Highlights from Seventh Advances in Energy Studies Conference in Barcelona

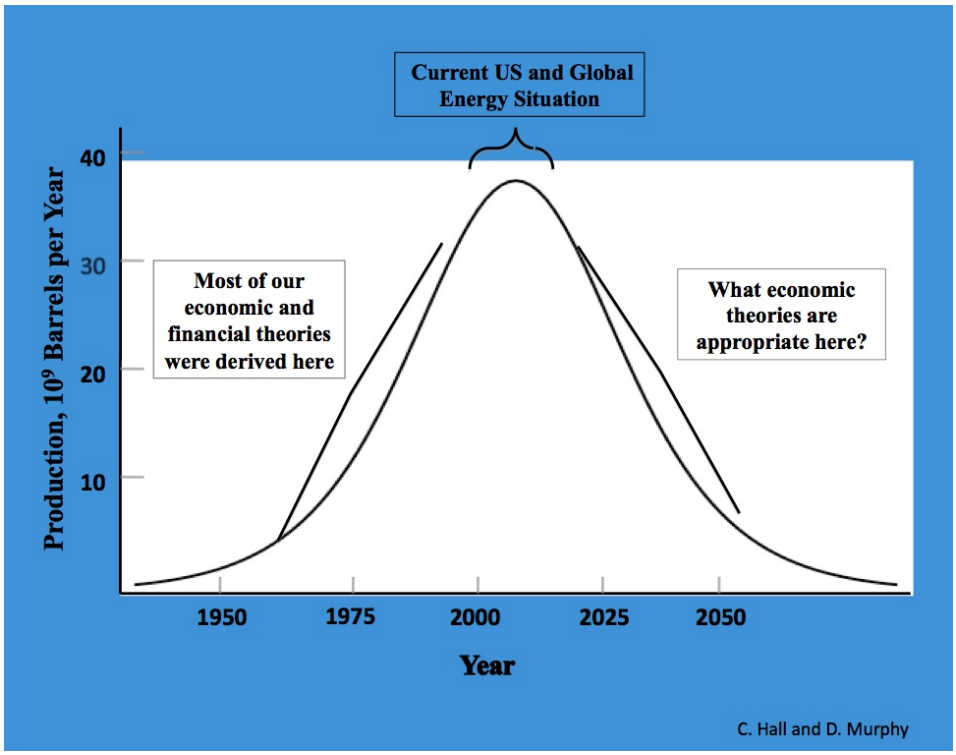
Posted by Gail the Actuary on October 27, 2010 - 10:20am
Topic: Environment/Sustainability
Tags: charles hall, joseph tainter [list all tags]

Last week, I participated (as an invited speaker) in the 7th Advances in Energy Studies Conference in Barcelona, Spain. Other invited speakers were Charlie Hall, Joe Tainter, Marcel Collel, and Seth Blumsack. Other Oil Drum staff members at the conference were Ugo Bardi and Dave Murphy--Ugo as one of the speakers, and Dave as the second author on Charlie Hall's presentation. Dave also asked lots of good questions!

In this post, I give a few highlights of the conference. The full agenda can be found here.

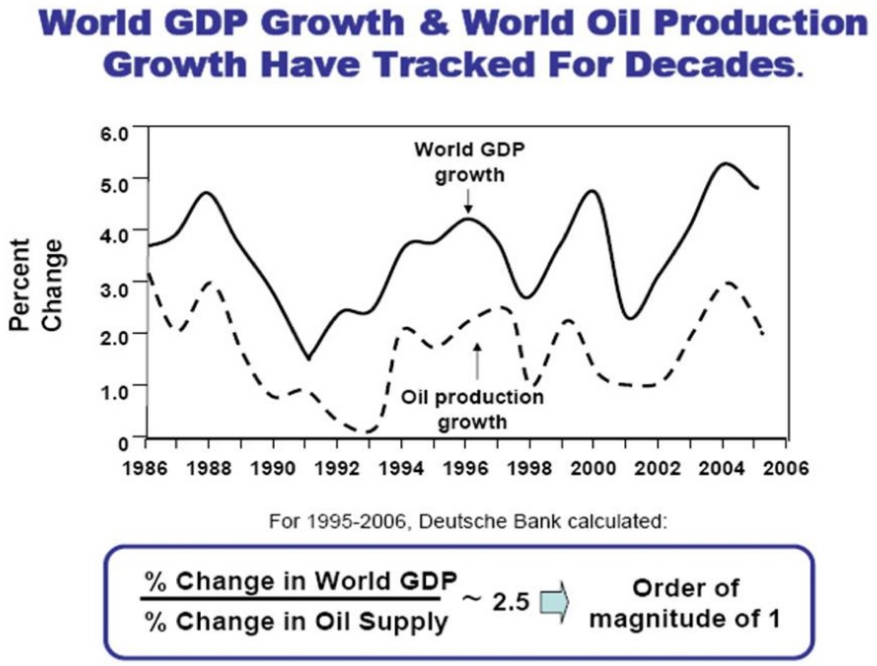
Charles Hall - Adjusting to New Energy Realities in the Second Half of the Age of Oil

Charlie Hall started the conference off, talking about the fact that we have all lived all of our lives on the upslope of oil production.

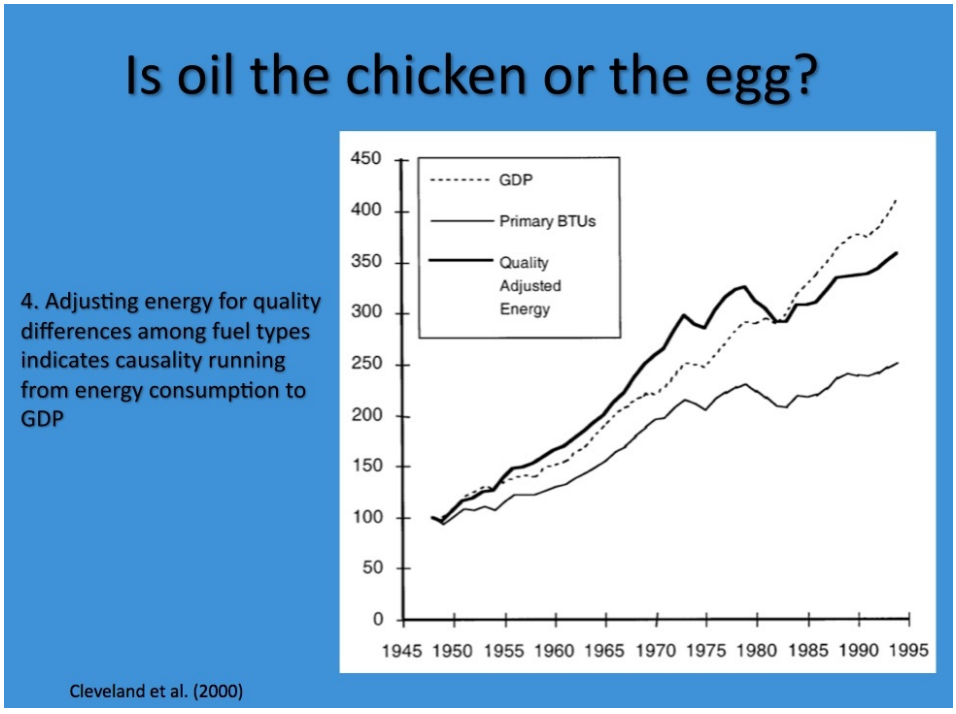


Current economic views regarding the likelihood of long term economic growth are based on historical patterns, but are quite probably not true, going forward. We need new economic theories applicable to the downslope we are approaching.

Prof. Hall presented the work of Dave Murphy (his PhD student and our Oil Drum author), showing that high oil prices tend to go with recession, and low oil prices go with expansion. Recession tends to hit at $80 to $85 a barrel, or when consumption equals 5.5% of GDP. I won't show the slides, since we have seen similar ones before.

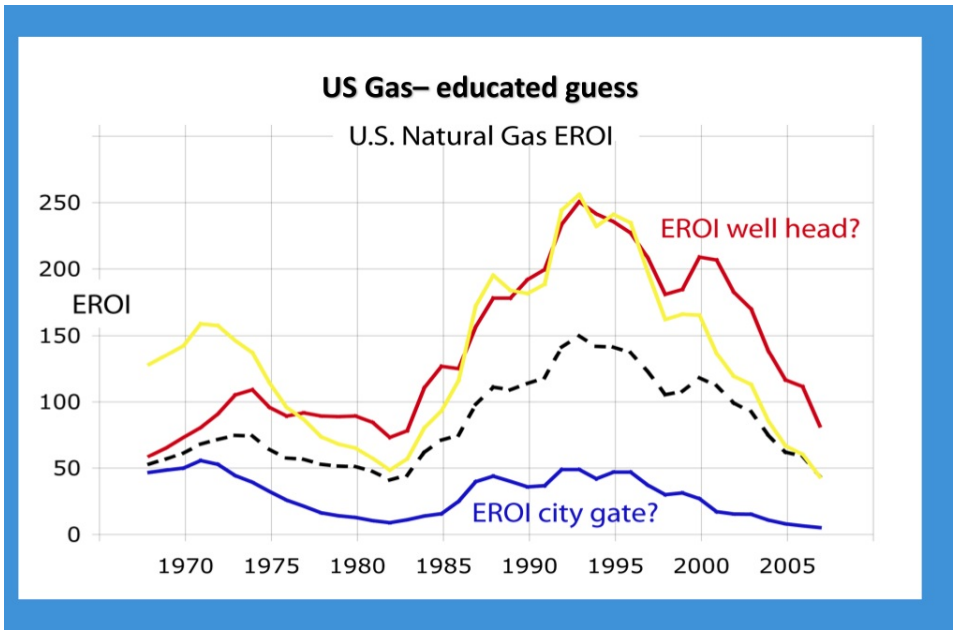


He also talked about the relationship between oil availability and GDP, showing first a slide with the historical relationship between increases in oil use and world GDP, and then showing a quality adjusted slide, comparing the growth in all fuels to the growth in world GDP.



He also talked about how EROI seems to be declining for all types of fossil fuels. Most of the amounts we see quoted are calculated at the point of production, but there is also a significant drop in EROI between where the fuel is extracted and the point where the energy is actually

used.



As an example, he showed the above graph, showing an estimate of natural gas EROI, at the well head and at the point of use. Prof. Hall made the observation that the EROIs are declining so much, and the difference between the EROI at the point of calculation and where the energy is delivered is so large, that coal may be what is running the US economy--the net energy added by all other types of energy on a delivered basis may be insignificant.

Prof. Hall concluded by showing a slide suggesting new ways to do economics, in a post peak world.

Mark Brown - False Promise of Renewables

In his paper, Mark Brown sums up his findings as follows:

> In summary, the false promise of renewables actually has two related parts. The first part is whether there is sufficient net yield from renewables to drive growth or even a steady state economy without fossil fuels. The second is whether there is enough renewable energy on the planet to drive our complex techno-industrial society. We have shown that most renewables have very low net emergy yields, that those that have higher yields are limited by the availability of potential sites and the quantity of energy that might be generated, and finally that growth always generates non-negligible environmental impacts. Thus, in reality, the concept of "sustainable growth" on renewable energy sources is a false promise that if pursued, can only add to the economic and environmental catastrophes that are beginning to appear.
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> . . .
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> The problem is not just resource availability nor is it finding another energy source. The problem is BUSINESS AS USUAL. The environmental, social, and economic consequences of unlimited cheap energy might be even worse than limited fossil fuels. Our fascination and addiction with continued growth may have unbelievable consequences in the long run. Faced with the possibility of unlimited growth, and its coupled consequences, one can only hope that we fail in our attempts to solve this current crisis so that our focus will turn to living within the planet's carrying capacity. Some suggest that this will happen, no matter what, and thus the real issue is if we want to be part of the solution or continue to be the problem.

Alevgul Sorman - Metabolic Trends

Alevgul Sorman (who is student of Mario Giampietro, one of the chairs of the conference committee) presented work in which she had broken out energy use by sector (agricultural, productive, services, and household) for several countries. These countries generally show less "energy intensity" over time (higher GDP growth than would be expected based on growth in energy use). But when one looks at the results by sector, Sorman showed that this is the result of a change in mix. Within the different categories, energy intensity is increasing over time. It is just because less productive work--manufacturing--is done, and more services are provided, that energy use per unit of GDP is declining.

Ugo Bardi - EROEI and net energy in the exploitation of natural resources

I was not able to be present for Ugo Bardi's talk, but heard it was very good. Based on the paper he submitted, the talk was fairly closely related to the Mind -Sized Hubbert post he wrote for The Oil Drum in September 2009, using the Lotka-Volterra model applied to resource exploitation. In his paper, the focus was more on the net energy that is generated and the capital available from a system with declining resources. According to his analysis, Net Energy is expected to have a maximum that takes place, approximately, near the production peak:

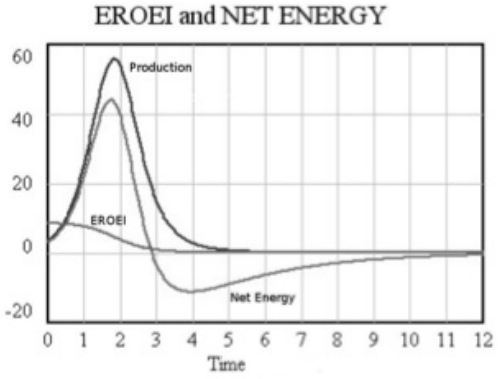


Figure 2. Qualitative solutions of the LV-system obtained using the Vensim software. The parameters reported are production, net energy and EROEI.

Capital available for reinvestment is only a fraction of the positive net energy generated. This relationship can be used to estimate historical EROEI, assuming all of the net energy is reinvested. This will give too low an EROEI, since only a part of the energy return is invested. Perhaps Ugo can explain more about his ideas in a post.

Marcell Collel - Nuclear

Marcell Collel (one of the organizers of ASPO-Spain) gave a talk on his view of nuclear. He pointed out that a huge number of new reactors (1000 - 1500) that would be needed, if a true shift toward nuclear were planned. Even replacing reactors that are near the ends of their lives will be a major undertaking.

He pointed out that a "nuclear renaissance" is unlikely. In his abstract, he says:

> In fact, after 22 applications for new reactor licenses were brought to the NRC for consideration by the end of 2008, in 2009 only one application was added to the queue and none so far this year. In the last few months the would-be builders of seven of these reactors have deferred their projects and some others have definitely cancelled them, mostly because the economics have swung against nuclear. Weak power demand and competitive electricity markets, together with a surge in US production of shale natural gas, have raised the prospect that electricity prices will be held down for many years to come with gas generation competitively advantaged.
>
> The new generation reactor that on paper most closely matches Weinberg's prerequisites for a second nuclear era, the Evolutionary Power Reactor (EPR), has evidenced how difficult it still is to make a reactor sufficiently safe and at the same time affordable. The failure to meet economic and construction-period targets at Olkiluoto and Flamanville has heavily weighted against this French offer to the world. . . Only in China it seems that nuclear constructions are going ahead without much consideration for markets, financial or otherwise.

Michael Dittmar - Nuclear

Michael Dittmar also talked about Nuclear. His paper can be found here. As readers of Oil Drum posts by Michael Dittmar might guess, his expectation is that the amount of electricity generated from nuclear sources will decline in years ahead. One of the issues is the age of nuclear power

plants. Only a handful are now over 40 years old, and these seem to be showing signs of deterioration. It is likely that quite a few nuclear power plants will need to be replaced in the years ahead, just to keep generating capacity level. Michael Dittmar also sees problems with long term uranium production.

Xin Li - Wind Power in China

Xin Li gave an interesting talk about critical issues facing China as they add new wind capacity--lack of adequate transmission lines; distance between where wind energy is generated and where it can be used; and a lack of easily-variable back-up power (since most electricity production is coal generated). It sounds like the installed capacity is not being fully utilized. Quoting from his paper:

> The current Chinese policies focus on installed capacity in the pursuit of a sustainable electricity mix. For instance, the Medium-Long Term Renewable Energy Development Plan has stipulated the responsibility of power generation companies which have more than 5,000 MW generation capacities to contribute 3% and 8% of their generation capacity to non-hydro renewable energy sources by 2010 and 2020, respectively. The mandatory timelines and proportion commitments have induced the large power generation companies to increase capacity growth contributing to the actual operating hours of wind turbines being much lower than the expected operating hours.

Seth Blumsack - Smart Grid

Seth Blumsack gave a very lukewarm endorsement for the smart grid. While we need a smart grid if we have electric cars and local electricity generation, it will create a more complex, less predictable system. It is not clear that the investment will be worthwhile. Quoting from his abstract:

> The U.S. federal government has dedicated tens of billions of dollars of economic stimulus funding to smart-grid deployment projects, and a number of U.S. states are implementing policies aimed at a rapid implementation of smart grid technologies. If the promise and challenges of the smart grid were an area that had been exhaustively studied, then this enthusiasm would be warranted. Unfortunately, only half of the previous statement is true – the promise of the smart grid has been written, broadcasted and blogged about but the swell of enthusiasm has drowned out much of the real analysis of the smart grid's potential and limitations. The smart grid is not snake-oil, but there is a widespread lack of understanding among policymakers, the general public, and researchers regarding what the smart grid actually is and how it can improve the reliability and sustainability of our electricity systems. The smart grid is being deployed faster than our ability to think through how it should be deployed, leaving important technical and social issues by the wayside.
>
> The purpose of this talk will be to provide a clear understanding of the "smart grid" as more than advanced "smart meters" or digital sensors for transmission grids. The essence of the smart grid is to bring modern communications and control systems to the production and delivery of electricity. The potential for improving the reliability and sustainability of electricity consumption and allowing for more decentralized decision-

> making is real, but the smart grid will inevitably evolve towards greater coupling of multiple infrastructure networks (electricity, communications, fuels and potentially transportation) with emerging and difficult-to-predict implications for cyber-security, infrastructure vulnerability and consumer privacy. These are not necessarily reasons to reject the smart grid (though regulators in some jurisdictions have done so) but policymakers and the public need to consider the real promise and perils of the smart grid before endorsing aggressive deployment.

Mario Giampietro -Energy Statistics

Mario Giampietro (one of the chairs of the conference committee) talked about the difficulty of aggregating different types of energy, when they have quality difference, and really cannot be substituted for each other. One thing he mentioned is the practice of converting hydroelectric and nuclear to "tons of oil equivalent" in different ways, making nuclear look like it is disproportionately more of the total than hydroelectric. According to his paper:

> Therefore, in Eurostat and IEA statistics the summing of the various formal categories (the numerical values expressed in energy units) included in the "semantically undefined" category "Primary Energy Commodities". Within this very same category the kWh of electricity are accounted in different ways! Those from nuclear plants are multiplied by 3 - or by another conversion factor when available - those from hydroelectric plants are not multiplied at all (as discussed in section 2.1 with the great differences between the physical energy content method - currently in use by international statistics - and the partial substitution method). To clarify better the implications of this choice, we have to note in the latter case we have that kWh of hydroelectricity are simply summed to tons of oil!

Joseph Tainter - The Energy Complexity Spiral

Joe Tainter's topics were similar to ones he has covered elsewhere. If you hear him in person, he does an amazing job of presenting his talks--a mellow voice that flows, with a sense of humor built in. I'll show some of his slides, to show some of his major points:

Complexity in Problem Solving

- Complexity grows incrementally as problems are addressed.
- As simple and cost-effective solutions no longer suffice, institutions develop solutions that are more complex and costly.
- Complexity in problem solving is an economic function. Complexity has costs and benefits.
- Complexity in problem solving reaches diminishing returns.

Why Does Complexity Grow?

- Complexity grows because it has great utility in solving problems.

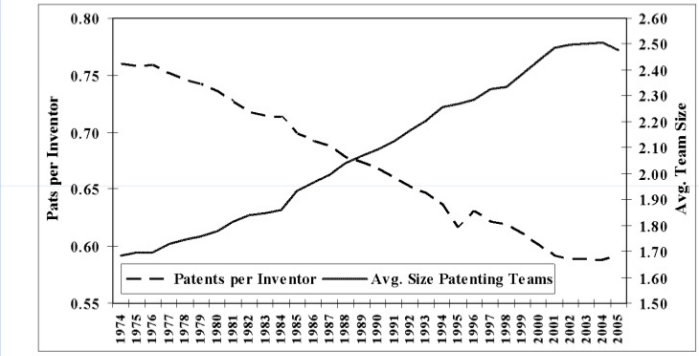
- Problems are often solved by developing more complex technologies, adding new positions and social roles, or conducting new kinds of activities.

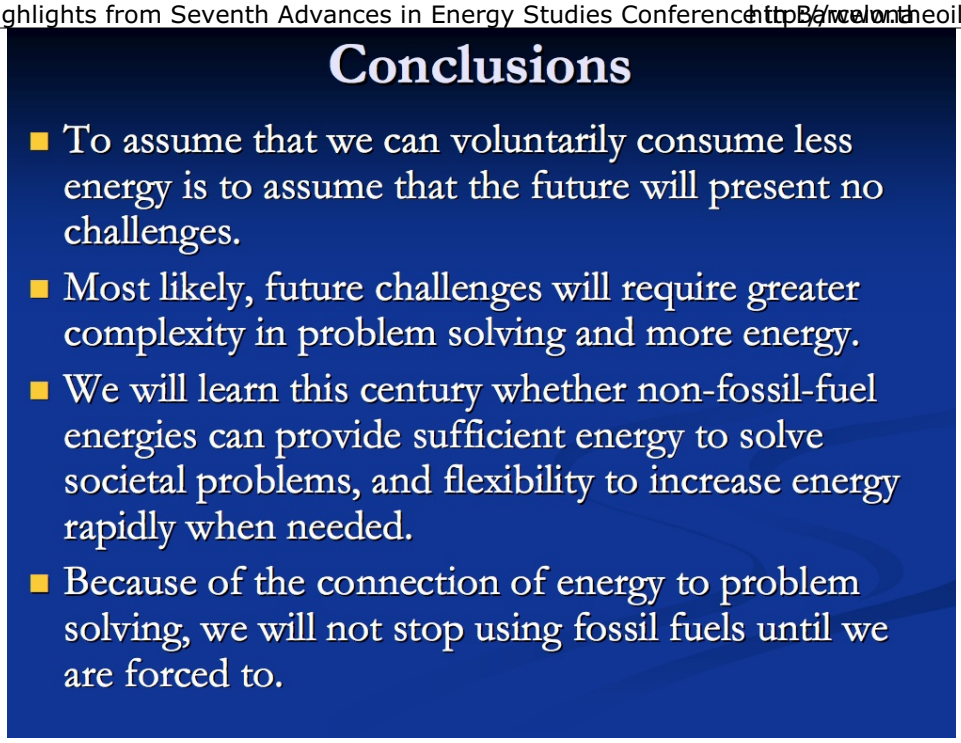
Sustainability: Common Misconceptions

A. Future sustainability requires that industrial societies consume a lower quantity of resources than is now the case.

B. Sustainability will result automatically if we do so.

Diminishing Returns to Innovation





Gail Tverberg - Peak Oil and the Continuing Financial Crisis

I gave the concluding talk of the three day conference. (I was also on the "team" that talked to students from 11 high schools the day following the three-day conference.)

My talk was close to a combination of two previous Oil Drum posts, with a few things added. The two most similar previous posts were:

Where we are Headed: Peak Oil and the Financial Crisis (March 2009)

Delusions of Finance: Peak Oil and the Financial Crisis (Feb. 2010).

Since many folks are familiar with these, I will not repeat what I said here. For those interested in reading something similar to my talk, this is a link to a PDF version of my talk.

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