
# Energy Journal Roundup: April 2009

Posted by David Murphy on April 21, 2009 - 9:55am
Topic: Miscellaneous
Tags: academic, articles, energy, eroi guy, journal, original, rembrandt koppelaar [list all tags]

We are starting a new monthly series today. Once a month, a selection of peer reviewed articles from several Energy Journals will be posted on the Oil Drum by Rembrandt and EROI Guy. The journals from which we select articles include Ecological Economics, Biomass and Bioenergy, The Oil & Gas Journal, The Energy Journal, Resource and Energy Economics and Energy Policy, to name just a few. Links are provided to articles but some may require fees for access.

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Oil and Energy Trends - China looks for more oil

> The growing share of imports in China's oil balance is a source of increasing concern to policy-makers in Peking. The government's response has been to try and secure as much crude oil as possible from foreign suppliers under long-term contract arrangements. To this end, it has concluded several deals: often on a government-to-government basis...Two of the latest deals have involved loans totalling $37 bn to Venezuela and Russia. The Venezuelan loan–amounting to $12 bn–is in return for a long term supply contract for up to 200,000 bpd of Venezuelan crude oil. Venezuela exported 129,000 bpd of crude to China in 2008. The Russian deal involves loans worth $25 bn made to an oil producer –Rosneft– and the national pipeline company –Transneft– in return for a 20-year deal to supply China with 300,000 bpd of oil from 2011. The oil is expected to come from eastern Sibe-ria. The arrangements involve the construction of a 40-mile spur line from the planned main export pipe-line from Eastern Siberia to the Pacific Ocean. The spur line will connect with a pipeline within China supplying the refining centre of Daqing, in the north-east of the country. The Chinese are reported to be discussing further large oil-related loan arrangements. The China Development Bank is thought to be willing to provide loans of up to $10 bn to the Brazilian state oil company, Petrobras, as part of a deal that could see the supply of 160,000 bpd of Brazilian crude to China.

James D. Hamilton - Understanding Crude Oil Prices - The Energy Journal volume 30 number 2.

> This paper examines the factors responsible for changes in crude oil prices. The paper reviews the statistical behavior of oil prices, relates this to the predictions of theory, and looks in detail at key features of petroleum demand and supply...Our overall conclusion is that the low price-elasticity of short-run demand and supply, the vulnerability of

> supplies to disruptions, and the peak in U.S. oil production account for the broad behavior of oil prices over 1970-1997. Although the traditional economic theory of exhaustible resources does not fit in an obvious way into this historical account, the profound change in demand coming from the newly industrialized countries and recognition of the finiteness of this resource offers a plausible explanation for more recent developments. In other words, the scarcity rent may have been negligible for previous generations but may now be becoming relevant...The $140/barrel price in the summer of 2008 and the $60/barrel in November of 2008 could not both be consistent with the same calculation of a scarcity rent warranted by long-term fundamentals. Notwithstanding, the algebra of compound growth suggests that if demand growth resumes in China and other countries at its previous rate, the date at which the scarcity rent will start to make an important contribution to the price, if not here already, cannot be far away.

Justine Barden, William Pepper, Vineet Aggarwal - The Impact of High Oil Prices on Global and Regional Natural Gas and LNG Markets - The Energy Journal Volume 30 Special issue on natural gas markets.

> Oil prices are notoriously hard to predict, but they are an important input in many energy and economic models. This paper explores the effects of different oil price assumptions on natural gas markets (production, consumption, prices in different regions) in the International Natural Gas Model (INGM). Three cases from the INGM are presented: a reference case, a high oil price case and a second high oil price case, where gas-to-liquids (GTL) capacity additions are constrained. The results show that regardless of constraints on GTL capacity additions, higher oil prices lead to higher production and consumption of natural gas. However, when GTL capacity is allowed to expand, higher oil prices generally lead to higher natural gas prices and to less gas consumption in the electric power and industrial sectors as they switch to cheaper fuels and more natural gas is diverted to the production of GTLs.

Kevin F. Forbes and Ernest M. Zampelli - Modeling the Growth in Gas Reserves From Known Fields - The Energy Journal Volume 30 Special issue on natural gas markets.

> The extent to which future United States demand for natural gas is satisfied by imports of LNG is contingent on the adequacy and cost competitiveness of North American supplies. One of the cheaper and more important sources of natural gas supply is accounted for by reserve appreciation, i.e., reserve growth, in known fields. Based on an extensively applied methodology developed by Arrington (1960), the increase in proved ultimate recovery is presumed to increase at a diminishing rate with the age of the field. In this paper, a single equation model of natural gas reserve growth in the Gulf of Mexico is developed and estimated. The results strongly suggest that the annual growth rate in the reserves of a field is significantly affected by initial discovery size, price, water depth, and unobserved field-specific effects. Hence, estimating oil and gas reserve growth using an Arrington based approach may underestimate the response of reserve growth to changes in economic fundamentals.

Tayebeh Ameri, Gilles Dennler, Christoph Lungenschmied and Christoph J. Brabec - Organic Tandem Solar Cells:A review - Energy and Environmental Science, 2009, volume 2.

> The same analysis performed above for traditional PV can be carried out for organic solar cells. It reveals that although organic solar cell research was marginal before 1999, it is currently experiencing an exponential growth. Over the last eight years, the number of papers directly addressing organic solar cells has increased by about 65% per annum that is almost twice the breathtaking evolutionary pace of the world photovoltaic market. Consequently, in 2006 10% of the scientific publications dealing with photovoltaics focused on organic solar cells. These impressive figures suggest that the science surrounding the topic of organic solar cells has been evolving greatly during the last years. While the best efficiency reported eight years ago barely reached values higher than 1%, several teams have recently realized devices showing efficiency beyond 5%.11–13 Though impressive, this value is not high enough to allow direct competition against mature PV technologies. Thus, the development of more efficient devices is required to ensure a bright industrial future for organic semiconductors. In this regard, the recent realization of tandem solar cells may pave the way toward high performance OSC. In this article we aim to review the most important and recent developments that have been reported on organic tandem solar cells.

Ioannis Vallios, Theocharis Tsoutsos, George Papadakis - Design of Biomass District Heating Systems - Biomass and Bioenergy 33:4

> The biomass exploitation takes advantage of the agricultural, forest, and manure residues and in extent, urban and industrial wastes, which under controlled burning conditions, can generate heat and electricity, with limited environmental impacts.
>
> Biomass can – significantly – contribute in the energy supplying system, if the engineers will adopt the necessary design changes to the traditional systems and become more familiar with the design details of the biomass heating systems.
>
> The aim of this paper is to present a methodology of the design of biomass district heating systems taking into consideration the optimum design of building structure and urban settlement around the plant. The essential energy parameters are presented for the size calculations of a biomass burning-district heating system, as well as for the environmental (i.e. Greenhouse Gas Emissions) and economic evaluation (i.e. selectivity and viability of the relevant investment). Emphasis has been placed upon the technical parameters of the biomass system, the economic details of the boiler, the heating distribution network, the heat exchanger and the Greenhouse Gas Emissions.

Christian Kerschner and Klaus Hubacek - Assessing the suitability of input–output analysis for enhancing our understanding of potential economic effects of Peak Oil - Energy 34:3

> Given recent developments on energy markets and skyrocketing oil prices, we argue for an urgent need to study the potential effects of world oil production reaching a

maximum (Peak Oil) in order to facilitate the development of adaptation policies. We consider input–output (IO) modelling as a powerful tool for this purpose. However, the standard Leontief type model implicitly assumes that all necessary inputs to satisfy a given demand can and will be supplied. This is problematic if the availability of certain key inputs becomes restricted and it is therefore only of limited usefulness for the study of the phenomenon of Peak Oil. Hence this paper firstly reviews two alternative modelling tools within the IO framework: supply-driven and mixed models. The former has been severely criticised for its problematic assumption of perfect factor substitution and perfect elasticity of demand as revealed by Oosterhaven [Oosterhaven J. On the plausibility of the supply-driven IO model. J Reg Sci 1988; 28:203–17}. The supply-constrained model on the other hand proved well suited to analyse the quantity dimension of Peak Oil and is therefore applied empirically in the second part of the paper, using data for the UK, Japanese and Chilean economy. Results show how differences in net-oil exporting and net-oil importing countries are clearly visible in terms of final demand. Industries, most affected in all countries, include transportation, electricity production and financial and trade services.

Ugo Bardi - Peak oil: The four stages of a new idea - Energy 34:3

The present paper reviews the reactions and the path of acceptance of the theory known as “peak oil”. The theory was proposed for the first time by M.K. Hubbert in the 1950s as a way to describe the production pattern of crude oil. According to Hubbert, the production curve is “bell shaped” and approximately symmetric. Hubbert's theory was verified with good approximation for the case of oil production in the United States that peaked in 1971, and is now being applied to the worldwide oil production. It is generally believed that the global peak of oil production (“peak oil”) will take place during the first decade of the 21st century, and some analysts believe that it has already occurred in 2005 or 2006. The theory and its consequences have unpleasant social and economical implications. The present paper is not aimed at assessing the peak date but offers a discussion on the factors that affect the acceptance and the diffusion of the concept of “peak oil” with experts and with the general public. The discussion is based on a subdivision of “four stages of acceptance”, loosely patterned after a sentence by Thomas Huxley.

Carlos de Castro, Luis Javier Miguel and Margarita Mediavilla - The role of non conventional oil in the attenuation of peak oil - Energy Policy 37:5

In this paper, the possible substitution of conventional with non conventional oil is studied using system dynamics models. The model proposed in this paper is based on geological, economic and technological aspects, and it fits approximately the behaviour observed by Hubbert. A first validation of the model has been made with the USA oil production data. These USA data show that there is a good coincidence between our model and the reality. This model has been expanded in order to include the substitution of the conventional oil with the non conventional one for the World. Two models with different ways to treat the contribution of non conventional oil have been developed and tested: a base model (business as usual), which extrapolates the last two

> decades' growth of this type of oil into the future, and a model that explores how much non conventional oil would be needed in order to avoid a peak and decrease in the global non renewable fuel production. The results show that, even under some hypotheses that we consider optimistic, the attenuation of the peak oil decline requires more than 10% of sustained growth of non conventional oil production over at least the next two decades.

Afshin Honarvar - Asymmetry in retail gasoline and crude oil price movements in the United States: An application of hidden cointegration technique - Energy Economics 31:3

> There is a common belief that gasoline prices respond more quickly to crude oil price increases than decreases. Some economists and politicians believe that asymmetry in oil and gasoline price movements is the outcome of a non-competitive gasoline market requiring that governments take policy action to address "unfair pricing". There is no consensus as to the existence, or nature, of the asymmetric relationship between prices of gasoline and crude oil. Much of this literature specifies asymmetry in the speed of adjustment and short-run adjustment coefficients. In contrast, Granger and Yoon's [Granger, C.W. and Yoon, G. "Hidden Cointegration", University of California, San Diego, Department of Economics Working Paper, (2002).] Crouching Error Correction Model (CECM) identifies asymmetry of the cointegrating vectors between components (cumulative positive and negative changes) of the series. Applying the CECM to retail gasoline and crude oil prices for the U.S., we find that there is only evidence of cointegration between positive components of crude oil prices and negative components of gasoline prices. In contrast to the literature which attributes asymmetric price movements to market power of refiners, these findings suggest that gasoline prices –in the long run– are more influenced by the technological changes on the demand side than crude oil price movements on the supply side.