA board member
Steve Andrews, Co-Founder, ASPO-USA
Kjell Aleklett, President, ASPO-International

Andrews: Comments about the meltdown in the markets…we are at the most severe point in the markets in our lifetimes.

There will be an update on the bet with CERA. ASPO does not believe that world oil production will reach 100 mbpd by 2017…

Kjell Aleklett

- ASPO International formed in May 2002 by Aleklett, Colin Campbell and others.
- Some general comments about what peak oil means, and a brief history of the organization.
- Reviewed some per capita data from various countries.
- Discussed the impact of the net export problem.
- Regarding African production, "It's the biggest robbery in history."
- Quoting King Abdullah of Saudi Arabia: "The oil boom is over and will not return. All of us must get used to a new lifestyle."
- Made a bet with Tony Hayward (of BP) that in 10 years, oil production will be lower than it is today, and the amount of the bet is the price of a barrel in 10 years.

Watched a clip from the movie *Three Days of the Condor*

8:30 am – 10:00 am

OIL: Once Cheap, Never Easy
Panel discussion

Ken Verosub, Professor of Geology, UC Davis
Gill Mull, Alaska Geological Survey, retired.
Jeremy Gilbert, Barrelmore, Ltd. formerly BP Chief Petroleum Engineer
Sally Odlund, ASPO Board Member (Moderator)

Gill Mull is ill and was unable to attend but his presentation is posted online.

Ken Verosub: "Petroleum 101"

- Recalling Sinclair oil company and the notion that oil comes from dead dinosaurs. Oil in fact calls from small marine micro-organisms in the ocean, which fall to the bottom when they die, to become incorporated into source rock as they decay. A porous rock like sand or carbonate reef then must be deposited to collect the material. On top of that there must be a cap rock to secure the deposit in a trap, and keep it from migrating to the surface. Then the organic material must be cooked at just the right temperature: the "oil window." Most oil comes from rocks that are hundreds of millions of years old.
- Reviewed various kinds of stratigraphic traps.

- Reviewed seismological methods of surveying traps, like “thumper trucks” and “geophone arrays” that listen for the thumps, on up through 3-D computer models.
- All of the easy oil has been found. Efforts to find oil are getting more extreme and technologically complex.
- Reviewed the rough bell curve of an oil field’s production, the Hubbert Curve, and his correct prediction of the peaking of US oil production in 1971.
- Discussed the relationship between discovery and production curves. We are long past the peak of oil discovery, and have been running a growing deficit for years.
- Ridiculed the scientific illiteracy of Newt Gingrich’s “Drill here, drill now, pay less” campaign, and the unsubstantiated claims of Wall Street analysts who claim that we just need to drill more (most of whom, thankfully, probably don’t have jobs anymore)
- Deepwater offshore is where much of the remaining oil is to be found. But we won’t find any big fields…reviewed Hubbert Curve of oil discovery, showing the declining size of oil finds.
- Even if we did have some large new finds, it takes about 10 years to bring any of it to market.
- How much time do WE have left?:
  - Total US reserves: About 20.9 billion barrels
  - Total US daily consumption: 20.7 mbpd, of which we import 11.7 mbpd
  - Domestic oil, daily consumption: 9 mbpd
  - US domestic oil, annual consumption: 3 billion barrels per year
  - 20.9/3= 7 years
  - So: we only have until about 2015 +/- 2 years for remaining domestic production!
- Global competition for remaining oil, with a likely global peak around 2010, means that prices must rise to resolve the tension.
- World:
  - 32 billion barrels per year (bpy), call it 35 billion bpy/365 or ~100 mbpd is the theoretical peak.
  - Again: 2015, +/- 2 years…”It’s crunch time!”
- Official future production estimates defy this reality…
- As consumption rises fairly slowly in industrialized countries, it’s rising much faster in developing countries, leading to a fairly sharp global increase in the rate of oil consumption.
- “This is a global problem!” In China, everybody wants to drive an SUV, and aspire to a US standard of living.
- Since 1965, US consumption has increased 70%, while China’s has increased over 3000%
- 100 mbpd on the chart is likely to be around 2016, the maximum theoretical peak.
- “In about 7 years, demand for oil will exceed maximum total oil production. Then what happens???”
- Why can’t we be like the Europeans, and use far less oil per capita? Are you ready to live like a European and cut your oil consumption in half? Then which two of your family’s four cars are you willing to give up? Which processed foods will you give up? Which half of your wardrobe? Etc.

- But because there are so many more people in the developing world than in the US, a 50% reduction in our energy consumption only gives them a 33% gain. Inversely, if the rest of the world were to increase their consumption by 100%, we would have to reduce ours by 80%.

Gill Mull: "Alaskan Oil: Prudhoe Bay Discovery and Outlook for North Slope Oil"

- Mull is ill and unable to attend, so some slides were highlighted by Sally Odlund of ASPO.
- TAPS has min capacity of 200 Kbpd to keep it flowing.
- Some photos and maps of ANWR and various wells
- Alaskan oil production peaked in 1988
- ANWR has surface seeps, rich source rocks with anticlines and caps
- P50 [50% probability] estimate for ANWR: About 10 billion bbls in aggregate
- All of the new fields put together can't come close to overcoming the peak profile caused by the North Slope

Jeremy Gilbert: "Peak Oil Global Overview, An American Wake Up Call"

- "It's time for you guys to wake up!"
- First wake up call: [ASPO conferences in] Uppsala 2001, then Denver 2005….Now, after 7 years, what's changed?
- While America slept:
  - Discovery rates continue decades-long fall
  - Calculations suggest reserves can't meet demand projections
  - Some recognition of political, investment risk in developing resources
- 2008: No improvement in resource situation. New, more accurate calculations of supply define earlier and clearer peak. Political will to increase supply clearly absent; prices not stimulating investment to increase supply.
- IOCs are not investing the way we have hoped and expected.
- Oil consumption per capita: The US, Canada and the Middle East use the most by far, and there has been little changed on a per-capita basis. [Excellent morphed maps!]
- IEA's wake up call: "There are three problems: Geology, investment, and policy of main producers. These, taken together, make the future of oil very difficult." – Fatih Birol, IEA Chief Economist
- Some wild statements of wishful thinking… "In your dreams"
  - The explorers will fix it; there's lot of oil out there - think of Jack and Tupi; add in the OCS (Outer Continental Shelf) and ANWR (Arctic National Wildlife Refuge)
  - Worldwide reserves/production ratio is still 40, there's lots of time to find other energy sources.
  - Technology will deal with the problem: add just 10% to recovery efficiency and we're fine.
- While we still have people like Kissinger and Gingrich giving us palliatives, we're not in a dream, we're in a nightmare.
- Discovery peaked 40 years ago; production increases all the time, but what we're producing is the oil we discovered 40-50 years ago. Once the cushion of discoveries from the 1940s-60s is used up, where will we turn? We discover about 1 for every 4-5 bbls we use today.

- If all of the OCS were opened to exploration, we might get a 20% increase in reserves. You have to look 15-20 years ahead to see any substantial amount of that oil come to market. “This is not going to help you!” It will not move the peak.
- The reserves/production ratio…oil production doesn’t go flat and then hit the end and plummet to zero; it declines in a curve over time.
- The world falls from ~85 mbpd to ~18 mbpd in 40 years, and ~8 mpbd in 60 years! So yes, the oil will be produced, but not at nearly the rate we now have.
- New technology: Little indication that recovery efficiency is increasing in established fields. Main benefits seems to be in dealing with unexpected problems and in finding small accumulations.
- We’re trying harder and drilling a lot more wells, which close to doubled over the last few years, but production has been flat.
- Russian oil production was counted on to keep non-OPEC production growing. But their production has fallen from about 9.9 mbpd in 2007 to about 9.7 mbpd in 2008. It looks as though their production has peaked (for whatever reason).
- Consider that energy growth is relative to GDP growth, then realize that non-OECD is way behind us.
- High gasoline prices produced a decline in gasoline consumption growth since December 2007, with about 100-150 kbpd of gasoline consumption decline per month
- Looking at long queues for fuel when shortages developed in China and Scotland recently.
- WAKE UP, AMERICA!

Q&A

- Gilbert: The biggest problem is the general ignorance of the oil supply/demand situation. Proposes that those who take a 10-hour class in supply and demand on oil get a 10% cut in their income tax. [If I may: A capital idea!]
- Verosub: The message needs to be that the problem is real, it’s huge, it’s global, and it’s transformational. Some people will die from famine, disease, etc., but civilization as a whole will survive. This will change the world in a way that we have not seen since the industrial revolution! We need to throw resources at this problem in an international way. And we should stop throwing money away on space trips to Mars, bad biofuel policies, bridges to nowhere and other wasteful projects.
- Gilbert: Can’t account for Nansen Saleri’s much more optimistic expectations for reserve growth. New tech does in fact give higher efficiency & greater recovery, with recovery factor increasing from 30% of oil-in-place years ago, to as much as 50% today, but we need that new technology to deal with the more extreme characteristics of the remaining fields. [The implication being that net production will not grow due to EOR.)
- The fact that remaining oil is largely heavy and sour will make life more difficult.
- Verosub: Cuts will be in manufacturing, food production, etc., not just driving less.
- Gilbert: About a half-trillion dollars per year flows into the Middle East for oil. We’ll see wars, we’ll see famine, we’ll see increased blackouts and shortages.
    - o

10:15 am – 11:45 am

Pipedreams: Oil & Gas Delivery Bottlenecks

Panel discussion

Morey Wolfson, ASPO-USA Board Member, Utilities Program Manager at Colorado Governor Bill Ritter's Energy Office
Matthew Simmons, Simmons & Co. Int'l
Randy Udall, ASPO-USA Co-Founder (Moderator)

Udall: Check out good report on shale gas by Deutsche Bank Securities Inc. research analyst Shannon Nome, "From Shale To Shining Shale: A Primer On North American Natural Gas Shale Plays" [I was unable to find this online.-CN]

Morey Wolfson: "Google Earth Fly-over Global Energy Infrastructure"

A breathtakingly fast, head-spinning tour of major world energy projects using satellite photos from Google Earth. [To see it, first install Google Earth, then open this file: ASPO-USA_Global_Energy_Infrastructure.kmz]

[I could only take very fragmented notes of this presentation, it went by fast. I'm not sure I got all the stops. Notes are from Wolfson's verbal commentary.]

- Sakhalin Island, a huge Russian project, $20 billion project. Massive time and cost overruns.
- China: Three Gorges Dam. Huge hydro project (600' tall, 1.5 miles long).
- China: coal fired generating station. China will build about 1 plant a week for the next decade. China has overtaken the US as the top emitter of GHG.
- Newcastle coal plant in Australia…largest thermal coal facility in the world. Japan is their top coal customer.
- Australia: Uranium mine…Oz has the largest uranium reserves in the world
- Bangladesh: At sea level, likely to have mass refugees from rising sea levels
- Ras Tanura refinery in Saudi Arabia
- Ghawar field in KSA, producing 5 mpbd
- LNG terminal in Qatar, the largest gas exporter in the world. New export facility is the largest such facility in the world.
- Nuclear reactor in Iran…expected to build 6 new plants by 2021
- Antwerp refinery, with 360 kbpd production, second largest in UK (?)
- Copenhagen wind farm, a huge offshore wind farm.
- Nigerian port, largest exporter of oil in Africa.
- Brazil: sugarcane ethanol facility.
- Columbia: a coal port from a nearby coal mine (world's largest open pit coal mine)
- Venezuela: oil port facility
- Gulf of Mexico, Thunder Horse oil platform ($1 billion platform)
- Houston Ship Channel, approx ¼ of US refining capacity
- Lake Charles LNG importation terminal
- Iowa corn ethanol facility…US uses more ethanol than any other country in the world
- Palo Verde nuclear facility outside of Phoenix, AZ
- Nevada CSP plant – 64 MW
- Palm Springs wind farm
- Powder River basin in Wyoming, huge coal operation, 25% of US coal production

- Alberta tar sands project
- Alaska pipeline, terminal in Valdez, AK
- Choke points: The Strait of Hormuz, where 25% of the world's oil is moved
- Pakistan: Gwadar Port, project in partnership with China
- Red Sea strait, 3+ mbpd flows through
- Suez Canal, transports 4 mbpd
- BTC pipeline
- Turkish straits, 2.4 mbpd flows through there
- Strait of Gilbraltar
- Panama Canal, 0.5 mbpd flows of oil…may not be expanded because the Northwest Passage is now a reality (saving 4000 miles)
- Straits of Malacca, a chokepoint in Singapore

Udall: Coal train leaving Powder River basin is about 150 miles long (?!)

Matthew Simmons: "Grappling with Energy 'Risk'"

[See video and related interview at the conference here.]

Aging Infrastructure, Workforce, etc.

- The combination of Ike, Bernanke and Paulson made for a week that will go down in history. How casually we take the concept of risk!
- Era of deregulation, "transparency," globalization of capital markets and securitization were suppose to take out "financial risk"
- Derivatives were supposed to disperse risk "elsewhere." Risk has reached 300 or 400-to-1 in some cases. We've made a situation that is far worse than the 1920s.
- Proper size was deemed to create a system that's too big to fail
- LTCM was a prelude…Enron happened 7 years ago and was a prelude to what might happen next
- And the lava gushed…Merrill, Fannie, Freddie, Lehman…
- Risk is a very real term, still exists, leverage can be extremely dangerous. The greater the risk, the faster big systems can fail
- Peak oil and gas has ominous parallels to financial crisis. Most observers do no graphs of peak oil, (?) or how savage a post-peak world can be
- Were Gustav and Ike the initial tremors of the big bang crisis?
- Recent collapse in petroleum prices created a false sense of security
- Hurricane aftermath: GoM has been offstream since early Sept (~30 million barrels not produced)…many plants still not producing…LOOP pipeline and HSC were crimped. This is all draining inventories.
- Could we have a "run on the bank" with fuel stocks like we have in the financial system and breach MOL [minimum operating levels]?
- **Topping off tanks literally creates a run on the bank.**
- An example of how fast we could break the bank:
  - 220 million vehicles
  - 20 gal capacity each
  - Average tank has 5 gals in it
  - Topping off ~15 gallons x 220 million = stock draw of 78 million barrels.
  - Current finished stocks: ~87 million barrels!
- What happens when stocks deplete?

    - Food supply in jeopardy within a week
    - Economy slows to a crawl
    - Financial markets panic
    - Energy risk is finally grasped.
- If heating oil also becomes scarce, a cold winter will be a disaster in the US. A few weeks of winter could deplete usable stocks. 9-10 million homes rely100% on heating oil for winter heating.
- **What are the odds? No one knows.** Reported petroleum stocks are only estimates; there is zero data on secondary/tertiary stocks. The odds of this eruption occurring are higher than another hurricane occurring.
- "How could the world's most prosperous, advanced society move into harm's way so fast?"
- Peak Oil is like Gustav/Ike squared. The ebbing of supply is equivalent to current crisis…are we flying blind into a Cat 6 storm?
- We need to demand country-by-country production data, including key fields, various grades…
- Key fault lines:
    - Energy intensity to create usable petroleum from unconventional crudes (shales/tar sands).
    - Drilling rig tightness & shortages, but we have no data! (No rig count! We just have estimates).
    - We lack realistic expectations…
- Is the size of oil markets "too big to fail?" 85 mbpd is the world's largest single industrial market by several fold. But there are no regulators like the Fed, etc.
- Other risks:
    - The straits: Malacca, Hormuz, Yucatan/Cuba passage, etc.
    - Key facilities: Abqaiq, LOOP, TAPS
- What about insurance? SPR is limited and should not be used to manage prices. Untested EIA member country energy stocks. Line fill in pipelines and tank bottoms, then we're out of gas (finished product). Afterwards, we are in an uncharted sea and probably "out-of-gas."
- Could an energy pandemic really happen?
- **Most global leaders have no idea of any of these risks.** Peak oil is still barely understood.
- It took 5 months to melt down the whole financial markets.
- Energy markets could unwind in less than 30 days. Risk is real, energy risk is real risk squared.
- Rust is also energy risk squared. 98% of the infrastructure is built out of steel…a ticking time bomb.
- Energy oxymorons:
    - Energy independence: 100% impossible.
    - Improved technology: zero impact on any of these risks.
    - More drilling: we have no spare rigs and few places to drill with timely high impact.
- We live in a dark world of hidden data on energy.
- All past great crises were also ignored until we hit the tipping point.
- Peak oil is the singular and most ominous risk of the 21st Century.

Q&A

- Topping off tanks could cause shortages, and it will take a long time to rebuild the supply cushion. Running out of food is the most serious implication. Shelves can go empty in 5-7 days.
- This last week was potentially the “big bang”
- The Council on Foreign Relations (CFR) hasn’t had a serious energy event since 2004. They’re almost energy illiterate, despite being geopolitical experts.
- If we radically increase tight sands and gas… Barnett Shale has saved us from some serious gas supply issues. Net energy of Barnett Shale (traveling 70-80 miles per day to the rig, plus transport of rock, etc.) is questionable…it could be a net energy loser. We have real limitations of rigs, people, etc. We’re not gonna flood the world with shale gas.
- I wouldn’t want to be in a presidential cabinet for one minute…
- Peak oil is so much more real, and more immediate, and serious than global warming, but we have a large consensus about the latter (when the data is even less clear) and near total illiteracy on the former.
- Comment on Peter Wells’ more optimistic assessment of KSA reserves last night: We really don’t have any idea how much is there. 110 billion proven, 260 billion est. What we really need to know is how much is light sweet, and when/how fast will the largest fields decline?
- If I could get over the worry about people topping off their tanks, I’d be more optimistic. We’re going to have to rebuild our energy infrastructure. The Starbucks economy came to a grinding halt, and we’re going to have a long period of Wall Street remorse.
- Dr. Sadad al Husseini says that the world basically has no spare production capacity left, and I believe his estimate.
- The fact that we have to guess at the global depletion rate should make us all nervous. Why don’t we have better data on depletion?
- When will it be possible for an American politician to tell the truth about energy? I think it’s possible, based on my experience in speaking before many audiences in the last several years.
- Re: the new IEA report in November…Birol has been working on it full time for months. For the first time we’ll have a supply driven model. Birol is having a terrible time finding any significant pockets of good news. All of the agencies are under incredible pressure to cheer up their news. Stay tuned for November 15, it should be a shocker!
- We need to liberate the workforce and let people work from home…that day might finally be here.
- We can’t actually ration anymore. What we did in the 70s with even-odd days required service station attendants…only about 1 out of 4 stations has attendants anymore! We will need to print up rationing coupon books like we did in WWII to prevent a “run on the banks” in gasoline. Evidence suggests that many people are running around with $5 or less worth of gas in the tank!
- Get rid of vulnerable investments. Buy infrastructure companies because we have to rebuild everything (Baker Hughes, SLB, RIG, etc.)
- Re: the Energy Watch Group report saying that oil actually peaked in 2006. EIA’s databook shows that 2005 production was the all-time peak near 74 mbpd, slight decline since then. Newest data just barely exceeds that all-time peak, but it is subject to further revision. It’s very hard to imagine how we could ever get to 75 mbpd of crude.

- Should we try to print our way out of the financial crisis? We're lucky that foreign countries are still willing to ship us any oil!
- Check out The Hunt for Black Gold program on CNBC with Maria Bartiromo, including an interview with Simmons this Wed night!

12:30 pm – 11:45 am

Awards
Julian Darley, John Theobald and The Oil Drum received awards

Jim Buckee, Talisman Energy: "Peak Oil and Resource Nationalism"

- World oil field sizes: the top three fields (Ghawar, Burgan, Cantarell) are huge compared to everything else. Ghawar is unknown, but the other two are in decline.
- 97% of the world's known reserves are in 10% of the fields.
- Prudhoe Bay (and indeed all fields) go into exponential decline.
- Samotlor, Forties, West Texas – all in terminal decline. [Charts showing numerous fields in terminal decline.]
- On average, fields decline after 50% has been produced, on average decline at 10% pa. Depends on quality of the reservoir, facility constraints, etc.
- Demand growth 1.5% pa. World decline: 5-7% pa. Decline will be 50-60 mpbd in 10 years (6 Saudi Arabias).
- [Numerous detailed maps and charts on Saudi oil fields…Abqaiq is good, north Ghawar is good, but south Ghawar is bad.]
- Ghawar 174 x 16 miles…190 bn bbls OOIP (assuming 60% recovery factor). Reserves 80-90 bn bbls… 5 mbpd current production.
- Cantarell…massive decline rate
- Sadad al Husseini: "natural declines in existing capacity are real," getting KSA to 12 mbpd of production would "wreak havoc within a decade."
- Chairman Farouk Al-Zanki: Burgan "peak output in 2007 at 1.7 mbpd not 2"…reserve uncertainty
- Daqing (16 bn bbls): liquids 3% decline
- Alternatives: rate vs. volume. World NGL production will peak in 2010-11 (over 9 mbpd)
- World XTL (anything-to-liquids)…peaks at 2.5 mbpd in 2012.
- If conventional oil reserves are 750-1000 bn bbls, decline is 50-60 mbpd over 10 years. NGLs (probable), yet to find (10-20bn bbls), EOR, plus bitumen/extra heavy all together equals about 300 bn bbls, and can't make up for conventional decline.
- Why Majors are quiet on peak oil:
  - In a big company, CEOs are advised by economists: "commodities always go down," "ingenuity overcomes scarcity," …Club of Rome, Malthus cast ridicule on scarcity arguments
  - "There is plenty of oil we could get at it" - ignores volume vs rate argument!
  - "Low cost producer wins" – true but opportunity missed.
  - Political implications? Heavy implications!
  - There are signs of change: "end of cheap oil"
  - Predicting oil price is difficult
- Industry Outlook

    - Exploration is tough – F&D [finding & development cost] is rising
    - Industry is extremely tight: people, services, equipment
    - Costs have doubled in the past 3-4 years
    - Industry fights declines every day
    - No opposite of a train wreck. Things don't suddenly get better than they have been.
- Resource nationalism is rampant!
    - Host gov'ts want sovereignty and control, not tax collection. Also a rebalancing of power and status with the West.
    - Mineral resources deplete – finite pie to cut up
    - Not limited to OPEC!
    - But oil in the ground has no value!
    - Governments should maximize value…leave some in the ground
- Various slides on the share of revenues depending on the PSCs [production sharing contracts]
- Resource nationalism
    - IOC [independent oil company] motivation is to grow production, reserves, hence revenue
    - But host government motivation is more complex
    - How much money is enough? An empty purse is bad but in high prices other factors play
    - Do mechanisms exist to spend money usefully?
    - What to do with petrodollars?
    - Oil as a weapon (Venezuela, Russia, etc.)
- Current account balances are terrible for India, China, etc., and are huge for Venezuela, Libya, etc. Remaining fields with access to outside investors have extremely low financial returns.
- Rise of the NOCs [national oil companies]
    - Libya takes 55% from Oxy
    - Shah takes 55% from Anglo Persian
    - Venezuela takes 60%
    - KPC took over Gulf Oil, etc.
- Majors are rather minor in terms of reserves! Exxon, the largest of the "majors" is only #17 worldwide in terms of reserves!
- Rise of the International NOCs (INOCs): Statoil, Yukos, BP-TNK, etc. Benchmarking and chest thumping. ONGC, CNPC, Sinopec, CNOOC etc. are serious competitors.
- NOCs have problems
    - Uneasy relationship between NOC and government
    - Often used as a piggybank by gov't, starving reinvestment (Pemex, Petronas)
    - Upper echelons often choose other than by merit
    - Corruption – money siphoned off
    - Contract and sourcing sub-optimal
    - NOCs reflect the national culture…deference, unwillingness to say no, promotion by status or age, bad news messenger gets shot…
    - Inefficient: $15.28 revenue per barrel for IOC vs. $5.25 for NOC
- Exports fall faster than production. Population growth, food prices, subsidies for fuels, etc. In Indonesia, subsidies are 30% of the state budget!
- NOCs and INOCs get priority

- But NOCs provide more certainty for complex projects, and are aligned with host governments (as opposed to service companies)
- Not all governments want neo-colonialism
- The problem of reserves stalls progress.
  - Oil companies are partly valued in the stock market by booked reserves
  - In order to book reserves there must be "ownership"
- Gap between supply and demand increases relentlessly between 2005 and 2050. The world is expected to consume over 693 bn bbls of oil and over 2,500 tcf of natural gas from 2005-2025. By 2050, oil is very expensive and limited to transportation.
- On the demand side, OECD is still falling but non-OECD is still growing
- World produces 30+ bn bbls pa, replaces < 10 bn bbls
- World's reserves dominated by large fields
- Signs of decline in largest fields
- Alternatives can't offset decline rate
- Nationalism reduces access for IOCs, reduces efficiency
- Demand is still increasing
- Price of oil is going up

Q&A

- Natural gas and oil have different uses, so gas is a very limited substitute for oil. Not enough overlap. Thermal equivalents of oil and gas reserves are about the same!
- But peak gas is actually about 5-10 years after peak oil.
- Is it possible that the Club of Rome predictions could be true, but late?
- Ingenuity will not solve this problem.

1:30 pm – 3:00 pm

Economic Impacts of $100 Oil: Energy is the Original Currency
Panel discussion

Jeff Rubin, Chief Economist, CIBC World Markets
Herman Franssen, International Energy Associates
Jim Puplava, Financial Sense (Moderator)

Jeff Rubin: "Triple Digit Oil Prices Will Reverse Globalization"
Rubin was unable to attend, but a video presentation of his remarks with charts was shown.

- Transport costs have to become incidental. Globalization must be reversed.
- At $100 oil, transport costs are 40% of total shipping costs. At $200 oil, it's 80% of total shipping.
- Global trade is now about shipping and logistics, not the lowest labor costs.
- At $150 oil, it will be a quadrupling of tariff rates.
- This will take us back to the 1970s…
- Cost of shipping a standard 40' shipping container from Shanghai to NY: Went from $3000 a few years ago to about $9000 today.
- Cost of shipping ore to China to make hot rolled steel and then shipping it back to US adds about $90 to an $800 unit. Consequently US steel production is actually up now.

- Who would have thought that high oil prices would breathe new life into the Rust Belt? But that's what's happening. And it's not just steel – it's in many industries and products.

Herman Franssen: "Adjusting to a High Cost Energy Economy: Winner and Losers"

- OPEC meeting in Sept 2008. OPEC leaders are getting very worried. Price hawks wanted to cut production to defend price, but collapse of US financial markets took prices back up again.
- US inventories are below the 5-year average. Inventories for gasoline are extremely low – panic in Arkansas and elsewhere for gasoline supply.
- Will be surprised if this year's global demand growth is over half a million barrels per day. IEA estimates 0.69 mbpd growth (0.8%) for 2008, 0.89 (1.0%) for 2009. (IEA, Monthly Oil Market Report, September 2008)
- Huge increase in demand in OPEC this year.
- North America supply growth in 2007-2009 depends on biofuels and tar sands growth
- Call for OPEC oil down in 2009 (~ 1 mbpd less than in 2008) according to OPEC. This is a function of weak demand, strong supplies (crude + NGLs + biofuels)
- OPEC's view was that non-OPEC supply would increase by 10.4 mbpd even without Angola and Ecuador over 2000-2008!
- EIA thinks surplus capacity will increase by over 1 mbpd in 2009
- OPEC believes OPEC spare capacity will grow from 3 mbpd in 2008 to 6 mbpd in 2010! [Ed: 3 mbpd of spare capacity today is highly doubtful.]
- No major energy legislation between Carter and second term of GW Bush
  - Post 1980: Energy left to market forces. By contrast, Europe and Japan increased fuel taxes; Europe moved to diesel (25% more efficient) and Japan developed the hybrid engine.
  - 1985-2006: US oil consumption rose by 5 mbpd; Europe's by 3 mbpd. US oil production fell from 10.6 to 6.8 mbpd; Europe's rose from 4-5 mbpd…
  - Result: Expanded EU of 450 million people and Japan's 130 million people consume about the same volume of oil as the US with 300 million people.
- Revised EIA Outlook for energy through 2030 of March 2008
  - March 2008 EIA Outlook: US oil consumption to rise from 21 to 25 mbpd by 2030.
  - Oil imports stable at around 12.2 mbpd in 2015, rising to 12.7 mbpd in 2020…
- US slowest in the move towards efficient cars, behind EU, Japan, China, Australia, Canada, and California.
- Oil consumption is an indicator of the wealth of nations.
- Huge increase in demand in China and India spell the end of globalization?
- Expecting about a doubling of cars between now and 2025
- With 9.5 billion people by 2050, we would use 138.8 mbpd worldwide at 1% demand growth!
- A French study showed that if there were absolutely no constraints on further oil development, liquids production would peak at around 2020-2028 just shy of 100 mbpd.
- The oil supply outlook;
  - Assume that supply will always meet demand at reasonable prices
  - If projected supply fails to materialize, "there is no Plan B."

- IOCs only have access to 6% of the world's remaining reserves. Oil reserves held by new Russian companies: 6%. Less than 25% of worldwide reserves are accessible to private international capital.
- What kind of peak? Mt. Massive, CO (long flat "peak") or Mt. Rainier (peak with short plateau at top) or Matterhorn (sharp peak)
- As regards OPEC, "they may be sons-o'-bitches, but they're *our* sons-o'-bitches"

Andy Weissman: "Time to Stop Playing Russian Roulette with the U.S. Economy – Urgent Need for a Realistic Strategy"

- Electricity & gas crisis could be just as severe as peak oil. Impact of $100/bbl oil not limited to transportation.
- Electricity & nat gas = 56% of total energy use
- Could lead to $150/200 bbl electricity
- Global LNG price already near parity with oil. Spot price already near parity this winter despite multi-year low US imports
- While prices could moderate in '09 and '10, premium pricing likely by early next decade.
- We'll see shortages of global LNG by 2012-2013.
- Potential doubling of both nat gas and electricity prices.
  - Half a trillion dollars per year increase!...$5 trillion impact over 10 years.
  - Prices exquisitely sensitive to supply/demand balance as first part of 2008 demonstrates
- Need new approach to energy planning.
  - Needless supply risks should no longer be tolerated
  - Future of US & global economies at stake
  - Requires far more realistic, more hard-nosed approach to developing comprehensive strategy.
  - Critical not to over-rely on lowest common denominator, feel-good solutions. Feasibility & cost-effectiveness must be rigorously demonstrated.
  - Minimizing consumption growth & ensuring reasonable supply are not competing strategies!
- Five essential steps
  - Far greater sense of urgency required. Few other issues likely to affect nation's future as deeply.
  - Replace EIA to provide realistic estimates of supply & demand. We can't tolerate bad forecasts any longer! We're currently flying blind! Estimates mislead rather than inform. Requires a new National Energy Security Supply Board. **There is absolutely no time left to develop a comprehensive program to meet our energy needs.** The precise date of the peak isn't that important when it takes 7-10 years to develop mitigation strategies. Until the federal government issues more realistic numbers, the oil companies aren't going to do anything different.
  - Develop comprehensive national energy strategy applicable to energy use across the board. Must include electricity & natural gas, not just oil. Integrated planning essential. Market will ruthlessly seek out lowest cost BTUs and push prices to parity.
  - Maximize use of all cost effective domestic resources that can be developed in an environmentally sound manner. What's going on is crazy at the national level! We can't afford to rule out resources or rely on pipe dreams. We have

no national energy plan, nor an effort to develop one. Instead we need the most rigorous planning possible.
    - Use best expertise available to evaluate limitations of every supply option in objective, cold-blooded manner. Include limitations on available capital.

Jim Puplava: "The Economics of Credit – The Worst Is Yet to Come"

- Recession vs. "Muddle Through"
    - Chicago Fed National Activity Index, using 85 indicators, shows that we are likely heading into a recession
    - Fed of Philadelphia, State coincident indexes showing distress in the economy
- Data on losses and writedowns
- Credit crisis phases:
    - Phase I: writedowns, raise capital
    - Phase II: Bailouts
    - Phase III: Monetization
- Debt tsunami: US nat'l debt went from $1 trillion in 1998 to $9 trillion in 2007
- US Fiscal Crisis – Baby boomers 78 million @ $50K year in SS payouts = $4 Trillion annually!
- Current future liability of the US government: $70 trillion
- Inflation on the wane: PPI less Fed funds rate near all-time high
- Commodity bubble: corn and barley supplies are near all-time lows. Copper and aluminum inventories extremely low.
- [Good charts on relationship between energy and population.]

Q&A

- Weissman: We have an increasingly unstable situation, and it's frightening.
- Franssen: We must hope that the EIA will start to take depletion into account properly in their models. Latest IEA models assume sharp increases in imports, totally unrealistic. So the price mechanism will resolve the tension.
- Weissman: When you take the covers off the energy data, it's ludicrous to think that non-OPEC oil will increase. We're talking about the wrong set of solutions right now. We need to talk about the impending oil crisis in a whole different way.
- Franssen: Viable scenarios for taxing oil consumption to reduce demand? Not a snowball's chance in hell that any politician will support more taxes. Consumers stretched to the breaking point couldn't take it anyway.
- Puplava: 90% of the time, the markets are irrational, so they're not a good allocator of resources in the short term, but in the long term, they basically are good at it. Weissman: if we wait for markets, which respond to very short term signals, to address this long-term challenge, we will be very disappointed in the results.
- Franssen: If OPEC suppliers were fully rational, they would either freeze or lower the current levels of oil production, but they would never tell us!

3:30 pm – 5:00 pm

4 Billion New Consumers: What Asian Growth Means for East, West and the World

Panel discussion

David Fridley, Lawrence Berkeley National Lab
Vince Matthews, Colorado State Geologist
John Theobald, ASPO-USA, UC Davis (Moderator)

David Fridley: "China and Energy in the 21st Century"
[Missed first part of presentation]

- 80% of electrical energy is generated by coal in China
- Just last year China added 105 GW of power generation (equivalent to building California's entire base twice a year) almost all of it from coal.
- China has third largest reserves of coal. China is moving toward net coal imports, largely due to price differentials with imports/exports
- CTL and coal-to-chemicals is growing.
  - Total CTL capacity is forecast to reach 50-60 mt by 2020. Current CTL requirements: 4-5.5 ton of coal per ton of product; 10 tons of water per ton of product.
  - Shenhua is commissioning a 1 million ton direct coal liquefaction plant in 2008
- Coal-to-chemicals production, targets & requirements
  - Methanol production is displacing biofuel production
  - Coal is increasingly viewed as a chemical feedstock
  - In 2007 China consumed 9 million tons (Mt) of methonal; 2.7 Mt blended with gasoline
  - 2010 production capacity is expected to reach 39 Mt
- Can China produce the coal it needs?
  - If Chinese steel and cement peaks in 2015, and all Asian countries meet their efficiency targets, and we don't have a global financial meltdown, then the scenario shows that the IEA's demand-driven forecast shows a gap opening by 2015.
  - EWG report supports similar outlook (actually worse)
  - Prime coal exporting countries to China are declining: Vietnam, Indonesia, Australia (short term problems)
  - Chinese coal imports increasing for a lack of alternatives; India way up due to cost issues; Japan due to nuclear & LNG problems.
- China's CO2 emissions just from coal will exceed total emissions by US by 2010. China wipes out the entire EU commitment to Kyoto by 2012.
- China's crude production has plateaued, imports are skyrocketing. China is 50% oil import dependent. Decline rate is 4% pa. Daqinq looks a lot like Prudhoe Bay in profile.
- The decline of the giant and large fields has increased the energetic costs of extraction. Energy inputs have increased to about 1/7 of the oil they produce.
- China has the second-most complex refining setup in the world. But China is a diesel-based economy. Diesel demand is 40% of a barrel.
- Oil consumption in China supports fewer discretionary activities than in other large consuming countries. 43% is for transportation. Most of new buildings are dependent on diesel.
- Personal cars are not the main driver of Chinese oil demand! Moving stuff is. China is still a very material economy.
- The first thing they have to move is…coal! 50% of China's coal now runs on rail, with very efficient rail. Inadequate coal rail transport capacity drives oil demand higher. The rest has to run by transport truck running on diesel, increasing the

energy needed for transport by 16x. This is also forcing transport for other goods to road transport.

- Subsidies for all fuels greatly exacerbate the problem.
- Ambitious plan to expand natural gas use relies heavily on imports. Spot cargoes coming in at $22/mmbtu. They're now seeking new supplies everywhere, like Turkmenistan via pipelines through other "'stans"
- China's coal soot is now the largest source of mercury deposition in California.
- Major explosion in cement and steel production has caused growth in energy demand to far outpace growth in GDP. China is now the largest cement producers in the world, and most of it is being used domestically. This offset their long-term decline in energy intensity.
- The loss of control led to imposition of new 2010 target of reducing energy/GDP intensity by 20%.
- Quotes from a Chinese official:
  - "The model of economic development that we are currently pursuing is unsustainable."
  - "China's current supplies of energy and natural resources are unsustainable"
  - "China's environment is unsustainable"

Vince Matthews: "China and India's Ravenous Appetite for Natural Resources – Their Impact on the US"

- Population is driving growth, 1.3 billion for China vs. 1 billion for India and 0.3 billion for US
- By 2030, China is likely to pass the US in GDP. Average growth of 10.4% per year for the last 4 years
- World electrical consumption growth increased by 8 terrawatts in the last 10 (?) years, 2.7 from China.
- 2005: China opened 70,000 new supermarkets
- 2006: Became #3 car manufacturer
- Minerals:
  - China's share of world mineral production is #1, #2 or #3 of all major metals.
  - China is #1 importer in the world of copper; they import about half of what they consume.
  - Thefts of copper have increased all over the US. Increasing prices are the impetus; cost increased by 457% from 2003 to 2006.
  - Iron ore: China is #1 producer in the world, and the #1 importer. Went from 1 to 300 skyscrapers since 2001.
  - Price of scrap iron up 559% in the last five years
  - Charts since 2003: [ASTOUNDING CHARTS of the price increases of all major metals!]
    - US molybdenum exports doubled; price nearly doubled.
    - Gold prices up 205%
    - Silver 367%…plantinum, palladium, etc….similar price increases.
- Coal: Spot prices for coal went from $17/ton to $37 from 2004-2005, although contract price in 2004 was $24.4/ton…in 2007, $29.75. This is a natural resources driven price inflation. This is not a normal inflation and shouldn't be fixed with monetary policy.
- Cement: China began importing cement in 2003, with consequent shortages in half the states in the US
- Cement producers: #1 China, #2 India, #3 US

- China is going around the world and tying up every raw material in the world, anywhere they can get it…buying mines, everything.
- 94% of US energy comes from traditional sources (coal, oil, uranium, nat gas). All have increased 200-400% in prices since 2003.
- Natural Gas
  - China imports NO natural gas! US nat gas production has plateaued, we now import about 16% (?) of our usage.
  - Nat gas consumption in the US declined from 1971 to 1985 due to various events and policy changes, then grew again as we attempted to replace coal with nat gas for electricity generation. We import about 4 Tcf from Canada…but Canada's gas production has been flat since 2000…and production in 2006 required 5000 more wells per year than in 2001.
  - Domestic natural gas production vs rig counts: as rig counts have gone up, and with nat gas at the highest price in history, production *fell*…it's lower than 2000 levels now.
  - US nat gas production has been basically flat since 1995, but wells drilled went from 8,900 to 30,180 from 1995 – 2007
  - Price of nat gas has tripled since 1999
- Coal consumption in China:
  - Began importing in 2006. Prices went from $38/ton to $140/ton.
  - India coal growth enormous as well
- China oil consumption: imports over 50%. India imports over 2/3, so does the US
- Nuclear:
  - China and India are both dramatically increasing nuclear…India plans 17 new reactors in 7 years.
  - US generates far more than any other country in the world.
  - World's 439 nuclear reactors currently need 180 million pounds of uranium each year. We've been living off the stockpile we built since Three Mile Island and consuming old weaponized uranium.
- Oil shale (in Colorado) is being looked at again. The notion that oil shale is being blocked in the US is simply wrong. Open bidding was conducted, 20 proposals received, 6 approved. Companies were granted *free* access to the lands (without royalties) to begin production. 30,000 acres total granted for the six acres; equivalent to 60 billion bbls of oil. And yet, there isn't even an active permit to produce that oil.
- Alternative energy requires significant amounts of rare metals etc. [good chart]
- A 690 unit apartment complex in Beijing will use a huge ground source heat pump project.
- Overall impacts:
  - Coloradans will suffer from effects of inflation
  - Coloradans may see increasing shortages of critical materials and pressure to produce raw materials and develop new resources.

Q&A

- Fridley: China largely uses crop residues (corn husks, etc.) for home heating; wood gathering has been largely banned.
- Fridley: "Clean coal" is a complete oxymoron. US is going big with IGCC gasification process about 60% (?) efficient. Whereas China has gone with a supercritical process. Accordingly, there is no real cooperation between China and US to do carbon sequestration. CCC costs about 25% of the energy in the coal.

- Matthews: What about lithium for batteries? Can't really get any useful information.
- Matthews: The claim that the cost of producing commodities falls over time is simply wrong
- Matthews: The increasing switch from high-Btu black coal to poorer grades of bituminous coal is a treadmill. Over half the mining claims in the US in the last three years were from foreign buyers!
- Fridley: 95% of China's coal production is bituminous.
- Matthews: Is cement traded across oceans? Yes, 22% of US consumption is imported.
- Matthews: Half of all copper ever produced is now in landfills. It's probably inevitable that we will eventually resort to mining landfills.
- Matthews: Shale gas in the Rockies is a serious treadmill; you have to drill more and more to keep production flat. Decline curves tail off rapidly after first production, and it costs a great deal more than conventional gas. If we stopped drilling for a year, production would tumble.
- Fridley: We are in competition with China basically everywhere for all natural resources. This is leading to conflicts like the one in Sudan. Conflict is brewing over access to resources in the South China Sea, between Vietnam, Philippines, etc.
- Matthews: China already controls 98% of the rare earth metals in the world. What they're doing is far beyond what the US is capable of. Their strategy is all-encompassing and it will corner the global markets.
- Fridley: The US demand for Chinese products is not the primary source of China's emissions; more like 10%.
- Fridley: China has a bad data problem just like we do. Provincial governments have been feeding bad data to the central government; now that is changed and it goes directly to the central gov't so it's a little better now. New data is more discrete and hopefully will result in better policy planning now.

Robert Hirsch: Reflections on the conference so far

- Terminology: "peak oil" implies sharpness, but really it's been a fluctuating world oil production plateau since mid-2004.
- Onset of decline of world oil production is the greatest problem, and the timing is uncertain. (Est. 3-5% pa)
- Careful attention to small numbers is important!
  - 5% decrease in US oil – Recession (1973)
  - 1% of world oil consumption is huge: ~860,000 bpd
  - 3-5% changes in oil production cannot be identified as true trends until years later, because the plateau is that bumpy.
- Time frames
  - Production decline will likely start in 2-5 years, but worldwide physical mitigation will require maybe 20 years.
  - A precise forecast of the decline point is impossible but not critical to planning & early action.
- Consider where you have your money, and how you will adapt in your personal life: personal, business, national, int'l.
- The meltdown in the stock markets is prototypical of what will happen when peak oil consciousness hits the public. It is not realized yet! The bad things that

happened last week will happen again, only worse, because there are no quick fixes to the problem!

- One-liners:
  - "Willful human blindness" – really describes the problem we have communicating this stuff with decision makers.
  - Talk about discussing peak oil and global warming in the same way isn't really quite right. When people are losing their homes, cars, etc., people will be screaming for a fix *right now.*
  - "Peak roads" – We probably have enough roads now, but think about going up against the road-building lobby and associated special interests!
  - "The proactive choir" – That's us at the conference. As we try to convince people, follow the KISS principle! Keep it simple, and don't mix the message with other things.
  - Point was made that panic is probably necessary to inspire real action. As distasteful as that idea is, it's probably true.
- On the issue of rates of change, we should start doing some calculations…how long does it take to build new CTL plants, etc? The more you look at it, the more you see that the problem will outrun our efforts.
- This shock will have widespread effects. It will severely impact state & local budgets, further impacting services like fire and police.
- With all the other pressing problems like Medicare and SS, how do we get people to focus on peak oil?
- Denial…Faith in technology…Faith in government…these things stand in the way of getting the message out.
- "biggest robbery in history" re: African oil production Yes, we contribute to African misery by consuming their oil, but we also have "The biggest wealth transfer in history" under way as we send trillions of dollars overseas for oil.
- Kudos to the organizers of the conference!
- Don't think of this as an energy problem! It's a liquid fuels problem! We can't start running cars on PV panels right now, but in the near term, we have about $50-100 Trillion of investment in the existing fleets of vehicles and ships! We have to keep that stuff running or we're going to have total anarchy. We need to have substitute liquid fuels regardless.
- Re: environmental problems of hydrocarbon production. Don't think about the world of the past. Think about the world of the future. What compromises can we make? We will have to save ourselves and prioritize environmental protection. We're going to have to be pragmatic above all.
- The transition will spell enormous opportunities for those who offer solutions, who will prosper amid the coming miseries.
- I would love to see a politician, or a president, who will tell the straight story. But when it's said, people will freak out, so it has to be said along with a *plan* to get us out of the problem. Or we could see the kind of chaos we saw in 1973 when OPEC cut us off.
- People have been staying politically neutral about energy and that's important; it can't be a partisan issue.
- This is not the end of the US. This is not going to be like the end of the Roman Empire. I have not lost my optimism. We are going to come out on top (after a difficult period of adjustment) because we're Americans, and that's what we do.

6:30 pm – 7:30 pm

Visions of a Post-Peak Oil Future
Panel discussion

Denis Hayes, creator of Earth Day, founder of the Bullit Foundation
James Howard Kunstler, author of *The Long Emergency* and *World Made By Hand*
Randy Udall, co-founder of ASPO-USA
Richard Brenne (Moderator)
[This was a nearly impossible session to take notes for…the jokes went by quickly…but I did my best.]

- Brenne gave a hilarious and ironic introduction to the panel.
- Could Kunstler's apocalyptic visions come true?
  - Hayes: Yes, and the financial market meltdown is a prelude. Only with radically different leadership could we avoid it. A combination of other countries mobilizing to address the threat, coupled with a great flow of venture capital, could potentially make a difference in averting it. With the right advisors, Obama could succeed in making a difference.
  - Udall: How many of the members of Congress are lawyers? 4/5? Every once in a while we have a great president, and even McCain could be a great president. You need to have hope as a companion rather than fear.
  - Kunstler: The long emergency is only one scenario; there are others. I just wanted to come up with a vivid description of what life might be like in the future.
- What are the other things peaking you're concerned about?
  - Kunstler: Well, peak women my age…and this isn't the place to go looking for them!
  - Udall: Well there's impotent and "Aspo-tent"
- Are we nearing peak stupidity?
  - Kunstler: We're good at measuring things but not so good at doing something about them. Especially in the environmental community, there is a problem with "techno triumphalism" or "techno grandiosity." The idea that we can conjure up solutions…the idea that we're entitled to an orderly transition to the future.
  - Hayes: Well we were certainly much more stupid in 1998, when oil prices were so low. We were stupider yesterday, when oil was $27 cheaper.
  - Kunstler: It ought to be obvious that the airline industry is dying, and we have to restore the rail system asap, or else we're not going anywhere.
  - Denis: Hell if the Italians can do it, the French can do it (Kunstler: the Bolivians do it!), the Chinese can do it, then we can do it!
- Richard Heinberg's new book is called *Peak Everything*…let's talk about the order of things you're concerned about peaking.
  - Udall: Energy, courage, and time ("Kind of a haiku of where we're at right now.")
  - Kunstler: at the TED conference, the winner was this idiot who did a presentation about flying cars…right out of Popular Science 1953. The most preposterous thing you've ever heard in your life…that's what the Silicon Valley geniuses thought the future would be all about…it was very demoralizing.
- Brenne ([what was that question??]...

    - Hayes: the opposite of TED would be DE(b)T…between all the forms of national debt, when we refuse to tax ourselves, when our debt is 5x our GDP, options for the future are limited.
- Oil, natural gas, coal, and uranium…is that the order of things to be concerned about peaking?
    - Kunstler: Yes, but this is basically a liquid fuels problem.
    - Hayes: Energy isn't anywhere near my top peak worry. I know how to solve the energy problem…that's easy compared to racism, religious bigotry, water shortages, the loss of topsoil…those are really tough issues.
    - Udall: Peak oil just punctures everything; it augurs a new era. It could be tragic or it could be a glorious time. Thank God this banal 30 years is over. We should welcome and celebrate peak oil in our lives.
    - Hayes: When you throw coal and uranium into the mix…if this were a different type of group, and you asked them which issue is their top concern, they would say climate. Iran has a very sensible approach to their long-term energy survival by pursuing nuclear. The problem isn't the scarcity of coal and uranium, it's the *abundance* of them!
- From the localized "London fog" of coal smoke, up through the larger problem of acid rain, up to climate change which is clearly a global issue. Are we at the point where all of these problems are global, not national, and we have to think of ourselves as citizens of the Earth?
    - Kunstler: that's a sweet sentiment, but it's wrong. The world isn't flat, it's ever rounder, and we're going to be retreating into our various corners. We're fooling ourselves if we think we're going to have a worldwide Kum-ba-yah and a festival of worldwide cooperation.
    - Hayes: Worldwide, people are building networks in which boundaries are irrelevant, and global communities around certain things are tighter than physical neighborhoods. We must resolve bigotry and racism if we are to solve our problems. The great successes are local; fighting a freeway through town, etc. But against the combined might of all these energy industries, auto industry, etc., we have maybe $100K total on our side, yet we can still win our objectives in Congress, because we're right.
    - Udall: A lot of the achievements we made in the 60s and 70s were made possible by coal and cheap oil. We must recognize our debt to cheap energy and food, or we're doomed. We have 4 million Chinese underground today in pursuit of the black rock that would be the road to prosperity. We can't go forward without recognizing our indebtedness to all forms of energy.
    - Hayes: The entire science of ecology is about how you get energy in the most effective way, from photosynthesis to higher primates and everything in between. If we have an attractive future, it's information dense, it makes use of abundant renewable energy…maybe the fuels of the past are transitional bridges to the post oil and gas world.
    - Udall: Flows are different from fuels. Half of us wouldn't be alive without natural gas made fertilizers. The future belongs to flows, efficiency, and conservation…but we can't go there until we recognize how we got here. We won the wars because we had more domestic oil than they did in Germany, etc. We've always had a land ethic in this country; we've never celebrated the value and beauty of energy, and this is a mystery because it's part of our genius.

- What metals are you concerned about peaking? At current rates of consumption, we have basically less than 25 years' supply of most of the important metals. Does that concern you?
  - Hayes: Yes. Gold is basically a storehouse of value.
  - Kunstler: My book isn't an 'end of the world' book, it basically describes a discontinuity to interrupt our assumptions and extrapolations about the direction that things are going. We're going to have to make do with less of that stuff. But I certainly believe we're going to persevere.
  - Hayes: What we got out of these stocks of energy is 6.3 billion people moving up almost inevitably to 9 billion people, but at that level, the access to metals, foods, etc is much more limited than it would be if we had 2 billion people. But the world isn't necessarily better off at 9 billion than it would be with 1.5 billion people.
  - Udall: We may go back to 1.5 billion, but the journey may be fascinating, or bleak…it remains to be seen.
- Could we actually have a water infrastructure to support 9 billion people?
  - Udall: I don't think that's the most important limit. I would argue that food is the key limit. Water is cheap and isn't the most important limit. Grain production is key, and is the source of the water limits.
  - Hayes: If you depend on a finite supply of water, and you're growing exponentially, you've got some serious, albeit localized, problems.
- What if the limits to all these things turn out to be bell curves.
  - Udall: We're living in a strange, bizarre, amazing moment where we live like gods and goddesses…it's a moment.
- Kjell Aleklett thinks we might be at peak democracy…
  - Hayes: It depends on how things devolve from here. If we have self-contained and self-sustaining urban villages, we might actually have a good story for real democracy in the future. I'm interested in a principled, constitutional democracy that is removed from such forces.
- Are peaks symptoms of a more fundamental problem?
  - Kunstler: Some people didn't like the supernatural bit at the end of my book, *World Made By Hand*. The point is that our beliefs about reality, our consensus, would yield to something more magic and an apprehension of a more supernatural reality outside of the bounds of life as we know it. The biggest problem we have is constructing a coherent consensus about what reality is.
  - Udall: So who is offering this new narrative?
  - Kunstler: To me, this is like the 1850s, which preceded the last great convulsion that America went through, when all of our beliefs and conventions fell into disrepair. The Whigs vanished almost as fast as AIG. The Democrats were the party of slavery. The leadership of the 1850s was made of empty cravats, and into this void stepped a lawyer with a clarifying rhetoric that defined the convulsion that was going on…and that's sort of where we're at today. I want to redefine and re-brand the Republican Party as "the party that wrecked America."
- England didn't abolish slavery until we had abundant coal…Energy is key to overcoming these issues.
  - Udall: Ingenuity will substitute for energy.
  - Kunstler: We've reached peak crybabies.

    - Hayes: There are little chances for profound change in our polity. [Stories about Johnson & Nixon…] I think the Enlightenment was of crucial importance…
    - Kunstler: Don't be surprised if all of that yields to the reality of what will happen to us.
    - Udall: We had elements of paganism, naturism, etc…
- Is peak oil the best gateway to understanding the problem of resource overshoot?
    - Kunstler: it's a bitch-slap upside the head: "Yo, wake the fuck up!"
    - Hayes: I don't think people have ever had a better connection to reverence for nature than today. Pre-Enlightenment, it was all about witch hunts and craziness…
    - Udall: We've got a lot of that now…
    - Brenne: There seems to be an agreement between Islam, Christianity and Judaism that none of them can share an Enlightenment at the same time.
- (They all join arms and sing Kum-ba-yah)

DAY 3 – TUESDAY, SEPTEMBER 23, 2008

8:15 am – 9:45 am

Fuel Substitutes: Reality Check on the Prime Candidates

David Hughes, Canadian Geological Survey (ret.)
Andy Weissman, Editor-in-Chief & Publisher, Energy Business Watch
Robert Rapier, Accsys Technologies PLC
Steve Andrews, Moderator

David Hughes: "Coal: Some Inconvenient Truths"

- [Some good quotes]
- Something about how we've got a turkey syndrome going here: Turkeys get three squares a day, a nice warm place to sleep, and everything seems to be going just fine…until Thanksgiving.
- China has been building a coal plant each week….They will have 5000 more over the next 6 years. India 200 more over the same period
- In US, 28 coal plants under construction…more in Europe. Seaborne supplies are tight, and prices have doubled in the last two years
- History
    - Chart of phenomenal reproductive success of the human race since 10,000 BC
    - Population and energy consumption since 1500…extremely high correlation
    - World energy consumption is up by 190% in the last 40 years
    - [Great charts on energy growth by region and fuel type!]
    - Per capita world energy consumption is up 761% since 1850. The average world citizen consumes as much food (?) as the average person in 1850, but uses 2.5x more energy
    - Coal is 2/3 of the total remaining hydrocarbon energy.
    - 28.6% of the world's primary energy consumption in 2007, second only to oil…Lowest cost heat source.

    - Double the carbon footprint of gas using conventional technology….clean coal and reduce emissions almost to that of gas
    - Total world coal consumption since 1850 has been straight up…90% of the total was consumed since 1910
    - Enormous world consumption of coal since 1980s
    - On a Btu basis, 57% of the hydrocarbon energy we used in 2007 was coal
    - Middle East has no coal!
    - Price of hydrocarbons:
        - Oil: $16.15/Gj
        - Gas: $7.61/Gj
    - By energy content, peak of coal was 1998, even though tonnage is going up, due to the lower energy content of Powder River Basin coal. US now imports about 30 million tons/year from Columbia
    - Net US coal exports: 20% of production in 1981, now about 3%
- How much coal is there? Quotes from US National Academny of Sciences, June 2007
- EWG report from 2007 suggests global peak of coal in 2025, China peak in 2020.
- Uppsala forecast of 2008 says peak will be around 2030
- According to Dave Rutledge (of CalTech), we have 4.7 Tboe fossil fuels (oil, gas coal) and 90% of it will be consumed by 2076. Does not believe that there is enough recoverable carbon to meet the lowest IPCC projection on emissions ("production constrained projection").
- EIA electricity growth: World: 92% total increase 2005-2030. Coal up 115%, nat gas up 145%, hydro and renewables will contract in market share
- 57% of US electricty generation will be from coal by 2030
- 90% of our generation capacity since 1990 is from gas, but in the future will be largely coal
- What about "clean coal?"
    - CO2 can be reduced by 25%, with 99% reduction in Sox, NOx, and 90% in Mercury
    - The most efficient technology is ultrasupercritical (USC) combustion at 43.5%, compared to 34% for a '60s era subcritical plant
    - Denmark is the world leader in ultrasupercritical plants
- Challenges with CCS…
    - MIT study 2007, "The Future of Coal": Capture of emissions typically requires about 23-37% of the capital cost, depending on the type of plant. IGCC is the cheapest.
    - Best tech with heat capture vs IGCC with CCS
    - USC: 43.3% efficient
    - USC with heat capture: 70% efficient
    - CO reduction vs Old Coal with Best tech /HC: 51% efficient
    - IGCC: 38.4% efficient
    - IGCC with CCS: 31.2% efficient
    - CO2 reduction vs old coal with CCS: 85%
- Proponents of CCS often assume there is no energy problem because of the belief that coal is so abundant
- Scale and complexity of CCS…Vaclav Smil quote from Nature, May 2008…"Beware of scale!"
- Managing carbon and global warming by energy intensive and complex means such as CCS, and uncontrolled geoengineering experiments with Space Shields,

seeding the atmosphere with sulphate crystals, and seeding the oceans with iron filings only compounds and exacerbates the energy issue.

- China will top out around 1.4 billion people by 2030…India will go to over 1.5 billion by 2030, to become the world's most populous nation
- Per capita, Canada is the worst energy consumer, Europe is less than half of US per capita
- China will be the world's top energy consumer by 2030
- World pop in 2030 will be over 9 billion, plus adding as many cars as we added people in 2007.
- Total per capita energy consumption in 2030…65x as in 1850, 89% of it non-renewable, almost all of which will peak in the first half of the century
- "Anyone who believes exponential growth can go on forever in a finite world is either a madman or an economist." -- economist Kenneth Boulding, early 70s
- "The term 'sustainable growth' is an oxymoron." – Albert Bartlett, 2000
- Joseph Tainter 2006 - *Sustainability, Resilience, Complexity and Collapse*
- Ever increasing complexity is one problem-solving solution to a sustainability, provided the resources are available to pay for it – both in financial and energy terms. Eventually though, it leads to collapse.
  - The Sustainability Game (Tainter 2007)_
  - Complexity…"The party's getting close to last call"…declining EROI
- Crucial questions:
  - Will we think our way down to resilience, or will we keep our pedal to the medal to collapse?

Robert Rapier: "Biofuels: Facts and Fallacies"

- Currently works on wood acetylation technology to impregnate softwood with carbon to make it as strong as steel and other building products, making it a carbon sequestration technology.
- Has written about 150 essays for The Oil Drum and hundreds more for his blog
- The biofuel contenders: Ethanol, renewable diesel, misc. [e.g.,methanol, butanol, etc.], algae, anything-to-oil, etc.
- Corn ethanol: sets up a food vs fuel crisis, and essentially is a jobs program for the Midwest. But it's just a bridge fuel…unfortunately it's a bridge to nowhere and we should say "Thanks but no thanks" [Deft, oblique reference to Palin's political statements]
  - We have single oil refineries that out-produce any corn ethanol producer
  - By subsidizing ethanol we're really subsidizing fossil fuels [!]
- Can the US emulate Brazil?
  - Sugarcane ethanol is keyed on the bagasse waste, which is a good fuel for boilers to make the ethanol (in the US we use it in animal feed). For tropical countries, sugarcane ethanol works. But it's a solution for them, not for the US.
- Cellulosic ethanol…we've been working on it for 40 years. Serious logistical problems.
  - A small (50 mgy) cellulosic ethanol plant would consume a small forest of trees every year
- Ethanol from biomass gasification
  - It's really pseudo-cellulosic ethanol
- Diesel
  - Biodiesel is an alkyl ester, not a hydrocarbon diesel
  - Green diesel is gasification/FT process with any biomass, or hydrocracking to use waste oil via hydrocracking to make a true hydrocarbon diesel.
- Misc contenders
  - LS9

    - Di-methyl ether…methanol produced from syngas, converted to DME, which can be used in gasoline or diesel engines
    - Butanol is an industrial chemical produced from propylene and synthesis gas. Bio-butanol is produced via the acetone --> butanol --> ethanol process. Commercial production via this route is not viable
- Contenders
    - Our most pressing problem is energy storage, because it enables all the renewables.
    - Various fuel options… [dense slide]
- Can we emulate Brazil?
    - Oil usage in Brazil is still 90% of Brazil's energy needs. Annual oil usage in Brazil is 4.3 barrel per person; ethanol, 0.4 per person!
    - To be like Brazil, the US would have to quadruple its oil production or cut consumption by 75%
- The thermal depolymerization (TDP) story
    - *Discover* magazine had a gushing article in 2005 that was basically sci-fi…costs turned out to be much higher in 2006 update
    - Hard to scale from the lab to the commercial
    - Claims about ethanol are similarly overblown
- Algal Biodiesel
    - Algae could produce 15,000 gals oil per acre per year (1998)…
    - Biodiesel costs make it a far-fetched reality…comparable to retrieving the trillions of dollars of gold that are dissolved in seawater
- Techno-hustling: algal biodiesel investing hype
- Where politicians fail
    - By misleading the public ("we can be like Brazil")
    - By changing energy policies every year, lack of long-term planning
    - Lack of political courage
- Solutions
    - Cease the delusion of "cheap gas for everyone". Need a frank discussion with the public! Increase fossil fuel taxes…rebates, income taxes to make it revenue-neutral
    - Encourage energy conservation
    - Encourage alternatives
    - Encourage mass transit
- Stop waging war with the oil companies; they have the experience!
- Encourage behaviors that reduce energy consumption, including rebates for solar hot water (SHW), fuel efficient cars, etc.

Andy Weissman: "Time to Stop Playing Russian Roulette with the U.S. Economy – Urgent Need for a Realistic Strategy"

- Electricity & gas crisis could be just as severe as oil. All of our energy costs could go to parity (or a premium) compared to oil.
- Global LNG prices already near parity with oil. Spot prices already near parity this winter. Prices could go lower in '09 and '10 with increased LNG supply, but premium likely by early next decade.
- Demand could far exceed supply, far beyond EIA estimates, even in status quo scenario…EIA severely underestimates likely demand…projects little or no year-over-year growth! More likely, increase at least 3 Tcf/yr. Cancelling of coal-fired power plants in the last 24 months locks in the likelihood.
- Adverse impact of rising grid prices on US economy could be severe …half trillion a year shock to the US economy
- Natural gas demand could explode in the next decade
- Demand is set to spike starting right now, but it takes years to get ready for that…

- EIA just doesn't get it about nat gas demand growth for power sector, the key driver
- Annual Energy Outlook reports for 2006, 2007, 2008 all badly underestimated power sector demand for nat gas. We have about 400 Bcf growth per year in recent years
- Future long-term projections are equally bad: say that long term growth will be satisfied by coal. Long-term nat gas demand forecasts still assumes coal provides > 80% incremental electricity. Will only occur with CCS…
- Gas use in power sector is already growing
- If CO2 restrictions enacted, increase in nat gas could be staggering…CCS can't satisfy restrictions for 10-15 years!
- Decision-makers flying blind: EIA understating future US gas demand by as much as 6-10 Tcf/yr (16-27 Bcf/day)…leaving producers, regulators without any reliable basis for decision-making
- Potential adverse consequences from such misleading signals
- We've seen this story before by expanding number of gas-fired plants, only to see prices spike.
- How do we avoid being in that situation again, and having to turn to LNG?
- Urgent need for a new comprehensive strategy…
- Must assess energy efficiency first. Huge potential savings, esp. with PHEVs, CHP plants, etc. But programs often undershoot, are unrealistic, difficult to motivate implementation. We need *radical* and large-scale solutions, replacing most the commercial HVAC systems, including forced cut-backs, to achieve major reductions in a short period of time.
- It's all about *risks.* We fall well short of our goals, resulting in spiking prices (to destroy additional demand).
- On-shore production skyrocketing, but pace not sustained due to various problems…
- LNG imports have been actually shrinking y-o-y, but that could change in the next 1-2 years for a *temporary* period of excess supply
- Emerging shale plays, e.g., Barnett Shale…Studies expect a potential glut, but most of the growth in unconventional gas is from tight sands and coal bed methane (CBM) and Barnett Shale. Barnett could peak early next year…takes 10 years to reach 4 Bcf/day. Haynesville shows promise but is only getting started, and is unproven. We need more evidence to see if the other shale plays are really exciting and comparable to Barnett or not.
- Conventional supply could rapidly decline over the next decade…expected decline of onshore conventional and imports from Canada.
- Factors to slow development of shale gas…
- US is dangerously dependent on LNG—we're already committed to that without realizing it. Growth in supply certain to level off.
- Scaling nuclear…unlikely to make major contribution before 2025 or later…cost projections exploding, capacity to fabricate components limited, etc.
- Wind also likely not a near-term panacea…huge long term potential with sufficient capital. Renewables' share of total US electricity in 10 years remains small.
- Burden for future grid growth thus falls on coal, but without CCS its future is dubious. CCS must move forward because increase in coal consumption is basically guaranteed. Under any plausible scenario, global coal use will increase

> 2 billion tons per year (tpy), but we can't achieve aggressive CO2 reduction goals without CCS.

Q&A

- Rapier: If bagasse is burned instead of returned to the soil, is it sustainable? Some waste is composted, plus ash from the burning, so it's much better than the essential strip-mining of soil via corn ethanol…some studies say it is sustainable.
- Hughes: World coal exports are probably tight…China and India both just became net importers. US is only a slight net exporter of coal on a net energy basis. Expect prices to remain high and supplies tight.
- Weissman: Re: Barnett and other shales, much of the gas is extracted in the first 6 months, then flows quickly tail off (to a long thin tail)
- Hughes: How can we achieve a planned descent to a lower energy future? The North American way of life cannot be propagated to the rest of the planet if you look at per capita data…there isn't enough energy in the world to do that. We need to forget BAU. The low-hanging fruit is efficiency, rethink infrastructure (e.g., suburbia), save fuels for their highest uses (e.g., CTL requires a lot of infrastructure). Reduce consumption, intelligent deployment of renewables. Realize scale problems! There are no silver bullets.
- EROI for cellulosic ethanol and algal biodiesel? Rapier: EROI for cellulosic ethanol of 18+ is nonsense, requires that residues are burned and that has never been commercially demonstrated! The 18 for sugarcane ethanol depends heavily on the value of bagasses residues. USDA has done some highly misleading work on corn ethanol, e.g,. hide energy inputs of distillers' grains. Actual net energy of corn ethanol is probably 5% gain.
- Weissman: Isn't Mackenzie Valley gas good for 5-7 years? The project has already been greatly delayed and its future is uncertain due to pipeline costs. Initial project target dates are based on hope, but reality falls short. Same problem has greatly delayed long-anticipated LNG supply. Grid operators assume that more gas will be available when it might not.
- Weissman: Applauds T. Boone Pickens' Plan for getting the dialogue going. Pickens probably knows this stuff better than energy policymakers. But the full evaluation of his approach still needs to be made and quantified.
- Aleklett to Hughes: China will have to go deeper to increase its coal production, how will this affect production? EROI is an issue. We're getting into thinner seams, decreasing EROI, and will need much increased investment to maintain production.
- Rapier: Ethanol can be useful as an octane booster, even corn ethanol (in Iowa). Where ethanol doesn't work is as a commercially scaled substitution for gasoline.
- Rapier: Algae are good for wastewater treatment and other benefits. It's a good area for research. It may have a future, but we need to clear away the hype first and do a sober assessment.
- When can renewables replace traditional fuels for power generation? Hughes: I don't think there's a hope that we could replace today's scale of hydrocarbons with renewables…intermittency is an issue, and the scale is too large. We need to reduce demand. Feebates, using grid as storage, demand response, etc. all that are useful and should be pursued, but there's no way to maintain BAU.

10:15 am – 11:45 am

Burn, Baby, Burn: Fossil Fuels and Climate Change

Michael Webber, Director, U of Texas, Austin
Pamela L Tomski, Managing Partner, EnTech Strategies, LLC
Randy Udall, ASPO-USA Co-Founder

Michael Webber: "Coal-to-Liquids: The Good, the Bad and the Ugly"

- Coal is an abundant resource, US has the largest reserves in the world
- Coal satisfies 53% of our power generation in the US; Petroleum is only 2% (was 17% in the 1970s)…we then switched to coal deliberately to reduce petroleum use
- Coal price is less expensive and less volatile than oil and gas, making it more attractive to investors.
- Older pulverized coal plants had 30-35% efficiency; new plants are 40-45% efficient, with heat capture goes up to 70%, vs. nat gas combined cycle plants which are ~50% efficient.
- Modern scrubbers for SOx, NOx, solids are quite effective
- CTL fuels have excellent performance characteristics, esp. for aviation. Cleaner (lower sulfur) and already flight-rated for B-52 in 50/50 blends, etc.
- CTL tech is well known and developed; originated in the 1920s, demonstrated by the Germans in WWII. There are dozens of Fischer-Tropsch plants installed worldwide with the capacity to produce hundreds of millions of barrels per year
- Bad news: resource estimates are out of date. CTL is very expensive and water intensive, etc.
- US coal definitely sufficient for 20-25 years, but might be sufficient for 100 years (NAS, 2007)
- Coal reserve estimates based on older reports with questionable methodology and optimistic recoverability estimates from 1970s.
- Running joke: CTL cost is the price of oil +$10/barrel. It's not clear that CTL works without gov't subsidies. Expensive up-front capital costs.
- Great Plains Synfuels Plant (Beulah, ND) started 20 years ago, profitable for the first time because of high NG price. Uses 18,000 tons of lignite to make 160 Mcf (?) of nat gas
- 4.3 million acres are under permit for coal mining, and surface mining is on the rise. Shift to surface mining driven by demand for low-sulfur Western coal…tunnel mining has been flat for decades.
- 1/3 of the energy from a coal fired power plant goes up the flue; 1/3 goes to heating waste water.
- Very carbon-intensive…CO2 emissions and carbon emissions from CTL are much higher than from other fuels.
- Carbon balance of CTL is at best even with conventional petroleum. CCS only makes sense for large stationary point sources like power plants, CTL, GTL. Carbon capture does not work with tailpipes. CTL will never be carbon neutral.
- A lot of water is needed…nat'l average for a thermoelectric plant: withdrawals are 21 gal/kWh, consumption [assume this means evaporation] is 0.5 gal/kWh.
- Water scarcity can be a limiting factor for CTL plant permitting. CTL requires ~7:1 water to fuel ratio. Conventional gasoline uses 1-2.5 gal water per gal of fuel produced. Irrigated biofuels use 1000+ gallons per gal of fuel.

- Outlook confusing: Unclear policy setting, technical issues, etc.
- Projections of coal use vary from 70% increase by 2030 over 2005, to possible 50% decrease over the same time!
- Key uncertainties: carbon policy, availability of alternative resources, CCS
- Coal future is highly affected by carbon policy and energy policy…emissions policies are key
- Will CCS work? Will IGCC (integrated gas combined cycle) work? What's the best way to sequester carbon? Will renewables work? At what scale, and when?
- CO2 is approximately the same mass and size as other flue gases (O2, N2, H2)
- Carbon capture lowers efficiency and is expensive and capital-intensive. Requires significant materials and heat input. Capturing 90% of the CO2 lowers output by 30%, and requires significant absorbing chemicals. Scalability is really unknown.
- 2/3 of coal is transported by railroads, which are already operating at capacity. Tonnage has increased even as rail miles have decreased. Plus delays and increasing prices. Can rail ramp up for CTL adoption?
- USAF wants alt liquid domestic fuels. USAF is the world's largest energy customer. Buying fuels from the countries we attack with those fuels just doesn't feel right…deep philosophical problem for USAF. USAF goal: fuel 50% of its fleet by 2015 with CONUS sources…total demand: ~3.3 B gal/yr of jet fuel. Fuel of choice is CTL, but also looking at biofuels: algae and cellulosic ethanol.
- EISA 2007 section 526 essentially blocks CTL due to emission limits! Unless carbon footprint is less than "conventional petroleum sources" then it will be prohibited. What's "conventional" though?
- The Energy Problem has three components: resource depletion, national security vulnerabilities, and environmental degradation. US solution must balance these three priorities. Most options for new fuels or technologies solve one or two priorities, but not all three.
- Coal is the elephant in the room. The energy transition will be partly determined by whether we replace coal with something better, or fix coal's problems.
- While we have this ambiguity we don't know the way forward.

Pamela Tomski: "Commercial CCS Deployment: Current Status and Reality Check"

- Assumptions:
  - Population and economic growth will drive demand
  - Coal will continue to dominate
  - No silver bullets
  - A solution to the CO2 problem should provide at least 1 Gt [gigaton, or billion tons] carbon/yr by 2050. Total US coal plants produce about 2 Gt/yr
  - CCS can play a key role
  - No climate change legislation this year or next but it's on the horizon
- Key CCS developments:
  - [Key milestones from 1991-2008]…CCS more central to the policy debate worldwide
- A long list of issues that affect commercial CCS deployment…Human capital, policy, legal, technology, regulatory, NUMBY (not UNDER my backyard)
- Scientific consensus is that substantial CO2 reductions are possible, 15-50% for stabilization.
- Three primary CO2 capture approaches…

    - Geological storage: saline formations, EOR, enhanced CBM, depleted oil & gas fields
- CO2 capture pros and cons
    - Commercially available but not large scale.
    - Cost, cost, cost
    - Energy penalty from 20-40%
    - Post-combustion is retrofit opportunity.
    - Oxyfuel - 100% capture potential but not commercial; O2 production energy intensive
    - Only two IGCC plants in operation in the US
    - CO2 transport: well-established network, ~3,600 mi for CO2 EOR. Excellent safety record. Dedicated interstate CO2 network unlikely…uncertainty about size, configuration and cost. Europe is looking at tankers for export of CO2, looking at subsea sequestration, or send to ME via tanker for EOR.
- Geologic storage options. Saline formations offer greatest potential. Analogues available in oil and gas reservoirs, gas storage, acid gas disposal, long term storage tech
- Injection activity vs. CO2 emissions chart: we do have experience with long term large scale injection
- CO2 EOR/storage potential: increased domestic oil production of ~48 b bbl. A "clearer path" to storage.
- CO2 trapping mechanisms:
    - Injection > 1 km deep
    - Primary trap beneath low permeability rock
    - Secondary trap: dissolves in water, grabbed by capillary forces, converts to solid
- Complex slide: Leaks, Releases, Remediation. Potential leakage routes and remediation techniques…
- CCS systems must be close to sources and linked to storage sites.
- World CCS projects under way…dozens of sites
- First CCS project was Sleipner (North Sea) Snovhit (Barents Sea) in Norway, started in 1996. 1 million tons CO2/yr injected into reservoir.
- Another major CCS project: Salah, Algeria…test bed for CO2 monitoring, started in 2004, 1 million ton CO2/yr injected.
- World's largest storage project: Weyburn, Canada. Started in 2000. $80 million+ project by EnCana. Est. 30 m tones CO2 stored over life of project
- DOE regional partnerships: field validation tests. FutureGen could have been (and may one day be) in Illinois. Would have been the world's first large scale CCS demo using IGCC tech but was quashed and is now being restructured.
- Reality checks:
    - Scale: 1 Gt carbon/yr = CCS for 800 coal plants (equiv to doubling the efficiency of the world's car fleet)
- "Trust NO cost estimates" – CCS configurations can vary significantly on location, tech, fuel type, etc. Commodity & materials costs have gone through the roof. Methodological assumptions vary…
- Roughly 40-80% increase in grid power costs estimated due to CCS costs
- Mixed views of CCS: the public, NGO, institutional investors, Greenpeace, NDRC
- There is currently no regulatory framework for commercial CCS. Various states are working on it, as are IPCC, World Resources Institute. EPA has a proposed rule published July 29, 2008, public hearings to be held in October.

- Human Capital: energy industry faces severe human capital shortages even without CCS. CCS summer programs under way to train new people…
- [Slide on policy developments]
- China and India coal demand growth regardless of what US decides to do about CCS
- Maslow's pyramid of energy policy needs: Access to commercial energy at bottom, then security of supply, then cost efficiency, then natural resources efficiency, then social acceptability at the top

Randy Udall: "Peak Oil and Global Warming: What's Missing from the Climate Debate"

- Has studied coal emissions for 20 years…is convinced of anthropogenic CO2 issue
- Warren Isley: "Man's long adventure with knowledge as been a climb up the heat ladder…"
- 4 million Chinese entered a coal mine this morning; 100 of them will die this week
- Global carbon emissions exploded exponentially with fossil fuel exploitation since rough 1950
- Some of our emissions today will still be there 500 years from now
- About 2 billion of the world's 6 billion people are still cooking over animal dung and other low-density fuels, and living low on the energy food chain.
- Are we taking the smoke for granted, and the fire for given?
- All the EIA charts are great if you just change supply to demand. [Great snark!] Appetite for fuel is soaring in the future, and this worldview is widely shared, including among environmental groups.
- In the cornucopian view, fuels are both abundant and cheap in the coming decades. World oil price projections are laughable.
- IPCC models seem absurd to the peak oil community. Climate modeler responded that they are extremely skeptical of the peak oil (and peak energy) notions, "We've done a few 300-year scenarios that have some shortages in them, but even that may not be realistic. This is especially so with coal!" "Do you really think there is only another 60 years of fossil fuel left? I don't think so."
- Roger Bezdek has a new paper showing that total world fossil fuel projection will peak ~2017 at ~11.5 BTOE/yr. [Wow, a more pessimistic forecast than I have seen previously.]
- The gap between these two worldviews is staggering…it blows your mind…how can these views be so opposed?
- What are the climate change modelers missing?
  - They believe that coal is 5,000-8,000 GtC (gigatons of carbon)
  - Unconventional fossil fuels: 15,000 to 40,000 GtC
  - Soils: ~1,500 GtC
  - Biomass: ~ 500 GtC
  - Nat Gas: ~250 GtC
  - Oil ~270 Gtc
- Climate modelers really don't understand energy, and have dismissed out of hand any "Mad Max" type scenarios…
- Nested assumptions:
  - Energy scarcity is a myth
  - Fuels are superabundant
  - No reason to hoard or fight over them

    - Globally traded from haves to have-nots
    - Coal-to-anything will expand significantly
    - Fuel will remain cheap for a century
- What the IPCC is saying is that there is plenty of fuel for another century of exponential energy consumption
- Consider Al Gore vs. Charlie Maxwell:
    - Charlie says we will hit $300 a bbl for oil by 2015
- Is our obsession with climate change dangerous? It's distracting us from the more immediate peril we're in. Consider the example of a suicidal pilot hijacking Egyptair 990… [tells story]
- Gore's Flight Plan: Protect posterity. We're headed to 550 ppm by 2100, committing us to a 3 degree C increase, with sea level rise; global emissions must be controlled
- Charlie Maxwell's flight plan: Preserve prosperity, energy is the original currency and we should save and conserve with utmost efficiency.
- If oil exports are peaking, then we are facing the most serious crisis in the history of manned space flight…
- How big is our "carbon budget?" James Hansen [now] says 350 ppm (which we passed 25 years ago). EIA vision (BAU) gives us over 6 degrees C increase. Path for 50% chance of avoiding delta T avg > 2 degree C is much more demanding than path for 50% chance of avoiding > 3 degrees C. Disagreement over the target befuddles global efforts.
- Hansen's model of fuel peaking: you have to begin phasing out coal globally by 2025
- "Wyoming boasts enough coal to weld every tie that binds, drive every wheel, change the North Pole into a tropical region or smelt all hell!" Fenimore Chatterton
- Bumper sticker: "Earth First! We will drill the other planets later"
- Peak oil is going to make resolving the climate problem much easier. It's really a gift!

Q&A

- Webber: CCS for EOR is favored because the pipelines & infrastructure already exist…it's really a way to "practice" CCS…but the carbon balance isn't really there.
- Tomski: When might we hope to achieve the target of 1 Gt C/yr? Really depends on when we start…cancellation of the FutureGen project was disappointing. Needs proper political support.
- Webber: US points out China is largest emitter; China responds that they're much better per capita (and with a one child policy has avoided 300 million users)
- Udall: Our "global" problem is really among about 10 nations, a quest for sustainable energy solutions. Consider the enormous funding and scientific talent thrown at climate change vs. almost nothing for peak oil, which is going to arrive with all the subtlety of an atom bomb…it's enough to drive you crazy.
- Webber: Some economists are beginning to recognize environmental constraints (limits to growth), if not the energy constraints.

Lunch

“Congressman Roscoe Bartlett Award”: Given to Rep. Terry Backer and Debbie Cook (Mayor of Huntington Beach, CA and ASPO-USA Board Member)

12:00 pm – 1:30 pm

Michael Boyd, President, The Boyd Group Inc.
Introduced by **Randy Udall**, ASPO-USA Co-Founder

Udall: A retrospective on the history of flight: The Wright Brothers, Charles Lindberg, Amelia Earhart. Today 8 million flights carry 600 million passengers each year.

Michael Boyd: “US Airline Industry Trend Forecast: Not New Metrics. A New Industry”

- An airline is an excellent investment…just use your ex-wife’s money and get even.
- Oil prices = Change in business fundamentals. The entire system of travel, distribution and logistics is in line for major changes…It was built on cheap oil. Whole shifts in the way things are made and sold are coming.
- ”Just in Time” warehousing may need to revert back to the traditional
- Proximity of goods & raw materials is more important than just-in-time inventory practices.
- We may have a global economy in the future, but it will be different from today
- Think of the air travel industry like the old Roman Empire…Barbarians are forcing it to shrink
- Fuel costs reducing the number of profitable businesses using air travel.
- Air cargo, charter airlines…
- New fleet mixes…smaller jets are coming out, that means some of the markets they used to service will shrink too.
- Less potential for new service….more potential for reduced service.
- Mr. Wizard isn’t coming to the rescue.
  - In the past, breakthroughs in technology have offset cost increases in the airline industry.
  - The average cost of air travel, adjusted for inflation, dropped 50% from 1978-2004. That’s going to change, big-time.
  - No tech breakthroughs will address the fundamentally higher costs of fuel.
  - Conclusion: changes in business patterns. Changes in spending patterns.
- Other problems:
  - Air Traffic Control. No upgrades from Washington represent real improvement. Plan of delays and higher fares. Nothing is being done.
  - Air Service Rationing: With no real plan, the “solution” will be to constrict the air transportation system. Gee, will airlines cut service to Phoenix, or to Pellston?
  - Larger airlines, larger costs. Airports will need additional funding to accommodate new fleets. Washington has no clue.
  - The funding of the industry is a joke with various small fees expected to support airport expansion, etc.
  - Labor: unhappy campers. They’ll leave the bargaining table with big increases. Or with strike posters. One or the other
  - Environment vs. second social agendas: Air travel is a positive part of our economy. There are two things you never criticize: religion, and Amtrak.

- Responding to the market
  - Flights are essentially full – over 75-80% is “full”…and flights have been “full” for the last 4-5 years.
  - A diverse fleet is needed to assure air access for communities!
  - We aren’t Europe. Very limited ground transport. No air service in a region means a problem for economic growth. We can put a man on the moon, but are totally incompetent at creating a rail network that works!
  - Realities of air service: access to the globe, frequency, and matching capacity to demand.
  - (Somewhere in) Mississippi, huge businesses are making parts for helicopters, rail, air, etc., but mostly for Asian companies!
  - Common belief: it’s all due to fuel prices. Reality: it’s mostly due to myopic vision and rearview-mirror planning.
- The new traffic dynamic:
  - It’s not just Tokyo-Newark. It drives rural America traffic, too.
  - Point: a exec from Taichung isn’t just going to Detroit, he’s going to AL and CT and OH too. There are many interrelated economic development opportunities from a single flight
  - India: highly developed economy, stable legal system, expanding investment in the US
  - China: number one global economy…Chinese investment in US will grow geometrically in the next decade. Huge potential for business growth in both directions. Watch for inroads by Chinese carriers, and Latin-China growth
  - US is key stopover/transfer point from China to South America
- Global Portal:
  - Dubai is example of being a global portal between areas. E.g., Dallas-FW, Detroit/Metro.
  - A traditional airline hub inter-connects cities.
  - Mega-connect points between regions, cities
  - If you want to go from Sao Paolo to Asia, you’re going through the US
- Forecasts:
  - US enplanements in 2008: -2.5% to -3.2%
  - 2009: -7.5% to -9.2%
  - US fleets: 100-120 small jets gone; 3-5% retirements
  - Off-schedule flights (aka delays): up at least 10% from 2008
  - Bankruptcies: On the margin. No majors. (Big carriers won’t go bankrupt)
- Myths
  - There is no real over-capacity. In fact there is increasing price traction in the industry
  - The hub system is outdated & inefficient: See what happens to Lubbock, El Paso & Ft. Wayne without it! There isn’t one single market to support air travel for Ft. Wayne Indiana.
  - Southwest is “The Model” for all airlines. They don’t make any money. Without the fuel hedging, they would lose money.
- Non-Solutions
  - Peak period pricing. Capping flights. Penalizing small aircraft.
  - The DOT has a plan to fix things: force people to pay more, or they can just stay home
  - The problem is that these clowns are taken seriously.
  - This isn’t the 7th avenue Subway. There are no “peak periods” per se.

    - People and business can't be reservoired like water: one 747 can't replace 7 small frequent flights
- US fleets will gravitate toward the mid-capacity sizes
- As of June 2008 the average fare all-in was $191; net to airline was $160-ish…. Airline industry now has only a 14% profit margin. So they're nickel and diming us.
- **Every airline in the world is obsolete at $100/oil.**
    - Flying less, and parking airplanes will only make the large dysfunctional system smaller
- Not "better", just "less bad"
    - 20% of flights are "defect"…failed to deliver as promised. Differences between "best" and "worst" are minor. Airlines assume moving airplanes is the main objective, but it's not. "Airlines operate on automatic pilot."
    - Airlines have no production management
- Get the data right
    - Bureau of Transportation Statistics is stuck in the Eisenhower age. Data shows that fuel consumption went down from 1997 to 2006, but that's just because they only count the big commercial flights.
- Air traffic control is so bad that the industry must fly 15% more than needed. Slower flights lead to congestion the system cannot handle.
- This industry will burn about 19.7 billion gallons of jet fuel this year. 15% is wasted; that's about $10 billion wasted annually. (@ $3.40/gal). This confusion is self-inflicted.
- Airlines don't count wasted minutes…must manage their production lines. 20% of flights today are off-schedule, but 100% are delayed.
- It's not a crisis, it's a problem. If they clean up their act they could have another 5 years before peak oil really hurts them.
    - Algae, peanut oil, hydrogen, pixie dust. Air transport is oil based for the foreseeable future. And it can use a lot less fuel.
    - Washington has mismanaged infrastructure for over 30 years; results can take backseat to congressional hearings.
    - ATC system must be re-designed. Current DOT programs insure more waste, more consumption, more nonsense. Airlines move customers, not planes.
    - We can retain and increase the benefits of a vibrant air-transportation network – it is not in conflict with environmental issues if managed properly.

Q&A

- If the Boeing Dreamliner really saves 10-15% fuel, it's going to be a real competitor. There's a real need for the Airbus A380, but worldwide there's only support for about 300 (?) of them. Many airports can't land them.
- Hedges on fuel only work at low levels…United just got bit by locking in costs at $130/bbl.
- At $200/bbl, how would the industry fare? If it happened rapidly, 1-2 years, it would destroy demand by limiting the flights that could work economically.
- Gov't supports inefficient system design
- Why can't we have bunk-style instead of upright seating? Safety.
- We will not start charging passengers by body weight.
- People in the airline industry don't know about peak oil.
- No planes in use today were designed with the expectation of oil over $50
- Seats seem designed for maximum discomfort.

1:45 pm – 3:15 pm

Good clip from *Three Days of the Condor*

From Fuels to Flows: Is the Future Electric?

Paul Gipe, Wind-Works.org
Denis Hayes, President, the Bullit Foundation
John Geesman, Commissioner, California Energy Commission
Morey Wolfson, ASPO-USA Board Member (moderator)

Wolfson: The shrinking of the credit markets and difficulty in getting loans could seriously affect the ability of power providers to finance new plants. A new renewable portfolio standard law in CO passed even over a well-financed campaign against it. Colorado just landed a deal to host the world's largest wind turbine manufacturing plant by Vestas Wind Systems. The electric industry is changing and policymakers are finally getting with the program.

Paul Gipe: "Renewable Energy: A Challenge Worthy of Great Nations - Moving From a Nation of Consumers to a Nation of Producers"

- North America (NA) is dabbling around the edges of energy policy
- Complacency is not a policy, and inaction is not an option
- NA RE market growth is exciting, but not early enough
- Profound issues:
  - Collapsing bridges, failing grid
  - Oil has peaked
  - Nat gas has peaked
- NA must move beyond Kyoto
  - Climate change not the only issue. Transport fuels are limited.
- Some numbers
  - US consumed about 4,000 TWh/yr
  - Consider: 2 MW turbine makes one million kWh/yr, or 2 million kWh/MW/yr or 2 TWh/1,000 MW/yr (23% capacity factor)
  - To meet ¾ of our electric supply (fossil fuels) we need 3000 TWh of wind per year…1,500,000 MW of wind (75x Germany's current generation)
  - Canada: Eliminate 155 TWh/yr from fossil fuels: equivalent to 75,000 MW of wind
  - Electric vehicle charging: light vehicles convert to hybrid: 5,000 billion km/yr, 1/3 kWh/m for EV, ~1,500 TWh/yr for EVs, or 750,000 MW of wind capacity.
  - Canada: 50,000 MW of wind to support EVs
  - NA: total 800,000 MW
  - Need 2,500,000 MW for NA
  - Heavy trucks: 365,000 in NA, is equiv to 200,000 MW/yr of wind (all-in)
  - Can it be done in NA: 2,500,000 MW/ 200,000 MW/yr in 12.5 yrs, <20 years heavy truck production. Yes it can be done but not at current pace. Cutting consumption cuts time or pace necessary. We must cut consumption to do it.
- Typical household consumption: Texas 14,000 kWh/yr/home vs. 6,500 for California; 3,000 for Netherlands.
- We can cut our consumption by 50,000 (units?).
- Plans:

    - AWEA: 300,000 MW (20% x 2030)
    - Pickens: 400,000 MW, $1 T
    - Gipe's plan:
        - 2,500,000 MW
        - 6x Pickens plan
        - $5 trillion
        - At 50% consumption, much lower
- NA biomass, solar, geothermal, etc. are all better than in Germany
- NA could go 100% renewable but at lower consumption levels
- Swords into Wind Turbines:
    - $600 B for Iraq war could give us…[missed it; see slide deck\
- Aggressive targets require aggressive policies by engaging the public. 18 EU countries use electrical feed-in tariffs (FITs), including Germany, France, Spain
- Advanced renewable tariffs deliver more capacity and more equitably because they enable participation by everyone.
- FIT turn farms, home, and businesses into entrepreneurs
- As a nation we have to move from a culture of consumption to a culture of conservation. There is no time to lose. This is a challenge worthy of a great nation, and I believe we can do it if we change our policies.

Denis Hayes: "Revolutionizing the Entire US Energy Strategy: What Will It Take?"

- It's been a long time since I was at a conference where I wasn't the gloomiest one.
- The financial market meltdown is a good example of a "black swan" event (ref. Taleb). Pearl Harbor was a classic political black swan event, which resulted in a huge transformation of US mfr capacity to make a war machine, in part because we had abundant and cheap oil.
- We have had numerous events that could have prompted us to transform our energy regime, but we didn't.
- I have a back-up plan, with reasoning by analogy and looking for a black swan.
- Compared information revolution and the explosion of the computer industry to energy transformation in the '80s.
    - In the 80s, we developed solar PV, solar thermal, zero-energy homes, EVs, CFLs, etc.
    - Oil as a weapon, Three Mile Island, climate change, loss of capital to buy foreign oil, all drove the energy revolution.
    - Whereas the computer revolution had limited and simple uses…games, spreadsheets.
    - Carter had set goals to produce energy from renewables, saying that energy transformation will be the "moral equivalent of war" and a test of the American people.
    - 20 years later, the PC revolution has been incredibly effective and has become wildly faster, more powerful, with more storage, at ever-falling prices. But what has this produced? It has fundamentally changed the structure of society…consider the impact of Amazon, of Google, etc. The information revolution is a real revolution.
    - Meanwhile, the renewable energy revolution has barely moved forward, and most progress has been made by other nations.
    - The similarities of the two industries are striking. Why did the information revolution blossom, while the energy revolution was stillborn?

    - The federal government generated key demand for the computer revolution (for military purposes), and built the original Internet.
    - In contrast, the federal government set out to consciously destroy the RE industry. Reagan totally dismantled the federal RE R&D effort. American PV industry is a great case in point. Has many, many advantages over traditional fuel. In 1998, America was the top producer of PV cells. Then, thanks to serious federal support, Japan surpassed us the next year. This was precisely analogous to the demand generated for the computer industry by federal demand. Of the top 10 producers of PV in the world today, none are in the US.
    - Now, we are finally building large facilities with major output capacity for PV.
- What were some key differences?
    - Creative revenue models. We use Google all the time, never pay them a penny, but they make money hand over fist. There is plenty of room for creative financing for RE, beyond carbon credits, third-party financing, etc.
    - Small technological beachheads transform into entire industries. Consider the iPod to transform the music industry, thence to the iPhone.
    - The RE industry has never formed a "killer app" or established such a beachhead.
- We have reached the inflection point for a number of RE technologies that could make a turning point for the industry.
- We may not see a full repeat of the success of the computer industry…things like oil shale and fusion will probably remain unworkable…but many other technologies of the clean energy revolution are succeeding and growing.
- Despite a flood of bad news from the financial industry, I am generally hopeful that a solar revolution is near.

Wolfson: In 1970, solar PV cost $100/watt. Today it's more like $3/watt. Dot-com is becoming watt-com in Silicon Valley.

John Geesman: "Feed-in Tariff (FiT) Initiative"
Former CEC Commissioner, long time investing industry. Site: www.greenenergywar.com

- No matter who wins the presidential contest, we are likely to see a wartime type mobilization of energy transformation
- Energy security, economic security, etc.
- 5-7% of our GDP is needed to solve our financial crisis; should we not be at least as equally committed to solving our energy crisis?
- RE is growing now because it's the path of least resistance, the least likely to create a showstopping reaction.
- RPS [renewable portfolio standards] and net metering have spurred a new wave of RE in California.
- If we are to meet the Governator's emissions targets for 2020 we're going to have to generate 30% of our electricity from renewables.
- Renewable energy has a great future in CA.

Q&A

- Hayes: asked to comment on the list of semiconductor materials covered in Vince Matthews' presentation last night. The PV revolution can be done without

them. The least expensive options now use some toxic materials, and if not encapsulated in PV cells, they would be banned in Europe (e.g., cadmium).

- Gipe: Texas has adopted a FiT, would the eastern grid do the same? Not sure about the Texas FiT, but customers will pay a fee on their utility bills that incentivize the development of new capacity.
- Geesman: Effectiveness of FiT vs. RPS? Consider the buyout of Constellation energy last week by Warren Buffett… Thinks FiT will win out. Gipe: FiTs are cheaper, faster, more equitable, more effective.
- Hayes: The energy revolution isn't going to happen like the WWII plowshares-to-swords effort, because we don't have the leadership starting with the president to make it a national priority. Other issues like the financial market meltdown will compete for attention. Instead it will be done by driving down costs and simply working within the market. We're going to go there because there simply are no other choices in the face of peak oil.
- Gipe: The states must act, beginning at the community level. We hope that the federal government will follow us.
- Hayes: The recent defeat of climate change legislation went down by trying to satisfy coal-state Democrats and nuke-booster Republicans. What we really need is somebody who can capture the national microphone and mobilize the public. Effective leadership is essential.
- Geesman: Both Obama and McCain have embraced GHG control proposals that would require a major transformation of the electrical generation system.
- What about EROI? Gipe: Wind hits payoff in 4-6 months where the turbines have 20 year lifespans. Cutler Cleveland and others have done some good studies on this.
- Opportunities for utility scale CSP [concentrated solar power]? Geesman: there are 40,000 MW somewhere in the permitting process now in CA; not clear how much of it will materialize. Some of it will be stymied by endangered species concerns, but much will move forward. It will happen.
- Geesman: The most promising investment space in RE is in the area of storage. Nat gas use will probably remain steady for grid power, but simple steam cycle nat gas fired plants will be replaced by new turbine systems.
- Gipe: Sees a buildout of new East-West transmission links in NA as an integrated market. We need everything: solar, wind, geothermal, etc.
- Hayes: CSP plants can have built-in storage. Distributed generation on houses, V2G systems could transform the grid in ways we can't imagine now, like using your car engine to power your house when the grid goes down.

3:45 pm – 5:15 pm

Clip from *Good Will Hunting*

Sustainable Mobility

Dan Sperling, Director, Institute of Transportation Studies, U of California, Davis and California Air Resources Board
Bryan Jungers, UC Davis
Geoff Wardle, Dir. Of Advanced Mobility Research, Art Center College of Design
Christer Lindstrom, CEO, Encitra Corp
Ron Swenson, ASPO-USA Board Member (moderator)

Dan Sperling: "The Future of Mobility"

- Exponential Growth in Mobility (passenger-km per day per capita in France)…interesting chart from 1800 to the future
- Vehicle travel growing faster than Population (but not in California?!) since 1970
- Transportation is vastly better today than it was 100 years ago, but the car is now a victim of its own success.
- 2 billion vehicles globally by ~2020, up from 1 billion today…another hockey stick chart
- Vehicle ownership will continue to surge partly due to new low-cost cars. India's Tata Nano costs only $2500
- 15 million electric bikes and scooters sold in China last year
- US car monoculture is resistant to change partly due to low population densities. US metro areas have the lowest densities. Atlanta: 6 people/hectare, Mumbai: 389
- Need a new paradigm of mobility services to provide choice and facilitate aggressive polities to reduce VMT. Our paradigm hasn't changed in 80 years: transit, paratransit (jitney services), ped/bike, carsharing, digital 'mobility' (teleconferencing)
- Paris rent-a-bike system is new but already hugely popular and widespread and highly effective
- Magnitude of the GHG challenge: To get to 1990 emission baseline by 2020 we have to remove 169 MMT CO2 reduction, and a huge cut by 2050
- CA AB32 (2006) timeline specifies a "scoping plan" to be published by 2009…
- Transportation accounts for about 38% of GHG in CA
- Transportation in AB32:
  - Vehicles (cars and trucks) 39 MM tons (light duty vehicle efficiency)
  - Fuels 17 MM tons (low-carbon fuel standard)
  - VMT and goods movement (8 MM tons)
- Transforming vehicles:
  - Mostly need to convert to electric drive propulsion
- Transforming fuels:
  - Low carbon fuel standard will accelerate the transition to alt fuels and transform the oil industry…mix of biofuels, electricity and hydrogen
  - Low carbon fuel standard requires 10% reduction in GHGs/unit of energy by 2020 (implies a large proportion of low-carbon alt fuels)
- Transforming travel and use of vehicles
  - AB32 target of 2 MM tons for VMT (<2% of planned GHG reductions for 2020) will be increased
  - Transport funding, insurance, gov't actions, etc.
  - Eco-driving (CIS/GPS gives better efficiency) etc.
- See his new book: Two Billion Cars – Driving Toward Sustainability
  - Bryan Jungers: 100 MPG or Bust(ed) – A Re-Valuation of Energy Use & Economy
- Personal motivations: economic stress over energy
- Global motivations: global consciousness?
- Students in teams all around the world working on new designs
- Inspirations: Buckminster Fuller, Paul McCready, Andy Frank (UC Davis, father of the electric car)

- Progress? Over a 15-year period, improvement of about 1 mpg
- VMT demand going up relentlessly for decades
- The Vision: new vehicle design – Int'l project
  - Series PHEV, lightweight, 4-6 passengers (but a small vehicle)…first commercialization will be in India
  - Industry thinks we're just kids. To the universities, we're a liability. To the public, an idea too good to be true. To our moms, we are hope.
  - Trying to raise $1 million over the next month

Q&A

[Early QA because Sperling has to leave early]

- Sperling: It's hard to compare efficiency across fuel types, e.g., fuel cell vs solar powered EV.
- Sperling: Almost any GHG reduction strategy works also as a strategy to reduce oil use. Low carbon fuel standard informs oil industry by preferentially choosing cleaner fuels (over, say, tar sands)

Geoff Wardle: "Changing the Design of the Automobile Industry"

- Huge parallels between the auto industry and the oil industry: "Wakey wakey!!"
- We have to get radical, and FAST!
- Requires big picture thinking. Must understand the total context of what we're doing. You can't talk about car design without talking about the design of the entire industry.
- See www.mobilityvip.com
- Imminent, unprecedented change for the established auto industry…
- Emergence of China and India as major players in the energy industry
- The end of artificially cheap energy – oil in particular
- Scarcity of unpolluted water (because of its role in industrial processes)
- Increasing awareness of public about environmental issues, urban congestion, and sprawl
- Biggest impact from China and India (e.g., $2,500 Tata Nano)…this will whet the appetite for cheap cars everywhere in the world. Will put huge pressure on established car companies, cars could become commoditized. This will favor newer, more nimble car companies.
- Japanese auto industry was the first major disruption to established car makers; China will be the second.
- New imminent, disruptive products like the Aptera and the Tesla Roadster.
- Some new players will succeed, others will fail, but it will change public perception and increase public pressure to fully recycle.
- GHG are a complex relationship between vehicle operation and mfr processes, recycling, raw materials production, major challenges to vehicle design
- An energy miracle tomorrow will not solve urban gridlock. It will not solve the diminishing reserves of materials, and it will not do anything about the waste stream
- Most of us want to cling to personal mobility. Oil is wasted on inefficient forms of transportation…we have squandered it. ICE is only about 20% efficient. 50% of usable power lost in transmission to wheels. 1 gallon of gas invested in driver, another 20 to transport the car itself. 5/1000th of every gallon actually does the job.

- We need to redefine acceptable efficiency standards and come up with good renewable alternatives to oil.
- Need to encourage urban development and new lifestyle habits
- A mass migration to urban living leads to need for smarter transportation systems. Sustainability policy agendas everywhere…
- Future of mass transport will remain the automobile, but in other parts of the world mass transport will be favored.
- Must drastically reduce the mass and aerodynamic drag that surrounds occupants
- Need to offer the public the right tool for the job, like a one-seater with minimum weight.
- Autonomous driving systems…are you crazy? Bio-mimicry could be useful, but also swarming technology (cars talking to each other). Removing the human element of driving removes reason for accidents, need for safety structures, which means we can eliminate 50% of vehicle mass, and do platooning (close-together travel) at higher speeds with far less drag, and support more cars on existing roads
- Alt propulsion systems are an inevitability. Too early to tell which will win out, but various systems until we figure out the whole energy and life-cycle equation.
- Lightweight materials will be crucial for cars of the future, but they must be totally recyclable (e.g, not composites)
- Dealing with peak oil is really important, but cradle-to-cradle is very important to future generations
- So what does this mean for the auto industry? Current auto industry model is outmoded. Few car companies can make a consistently decent return on investment. Making and selling cars seems not to be a very viable business model in the future. So there is an opportunity to redefine what the business really is. A "total mobility service" seems to offer a better option.
- There are lots of opportunities for the auto industry to transform into companies that offer a total mobility experience.
- Auto industry needs to see this as a new opportunity to redeploy its expertise and mfr capacity, and not as a threat.

Christer Lindstrom: "A New General Transportation Mode"

- www.podcar.org
- Formed out of a Swedish government think-tank, leading to an MoU between Sweden and California
- Objective was to rethink and see what we could do from scratch.
- Is there a solution to all these problems? Pollution, peak oil, food prices, etc. etc.?
- Want a great transportation system: safe, fast, accessible, automatic, comfortable, solar powered, reasonably priced, low resource impact, low footprint, personal (if we want), high capacity, exciting design [apologized for boxy Volvos]
- Swedish, Polish and UK development:
  - 3 mile commercial system at Heathrow
  - Half mile test track in Uppsala, Sweden
  - Test track underway in Poland
  - Beamways incorporated with venture capital in 2008

- [Movie clip about a pod car on rail design: “Vectus”…does autonomous driving, asynchronous travel]
- Is this futuristic? Yes, probably, but it’s pretty exciting and seems doable. 10 cities in Sweden joining forces for implementation of Podcars in May 2008. Close to $10 billion in capital committed from POSCO S. Korea, Masdar UAE and others
- Vast majority of travel can be replaced by Podcars: Work, school, shopping, leisure and free time…all are highly predictable
- Dramatic effects: If this works, it’s at least 10x more energy efficient, solar powered, 100x less resource demanding (much lighter and seldom parked), 1000x more fun (read a book, or drink & drive!), 95% less consumption of liquid fuels for transport is not only possible, it’s close to criminal not to pursue the Podcar idea further.

Q&A

- Consider the Jevons Paradox: Wardle: Yes, more efficient cars will encourage more driving and possibly more congestion. Congestion pricing may help address that.
- Lindstrom: If Podcars work, oil will be $25/bbl and nobody will want it! I will still have a Saab that I will drive for pleasure on weekends, powered by ethanol of course.
- Jungers: Cars will need to be a lot smarter than they are today.
- What about safety, roadkill, criminal activity on the Podcars? Lindstrom: crime may occur in Podcars, but those crimes will be easy to solve.
- Lindstrom: Economics of Podcars are definitely viable…details available.
- Jungers: There are a lot of efficiency & loss issues with hydrogen vehicles. Continuously variable transmissions are very efficient.
- If the financial system goes into hyperinflation, will there be capital to build new rail etc. systems? Wardle: One reason why the auto will continue to be a dominant form of transport for the near future.
- Wardle: Autonomous driving systems can make platooning feasible. We land planes on autopilot, so why don’t we trust it for road vehicles? The problem will be mixing legacy vehicles with autonomous vehicles, but that can be addressed also. Acceleration and braking are extremely wasteful. Autonomous cars and platooning can yield huge efficiency gains.
- Lindstrom: Platooning can be very dangerous and must be done right. Can do 1,700 people per hour with standard cars vs. 7,000 people per hour in Podcars.

6:30 pm – 7:30 pm

Our Energy Challenge: A Dialogue with Conference Speakers

Panel discussion with:
Debbie Cook
Tom Whipple
Michael Webber
Jim Hansen
Robert Rapier
Kjell Aleklett
Terry Becker

Rick Schecter

Charlie Hall announced a Call for Papers for the new ASPO publishing subgroup. Write papers [at] aspo-usa [dot] com or chris [at] getreallist [dot] com

For Whipple: What will it take to get the *Washington Post* to cover peak oil more? They won't until the pain gets greater. They didn't write anything until oil hit $147 and by the time they got it published, oil was back to $110.

For Becker: Will (??) publish your letter about peak oil? Yes they will do it as soon as I finish it.

For Hansen: About market risk for traders. Traders found themselves on the wrong side of the trade as they got whipsawed around, and finally they got out. Look, swings of 30% in the oil market are totally normal! Don't fixate on short term moves. Schecter: What we've seen in the markets in the last few weeks is a portent for things to come. This is sending a message to non-believers.

For Aleklett: The consequences of peak oil seem inevitable. Where can I get a great summary of the opposing view? A: The US has potential for great movements, and much media is focused on the US, but 95% of the global population lives outside the US. Look at what's happening in Asia but most Americans aren't aware of it. Things are moving to Asia in a way that many people aren't thinking about. Sinopec, for example, is the third-largest company in the world, with backing by Saudi Aramco and Exxon Mobil.

For Rapier: When might we reach 100,000 bpd from non-corn ethanol biofuels? A: It's a long time out, I'm not optimistic. You go beyond corn ethanol and biodiesel (which is small) and there is essentially nothing. Very small amounts of cellulosic ethanol. If you subsidize it enough, you can make cellulosic ethanol to 36 Bgpy, but I guarantee you will put more energy in than you get out. We'll get electric cars first.

For Webber: Peak oil isn't such a bad thing. We'll get more fit from riding bikes and walking, we'll relieve congestion, etc.

For Aleklett: Can we start treating peak oil and climate change together and not be so divisive? A: Peak oil must be ahead of climate change, because it will happen first.

For Whipple: How many congressmen have caught on to peak oil? A: I don't think it's making much progress. I think the peak oil caucus (only in the House) has about 10-12 members, and they hardly ever meet (if at all)…it's really a one-man band (Rep. Roscoe Bartlett, R-MD). I have tried meeting Senators and would-be Senators, but I haven't had much luck with them. What I did find is a desire for proof that high oil prices are due to speculators; if you don't have that kind of proof, they probably aren't interested in talking to you.

Q: Is it worth saving General Motors to get the Volt produced? A: Schecter: It's all about saving jobs. There are other companies that can probably get it done faster and better. As GDP shrinks and financial markets shrink we've got to replace that GDP with real mfr capacity, so we have to support the effort to retain mfr capacity without the financial markets driving all the GDP. Hansen: You never buy MS 1.0, so don't buy Volt 1.0.

A: How can we urge action before TSHTF? Becker: If you want intelligent action, you have to present the question in a way that they'll understand. You have to speak their language. Nevermind Washington, work with your local elected reps. I have been in the legislature for 18 years and used to run an $18 billion budget, and I know that how money is spent is key. You have to talk about economic impact and how that affects legislators. Talk GPD, unemployment, falling tax revenue, housing, prisons, road maintenance…so you have to lay out the economic impact and the role of the state to preserve services. That's how you get their attention. Whether you understand peak oil or not, you can understand escalating prices, a poor economy, and protecting their community. Needs to be focused as an economic response. Aleklett: I have been quite successful in Sweden in promoting the peak oil story, mainly by talking with industry leaders first, because they realize that this is reality that will affect their business. Volvo trucks is now making peak oil a key focus for their future production. Mercedes talked to me about it, seeking an alternative view to Chrysler and CERA.

Q: Are there commitments beyond CTL in the DoD? Webber: Yes, there is a purchase order on the street, but it's invalid…

Q: Has anyone asked Al Gore about carrying the peak oil message? A from Steve: Talked to Gore at a recent meeting in Denver and talked him about it. Gore saw his two-page handout and said "nice dataset!" Then *An Inconvenient Truth* came out, Gore was on Larry King's show, and he mentioned peak oil and talked about the geologists who are interested in peak oil.

Q: Is US produced biodiesel better/worse than ethanol (?) A: Rapier: Biodiesel has a better energy return. Even Pimentel agrees about that, calling it close to an EROI of 1 (but that's probably a bit too pessimistic). For soybean it's 2-3. Conoco Phillips had a plan to make "green diesel" from animal fat, where the byproduct is glycerin. The problem is the freeze point is so high. But green diesel is deprived of incentives, and without subsidies, it can't compete with other biodiesel that does get a $1/gal subsidy. Politicians shouldn't pick technology winners. Let everyone compete on an even footing.

Q: How long will oil be traded on the futures exchange? A: Schecter: It will continue to be traded on an exchange, the question is *which* exchange…but only until the day we begin rationing?

Q: How can we frame peak oil so it's a more palatable/sexy message? A: Whipple: if you think through it, it becomes a very unpleasant message quickly, which is why there is so little political support. Look what happened to Jimmy Carter, the last guy who tried it! I'm fairly convinced that the financial crisis will dominate attention right now. A: Becker: Needs to be reframed as an issue of energy security. Asking a figurehead to lead the charge…Whenever you have data that can be refuted, esp. when refuting data provided by our own government, it's tough. Until and unless we can change the data set and take the gov't data away as a weapon, it's tough. So that's the mission.

Q: What about the IEA report in November, what impact will it have? A: Aleklett: If it says what we think it will, that we won't exceed 100 mbpd, it will have a big impact. In fact the real numbers will be even lower, but they have to take it in steps. I won't be surprised if they lower their 2030 target to 80-90 mbpd, which will make it a very different game in terms of the economy. When will politicians come together to make a decision? When the numbers from the agency make it look urgent.

Q: Are you willing to approach Michael Moore? …no answer

Q: What are your suggestions for energy reduction strategies? Webber: Start with solar hot water, it's the best bang for the buck. Water efficient devices because water is a big part of our energy consumption. Food is the next step: efficient refrigerators and not putting the second refrigerator out the garage where it's hot. And limit the number of kids you have. Aleklett: On avg we're making four trips per day, make them shorter and more efficient (?)

Q: Do you think Mexico's event will be the thing that really puts peak oil on the map? Hansen: Jeff Rubin has predicted zero net exports from Mexico by 2013, I think it's 2012 or earlier, at that point Mexico has no revenue from oil, which is currently 40% of their budget. Therefore immigration will have a much greater effect, and sooner. We'll see a currency crisis before they reach zero exports…so we might not be very far away from that time.

Q: Given the low levels of finished gasoline stocks and so on, when will we have rationing? Rapier: We already have price rationing and occasional shortages in the Southeast. Refiners try to run their refineries minimally. You knew we were in a precarious position because we went into hurricane season with record low inventories, which told me that shortages were imminent. As soon as the hurricane hit, some gas stations ran out of gas.

Q: Non-energy ways of limiting oil consumption? A: Cook: Vegetarianism, limiting number of children, etc.

Q: At ASPO 6 in Cork, Professor Ping from China said they were unlikely to go forward with CTL because they didn't have enough coal. Wouldn't using coal for electricity to drive electric cars make more sense? Webber: Coal for electricity is better because it's easier to control 1500 smoke stacks than 300 million tailpipes. Plus the cost aspect, air quality, etc. So coal for electricity is better for transportation. Ozone is another aspect, but it needs sunlight to make ozone, so there might be some benefits at night when running coal-fired electric cars.

Q: Please guess at what year oil might reach $200 and $300 a barrel? Schecter: 2011. Becker: No idea. Aleklett; the day the Chinese are willing to pay that, because they set the price in the future. Rapier: 2011-2012 for $200, a year later for $300. Hansen: 2012. Webber: If the dollar keeps plummeting, it could happen this year or next, because it's a function of the dollar. Whipple: If one assumes the Chinese are setting the price, it might be awhile because China does seem to be slowing down.

Q: How do we better harness the intellect, energy and commitment at this conference? One suggestion you could tell an elected official when you get home about peak oil, and what they can do about it?

- Becker: I've been telling them for two years! Harnessing that energy starts with wherever you live, whoever you representatives are. You need a critical mass of lobbying locally. If you're asking them to change the world as they know it, you're asking for a big thing, you need a coalition to say it's a threat to safety and welfare. Stop preaching to the choir!

- Schecter: It's important to phrase it properly, so you don't create the opportunity for someone to block the message. Focus on *energy security*, and target politicians and their advisors, with a focus on energy security. Suggest that we have enough political pressure at all levels to convince the federal gov't to revisit the USGS data and revise it.
- Aleklett: Everybody is interested in drinking, so use a bottle and a couple of glasses, and demonstrate the problem this way. Talk about drinking, and not oil.
- Rapier: If you haven't already, talk to your family. You can't sit next to me on an airplane and not hear the message…I say "some people believe this *may* be the case" rather than coming off as a doomer. Talk to anybody, anywhere you are. Talk about gas prices and get the conversation going that way.
- Hansen: Totally agree. I talk about it almost every time I go to a party somewhere. I found success by using the climate change model, used it as bait, and gave a few talks to the U of Washington in Seattle…the climate change story got me in the door.
- Webber: I am a professor, so I focus on publishing, speeches, seminars, etc. Manure could offset 1% of our energy, which no one cares about, but when it got published in an academic journal as a scientific paper, it became a media sensation.
- Whipple: My message is urgency; this is a lot closer than most people think. We understand details that most people don't realize. There will be problems within months, that's my message.
- Cook: Relationships are primary, and everything else is derivative. It's the people you know directly. If you go to meet an elected official, go with somebody they already know.

[End]

Personal Review

ASPO-USA conferences are always outstanding, and this one was no exception. For my quick review of the conference, please see: Reflections on the 2008 ASPO Peak Oil Conference

Notes from Past Conferences

You may also want to explore my notes from past ASPO-USA conferences:
2005 Conference
2007 Conference

Other Notes

Here is a short list of others' coverage of the conference I happened to find:

Heading Out at The Oil Drum
A very readable, narrative account of the proceedings, highly recommended for a quick overview.
Day 1: http://www.theoildrum.com/node/4556
Day 2: http://www.theoildrum.com/node/4560

Day 3: http://www.theoildrum.com/node/4569
Comment: http://www.theoildrum.com/node/4586

See also: Summary on TOD of its presentations at the conference: The Oil Drum - At ASPO-USA Sacramento

Steve Balogh
Day 1: http://www.groovygreen.com/groove/?p=3368
Day 2: http://www.groovygreen.com/groove/?p=3369
Day 3: http://www.groovygreen.com/groove/?p=3385

Jim Puplava - Financial Sense
Audio interview with Robert Hirsch, Matthew Simmons and Chris Skrebowski:
RealPlayer | WinAmp | Windows Media | Mp3

Video Clips

Selected video and interviews from the conference at The Oil Drum:
http://www.theoildrum.com/node/4636

Video interview with Matthew Simmons at Global Public Media:
http://globalpublicmedia.com/peak_moment_oil_and_gas_the_next_meltdown